

# Virginia Water Central

Virginia Water Resources Research Center Blacksburg, Virginia December 2008 (No. 47)



In October 2008, approximately 2000 fourth-graders from the public schools in Floyd, Giles, Montgomery, and Pulaski counties participated in “habitat hikes” on the Virginia Tech campus in Blacksburg. Each class visited five stations dealing with water quality, aquatic life, trees, and Virginia’s physiographic provinces. Tech students participating in a service-learning course led the hikes. The “Jr. Hokies Showcase” program was organized by Virginia Cooperative Extension agents with assistance from Tech’s College of Natural Resources.

## IN THIS ISSUE

Director’s Column: S <sup>2</sup> on H <sub>2</sub> O _____	2	Water Quality and You (también en español)_____	21
Remembering Terry Reid _____	2	Va. Govt. Water Issues Overview _____	23
Tracking Water in the 2009 General Assembly____	3	Notices _____	26
Feature Article: Water-Energy Symposium _____	4	Teaching Water _____	28
More on Energy: Natural Gas in SW Virginia _____	6	At the Water Center _____	29
Clean Water Act Jurisdiction Guidance _____	7	An Illustrated Review of 2008 _____	30
Water Status Report _____	8	You Get the Last Word _____	31
In and Out of the News _____	15		

## S<sup>2</sup> on H<sub>2</sub>O



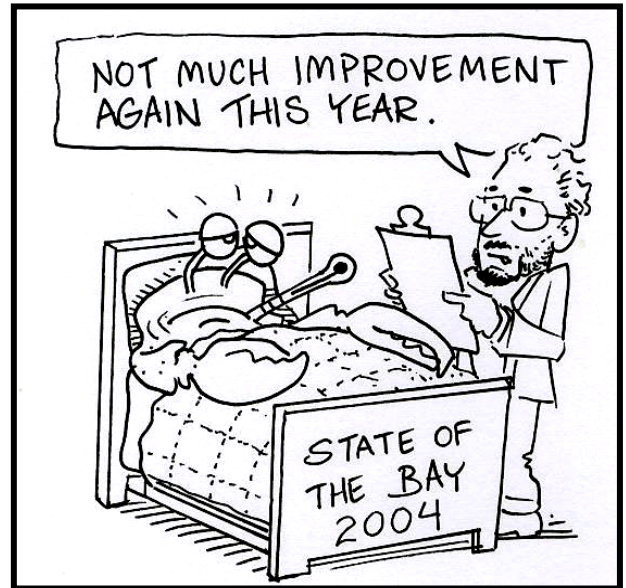
### Restoration of the Chesapeake Bay: Where do we really stand?

By Stephen Schoenholtz, Director  
Virginia Water Resources Research Center

There is not doubt that the degraded condition of the Chesapeake Bay has been well-documented and publicized during the 25 years since the Environmental Protection Agency (EPA) joined forces with Virginia, Maryland, Pennsylvania, and the District of Columbia to work together to restore the Bay's water quality and living resources.

The original pollution goals set for the year 2000 targeted a reduction of nitrogen and phosphorus by 40%. When it was recognized that these pollution-reduction goals would not be met on time, restoration targets were revised and reset for 2010. As noted in this illustration published in the January 2005 *Virginia Water Central Newsletter*, discouraging reports on the state of the Bay are nothing new.

Earlier this month, an article in the *Washington Post* documented misleading assessments by EPA officials of the Bay's restoration status. Interviews with EPA officials revealed that EPA reports repeatedly provided overly optimistic predictions of water-quality improvements based on computer models alone. Actual conditions of water quality in the Bay were not reflected in the numbers reported by the EPA.



This revelation suggests that we have been making less progress on the restoration of the Bay than we had been led to believe. In response, the Chesapeake Bay Foundation has filed a lawsuit against EPA for failing to enforce the Clean Water Act.

Where do we really stand? It is clear that we still have a long way to go in our efforts to restore the Chesapeake Bay. It is essential that we renew our efforts to control water pollution. We must also improve the accuracy of our assessments to show the true progress we are making.

### In Memory: Terrell John "Terry" Reid (1947-2008)

The staff members of the Virginia Water Resources Research Center express their condolences on the death of Terry Reid on December 27, 2008. Mr. Reid worked for 31 years for the City of Lynchburg's Public Works Department. After leaving that agency, he worked with the Wiley and Wilson consulting firm in Lynchburg. From 2000-06, Mr. Reid was a member of the Water Center's Statewide Advisory Board, and he served as chair of the Advisory Board. At our Advisory Board meetings, Terry was full of energy, ideas, suggestions, insights, opinions, friendliness, and kindness—in short, full of life. We will miss him.



## TRACKING WATER-RELATED BILLS IN THE 2009 VIRGINIA GENERAL ASSEMBLY

The 2009 Virginia General Assembly session is scheduled for January 14 to February 28. Beginning in late January, *Virginia Water Central* will post water-related legislation (from information provided by the Virginia Legislative Information System) on the Water Center's Web site, with occasional updates during the session. Please contact the *Water Central* editor, Alan Raflo (540-231-5463, or araflo@vt.edu) if you have questions about this service or suggestions for how it might work better for you.

As has been done for the past several years, *Water Central* will publish an inventory of water-related legislation in the first newsletter issue following the close of the General Assembly.

Below are some key session dates to check for changes in bills' provisions, status, or both.

### Some Key Dates in the 2009 Virginia General Assembly

January 23—All bills and joint resolutions must be filed with clerk by 5:00 p.m.

February 5—Committees responsible for correctional impact, appropriation, debt, revenue, and Virginia Retirement System (VRS) bills to complete work by midnight. Each house to complete work on its own legislation except for its own Budget Bill and bills for appropriation, debt, revenue, or VRS.

February 8—Committees responsible for Budget Bill(s) to complete work by midnight.

February 10—Each house to complete work on its own legislation except Budget Bill.

February 12—Each house to complete work on its own Budget Bill.

February 17—Committees responsible for revenue bills of the other house to complete work by midnight.

February 18—Each house to complete work on the other house's Budget Bill and revenue bills.

February 23—Last day for any committee action on legislation.

February 24—First conference on Budget Bill to complete work by midnight.

February 26—Budget Bill conference report due by noon; last day to put bills in conference.

February 27—Only conference reports and certain joint resolutions can be considered.

February 28—Adjournment *sine die*.

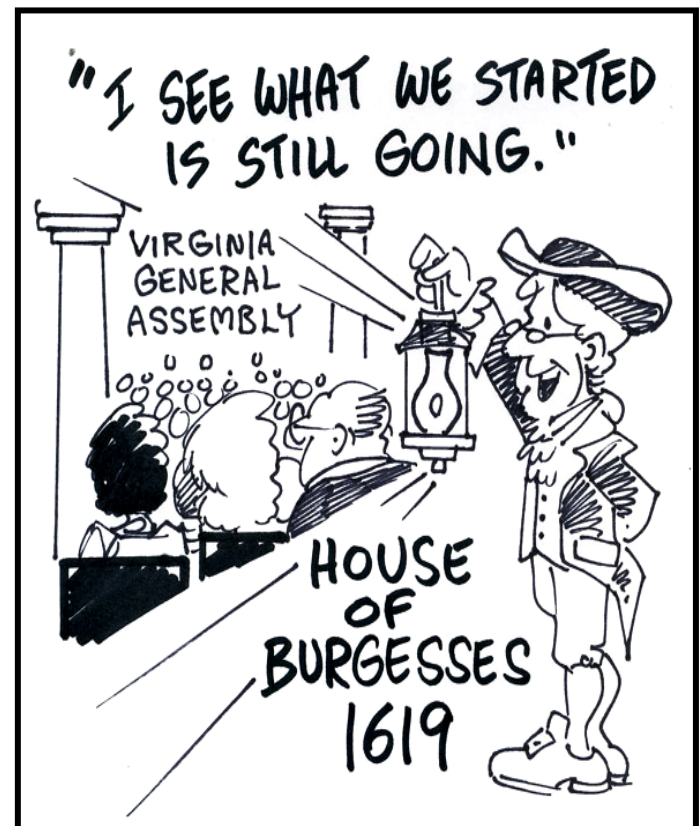
April 8—Reconvened ("veto") session.

For current information about the General Assembly (including lists and summaries of all bills, budget information, member information, committee schedules, and more) visit the Legislative Information System Web site at

<http://leg1.state.va.us>. You may also check on a bill's status by phone: for the House of Delegates, (877) 391-3228 (toll-free; in Virginia only), or (804) 698-1500; for the Senate, (888) 892-6948 (toll-free; in Virginia only) or (804) 698-7410.

According to the "Citizen Participation" information at the General Assembly's Web site (<http://legis.state.va.us>), when the General Assembly is in session the House of Delegates and Senate jointly operate a telephone message center to accept calls from citizens wishing to express an opinion on legislation. The messages are relayed to members' offices as requested. Phone the Constituent Viewpoint operators toll-free at (800) 889-0229 (outside Richmond) or 698-1990 (Richmond area).

For a selection of online news articles about the water-related legislation in the 2009 General Assembly, please visit the *Virginia Water Central* News Grouper at <http://delicious.com/araflo/09VaGenAssembly>.



## FEATURE ARTICLE

### **Mid-Atlantic Water Centers Delve Deep into the Water-Energy Nexus at November 2008 Conference in West Virginia**



*Text, photos, and graphic by Patrick Fay, Communications Manager for the Virginia Water Resources Research Center.*

When you think of energy, do you think of water? The U.S. Geological Survey (USGS) cites that nearly 40 percent of freshwater used in the United States is for generating electricity, whereas only about 12 percent is used for public water supply. Or consider these estimates by a USGS researcher: From 3 to 12 trillion gallons of water may be required to exploit fully the natural gas production potential of the Marcellus shales, a geological formation in New York, Pennsylvania, Ohio, West Virginia, and Maryland where gas drilling has dramatically increased in the past year. This water use would be 18 to 71 percent of the estimated 17 trillion gallons of precipitation available annually in that area. If these numbers surprise you, you are not alone. Many people do not realize the complex relationship that water has with energy.

In order to better understand the issue, researchers from the Virginia Water Resources Research Center (Water Center), along with other water and energy experts from the mid-Atlantic region, gathered in Shepherdstown, West Virginia, on November 17-19 for the 2008 Mid-Atlantic Regional Water Resources Research Conference, organized by the West Virginia Water Research Institute. Approximately 90 people attended the event hosted at the National Conservation Training Center, where 45 speakers presented, including a panel discussion on water-energy issues related to each of the states represented. Stephen H. Schoenholtz, director of the Virginia Water Center, commented on the unique nature of this conference, "This was the first time that several water centers in the mid-Atlantic region have worked together to organize a water conference. It had a true regional approach to serious water-energy questions."

It is widely accepted that new environmentally-friendly energy sources are required to help meet the ever-increasing worldwide demand for energy and to help address greenhouse gas effects. It is not

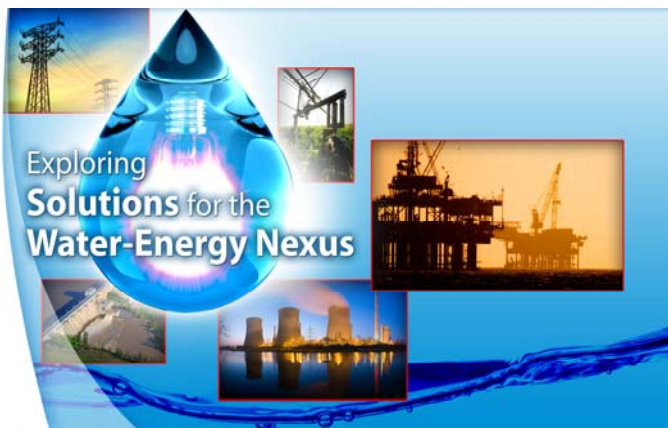
necessarily appreciated that most forms of energy require large amounts of water in the production process. As our population grows and requires more energy, the demands on water increase as well. In turn, climate change can impact the availability of water for use in energy production.

“This conference brought to the forefront the critical issue of the water-energy nexus like never before,” remarked Tamim Younos, associate director at the Virginia Water Center and research professor of water resources in the Virginia Tech Department of Geography. Technical topics addressed at the conference included a wide selection of water-energy issues and technologies related to traditional energy production, such as thermoelectric (generating electricity with steam-driven turbines), hydroelectric (generating electricity with water-driven turbines), and oil and gas production. Alternative energy sources—such as biofuels, wind, and solar—were also discussed. Topics were not limited to the use of water in large-scale energy production; home water and energy efficiency technologies were presented as well.

In recent interviews, staff members at the Virginia Water Center commented on how the water-energy issue has been, and will continue to be, a major topic of research and outreach in the years ahead. “We’ve been paying closer attention to water and energy connections for the past couple of years, and we were glad to see this multi-state meeting make water-energy its focus,” remarked Alan Raflo, research associate at the Virginia center. “This conference is part of a long-term effort by the Virginia Water Center to be knowledgeable about the connections among energy, climate, and water.”

Raflo noted that water and energy are connected through many specific activities, but most occur within four general areas: 1) water is needed to produce fuels and generate electricity from energy sources; 2) energy is needed to provide water supplies and to treat wastewater; 3) energy-production activities can affect water quality; and 4) energy production is connected to climate change, which affects water resources worldwide. “These connections among water and energy have been getting much more attention from the public and the news media in the past two or three years,” Raflo said, “so this multi-state meeting focusing on water and energy was right on time.”

Jane Walker, also a research associate at the Virginia Water Center, emphasized that more demands are being placed on Virginia’s water resources as the need for energy increases. She noted that with a large percentage of freshwater in the United States being used for the generation of electricity (as mentioned above), water conservation is closely tied to energy use. “Virginia is also seeing increased demands on its water resources for uses other than energy. Because energy requires substantial water supplies, and other water-use demands are increasing, management of Virginia’s water resources is becoming ever more challenging.”



Conventional energy-related activities will continue to be significant to Virginia’s economy and to influence water management in the Commonwealth. Meanwhile, investigation and development of alternative energy sources present many economic and environmental challenges and potential opportunities for Virginia. In addition, the future of energy in Virginia, as in other states, will be affected by government policies in response to climate changes, and those policies will in large part be driven by, or designed to address, impacts on water.

### Further Water-Energy Reading from the Virginia Water Resources Research Center

“The Intertwined Tale of Water and Energy,” by Rachelle Hill and Tamim Younos, April 2008:

[www.vwrrc.vt.edu/watercooler\\_apr08.html](http://www.vwrrc.vt.edu/watercooler_apr08.html).

*Analysis of Water and Energy Conservation of Rainwater Capture System on a Single Family Home*, by Caitlin Grady and Tamim Younos, SR 39-2008 (September 2008):

[www.vwrrc.vt.edu/pdfs/specialreports/SR39RainwaterHarvesting.pdf](http://www.vwrrc.vt.edu/pdfs/specialreports/SR39RainwaterHarvesting.pdf)

*Community-Based Sustainable Development Planning*, by Erica Adams and Tamim Younos, SR 41-2008 (October 2008):

[www.vwrrc.vt.edu/pdfs/specialreports/SR-41SustainableDevelopment.pdf](http://www.vwrrc.vt.edu/pdfs/specialreports/SR-41SustainableDevelopment.pdf).

Virginia Water Central News Grouper inventory of recent news articles on energy and water:

[www.vwrrc.vt.edu/va\\_water\\_group.html](http://www.vwrrc.vt.edu/va_water_group.html) (scroll down and click on “Energy Use and Developments”).



## MORE ON ENERGY: NATURAL GAS IN SOUTHWESTERN VIRGINIA

Following is a reprint (slightly edited for space) of an article published in the Fall 2008 newsletter of the Upper Tennessee River Roundtable, a non-profit organization in Abingdon working to improve water quality in the Upper Tennessee basin, including Virginia sections of the Clinch, Holston, and Powell rivers. To contact the Roundtable, phone (276) 628-1600 or e-mail: [uppertnriver@yahoo.com](mailto:uppertnriver@yahoo.com); Web site: [www.uppertnriver.org](http://www.uppertnriver.org). *Water Central* thanks the Roundtable for permission to reprint this article. Any opinions expressed are not necessarily those of the Virginia Water Resources Research Center. The original article was in remembrance of Bob Wilson (1943-2008), former director of the Virginia Department of Mines, Minerals and Energy's Division of Gas and Oil.

### **Natural Gas Extraction in Southwest Virginia: Working Together to Minimize Land-disturbing Impacts**

*By David Asbury, Director, Virginia Department of Mines, Minerals, and Energy/Division of Gas and Oil; and Kelly R. Miller, Regional Manager, Virginia Department of Conservation and Recreation/Division of Soil and Water Conservation.*

Natural gas is a substantial portion of the economy in Southwest Virginia. Southwest Virginia is blessed with a large supply of natural gas historically extracted by drilling conventional wells into deep reservoir rock. Improvements in technology have enabled the gas industry to tap into methane gas produced during the formation of coal and adsorbed within the pores of coal seams. In 2007, approximately 1588 wells produced 23.5 billion cubic feet of gas from conventional hydrocarbon reservoirs, while 4132 wells produced 88.3 billion cubic feet of coal bed methane gas from coal seams.<sup>1</sup> Virginia's gas production has increased by about 500 percent since 1990.

From January-September 2008, 3095 new permits [were] issued for gas well installation for conventional gas extraction, coal bed methane extraction, pipeline installation, facilities management, and service wells to 35 different companies. The concentration of conventional wells and coal bed wells is in Buchanan (2613), Dickenson (1624), Wise (622), Russell (437), and Tazewell (375).<sup>2</sup> Gas well activity is also present in Lee and Scott counties.

Virginia's Gas and Oil Act of 1990 authorized a comprehensive program to protect public safety and the environment from potential impacts associated with gas and oil exploration and development. The law and regulations govern activities from prior to initial disturbance of land for site preparation until after a well is no longer in service and reclaimed. The installation and operation of gathering pipelines is also governed by the law and regulations. The Department of Mines, Minerals and Energy's Division of Gas and Oil (DMME/DGO) is responsible for administering law and regulations.<sup>3</sup>

As of June 2006, in accordance with an exception granted by the U.S. Environmental Protection Agency, land-disturbing activity associated with oil or gas exploration or production is exempt from the National Pollutant Discharge Elimination System Regulations<sup>4</sup> and the Virginia Stormwater Management Program (VSMP) Permit Regulations. This guidance is mandated by the Federal Water Pollution Control Act (a.k.a. Clean Water Act), which authorizes states to institute programs to govern land-disturbing activities. However, this does not mean the oil and gas industry is not regulated to take preventive measures to control erosion and sediment runoff. The DMME/DGO regulations are very similar to those regulations in the Erosion and Sediment Control Law (*Virginia Code* 10.1-560-10.1-571) enforced by the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (DSWC), and DSWC has been party to DMME/DGO's regulation development. The Erosion, Sediment Control, and Reclamation regulations enforced by DMME/DGO can be found at 4VAC25-150-260 of the *Virginia Administrative Code*. In summary, property to be disturbed must have sediment controls in place prior to construction [and] maintained during construction and must have stabilization measures applied after disturbance is complete. Due to the nature of the land disturbance and the usually short amount of time the gas wells, roads, or pipelines are under construction, the regulations allow for more use of natural controls such as brush barriers, water bars, and traffic limitations at stream crossings.

Since 2006, DSWC's Abingdon Regional Office and the DMME/DGO have jointly designed and delivered training to 166 natural gas company employees to increase their awareness of erosion and sedimentation controls. Virginia's Secretary of Natural Resources, L. Preston Bryant, and Secretary of Commerce and Trade Patrick Gottschalk support efforts to responsibly access and extract natural gas reserves. Training efforts are planned to continue in the spring of 2009.

<sup>1</sup> As reported by the Va. DMME/DGO Website: [www.mme.state.va.us/divisiongasoil.shtml](http://www.mme.state.va.us/divisiongasoil.shtml).

<sup>2</sup> Data obtained from the Va. DMME/DGO on-line production database: [www.dmme.virginia.gov/dgoenquiry/frmmain.aspx](http://www.dmme.virginia.gov/dgoenquiry/frmmain.aspx).

<sup>3</sup> Information on the Va. DMME/DGO is available at [www.mme.state.va.us/dgo/documents/welldevelopmentactivities.shtml](http://www.mme.state.va.us/dgo/documents/welldevelopmentactivities.shtml).

<sup>4</sup> EPA Final Rule: Amendments to the Storm Water Regulations for Discharges Associated with Oil and Gas Construction Activities; 40 CFR Part 122, EPA-HQ-OW-2002-0068; FRL-8183-3, RIN 2040-AE81.

## CLEAN WATER ACT JURISDICTION GUIDANCE

On December 2, 2008, the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers issued a guidance memorandum to EPA regions and to Corps districts (revising a June 6, 2007, memorandum) on implementing the decision by the 2006 U.S. Supreme Court decision in the consolidate cases *Rapanos v. United States* and *Carabell v. United States*, collectively referred to as the *Rapanos* case. The Supreme Court's *Rapanos* case dealt with how the EPA and Corps are to determine which bodies of water and which kinds of wetlands fall under the jurisdiction of Section 404 of the federal Clean Water Act. On this page, *Water Central* reprints the "Summary of Key Points" from the December 2 guidance. The full guidance document ("Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in *Rapanos v. United States* & *Carabell v. United States*), along with related previous documents and other Clean Water Act information, is available online at [www.epa.gov/owow/wetlands/guidance/CWAwaters.html](http://www.epa.gov/owow/wetlands/guidance/CWAwaters.html). (As the guidance states, the summary below "is not a substitute for the more complete discussion of issues and guidance furnished throughout the memorandum.")

For a discussion of the *Rapanos* decision, please see the January 2007 *Water Central* article, "The Supreme Court Again Stirs the 'Waters of the United States,'" available online at [www.vwrrc.vt.edu/watercentral.html](http://www.vwrrc.vt.edu/watercentral.html). The cartoon below is from that article.

### Summary of Key Points

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters;
- Wetlands adjacent to traditional navigable waters;
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months);
- Wetlands that directly abut such tributaries.

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

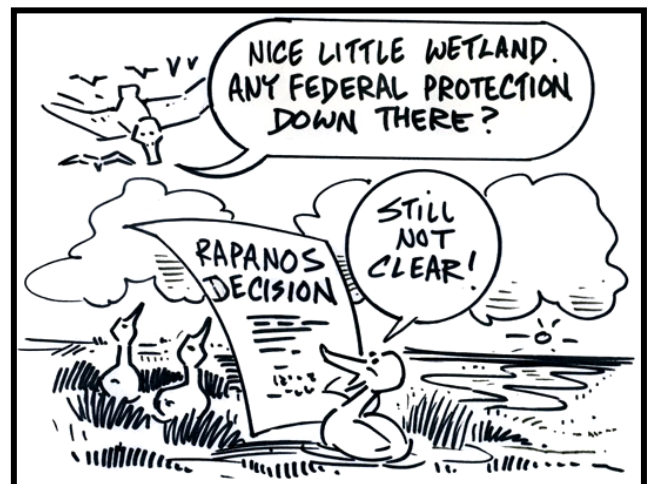
- Non-navigable tributaries that are not relatively permanent;
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent;
- Wetlands adjacent to but that do not directly abut a relatively permanent nonnavigable tributary.

The agencies generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow);
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

The agencies will apply the **significant nexus standard** as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters;
- Significant nexus includes consideration of hydrologic and ecologic factors.





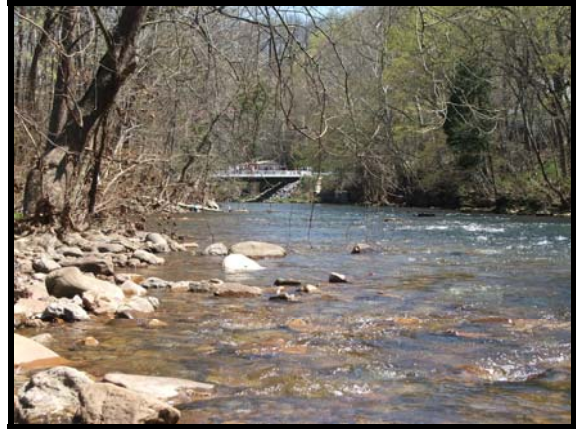
## VIRGINIA WATER STATUS REPORT

This section of *Water Central* presents recent and historical data on Virginia's precipitation, groundwater levels, and stream flow. In this issue, the section opens with a photographic look back at 2008.

### Seasons of 2008 in Virginia Water Views



Muskrat in a pond in Loudoun County, March 23.



Wolf Creek in Giles County, April 17.



North Fork Shenandoah River in Shenandoah County, August 16.



Cedar Creek in Frederick County, October 18.



Ice pellets on the ground in Montgomery County, December 2.



Icicles in a small stream along the Appalachian Trail in Smyth County, December 14.



## Precipitation in Virginia, January 2008-December 2008

The chart below shows precipitation (in inches) over the last 12 months at nine National Weather Service (NWS) observation sites in or near Virginia. The upper number for each entry is the **total 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 (on 1/7/09) at the “Climate” sections of NWS Web sites, as follows:

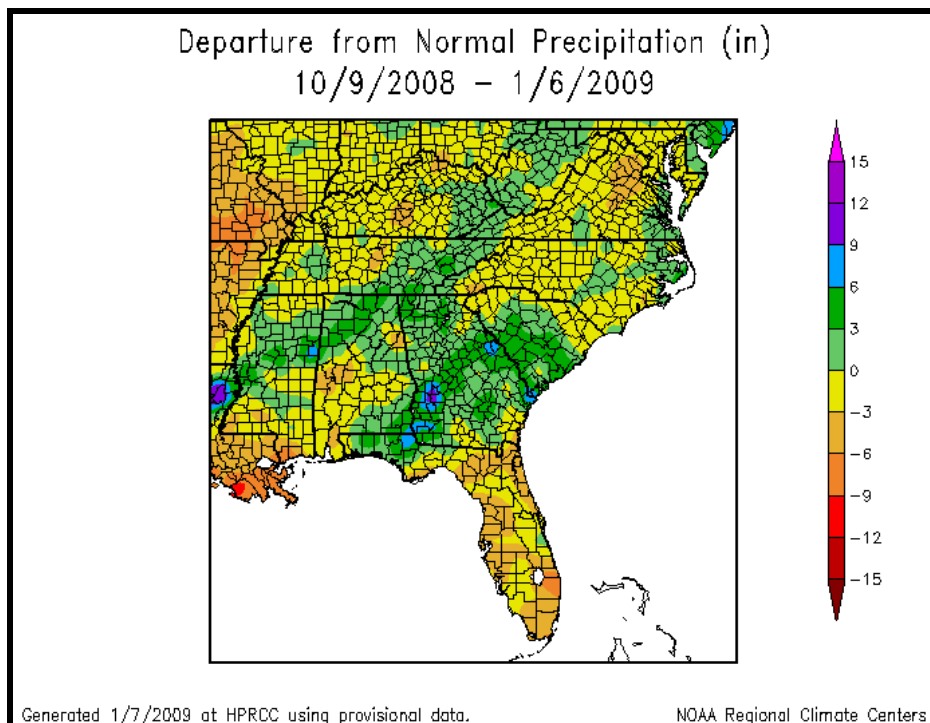
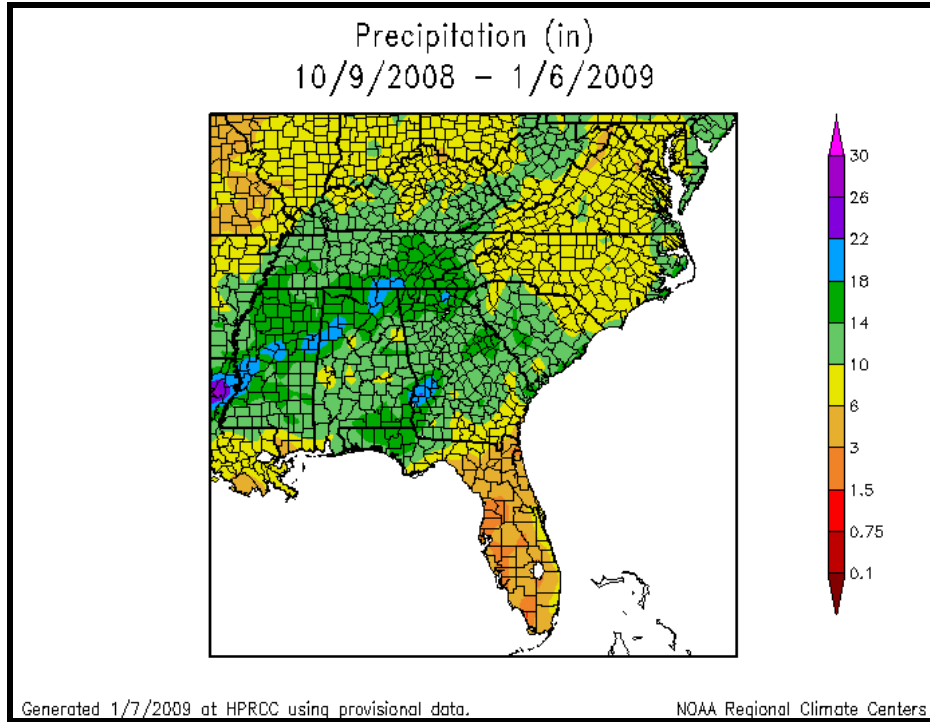
[www.weather.gov/climate/index.php?wfo=mrx](http://www.weather.gov/climate/index.php?wfo=mrx) for the Tri-cities Airport in Tennessee, about 20 miles from Bristol, Va.; [www.weather.gov/climate/index.php?wfo=rnk](http://www.weather.gov/climate/index.php?wfo=rnk), for Blacksburg, Danville, Lynchburg, and Roanoke; [www.weather.gov/climate/index.php?wfo=lwx](http://www.weather.gov/climate/index.php?wfo=lwx), for Charlottesville\* and Washington-Dulles; and <http://mi.nws.noaa.gov/climate/index.php?wfo=akq>, for Norfolk and Richmond. The lower number in each entry (in parenthesis) is the **average precipitation** for the respective site month (again, with the average yearly total at the bottom of the chart), over the period 1971–2000, according to the National Climatic Data Center, *Climatology of the United States No. 81* (available online at [www5.ncdc.noaa.gov/climate\\_normals/clim81/VAnorm.pdf](http://www5.ncdc.noaa.gov/climate_normals/clim81/VAnorm.pdf), as of 1/7/09). RL and RH mean record low or high, respectively, for that month. The recent monthly amounts are classified by the Weather Service as **provisional data and are subject to revision**; the National Climatic Data Center maintains any edited and *certified* data that are available.

	Bristol (Tri- Cities, Tenn., Airport)	Blacks- burg (Station #012)	Charlottes- ville (Station #023/2W)	Danville (Station #037)	Lynchburg (Municipal Airport)	Norfolk (Internat. Airport)	Richmond (Byrd Intern. Airport)	Roanoke (Woodrum Airport)	Wash.- Dulles Airport
Jan. 2008	3.45 (3.52)	1.40 (3.37)	1.04 (3.71)	0.79 (4.03)	1.27 (3.54)	1.36 (3.93)	0.96 (3.55)	0.96 (3.23)	1.26 (3.05)
Feb. 2008	3.63 (3.40)	1.86 (3.02)	2.86 (3.30)	2.24 (3.41)	1.95 (3.10)	3.41 (3.34)	3.41 (2.98)	1.86 (3.08)	2.68 (2.77)
Mar. 2008	3.84 (3.91)	2.57 (3.83)	3.58 (4.05)	3.11 (4.25)	3.61 (3.83)	2.96 (4.08)	3.50 (4.09)	2.27 (3.84)	2.47 (3.55)
Apr. 2008	2.84 (3.23)	5.69 (3.83)	5.09* (3.34)	5.38 (3.83)	4.39 (3.46)	6.37 (3.38)	8.32 (3.18)	4.94 (3.61)	6.22 (3.22)
May 2008	1.50 (4.32)	3.19 (4.39)	4.93* (4.86)	3.67 (3.96)	2.86 (4.11)	2.88 (3.74)	5.10 (3.96)	2.08 (4.24)	9.38 (4.22)
Jun. 2008	2.26 (3.89)	2.27 (3.93)	2.11* (4.46)	<b>0.88 RL</b> (3.50)	1.94 (3.79)	1.93 (3.77)	3.64 (3.54)	4.64 (3.68)	4.21 (4.07)
Jul. 2008	4.69 (4.21)	4.88 (4.17)	2.94 (4.94)	4.00 (4.44)	1.07 (4.39)	5.19 (5.17)	4.05 (4.67)	3.67 (4.00)	2.18 (3.57)
Aug. 2008	2.99 (3.00)	3.28 (3.68)	4.48 (4.14)	6.92 (3.54)	2.73 (3.41)	0.67 (4.79)	5.73 (4.18)	4.65 (3.74)	2.48 (3.78)
Sep. 2008	2.53 (3.08)	1.99 (3.39)	3.91 (4.85)	6.67 (4.08)	2.28 (3.88)	9.41 (4.06)	5.94 (3.98)	2.20 (3.85)	7.18 (3.82)
Oct. 2008	1.01 (2.30)	1.04 (3.19)	1.86 (4.22)	0.94 (3.71)	2.09 (3.39)	1.47 (3.47)	1.32 (3.60)	1.87 (3.15)	1.31 (3.37)
Nov. 2008	2.09 (3.08)	1.95 (2.96)	2.57 (3.74)	3.54 (3.07)	3.94 (3.18)	5.32 (2.98)	3.51 (3.06)	1.92 (3.21)	2.01 (3.31)
Dec. 2008	4.41 (3.39)	3.43 (2.87)	2.66 (3.26)	3.81 (3.16)	3.48 (3.23)	3.83 (3.03)	4.07 (3.12)	2.25 (2.86)	2.63 (3.07)
<b>Period Total</b>	35.24 (41.33)	33.55 (42.63)	38.03 (48.87)	41.95 (44.98)	31.61 (43.31)	44.80 (45.74)	49.55 (43.91)	33.31 (42.49)	44.01 (41.80)

\*Starred values for Charlottesville provided by University of Virginia Climatology Office, 7/11/08.

## Precipitation, continued

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) over the past three months and the departure from normal (in inches above or below normal; bottom) over that period. *These data are provisional.* These graphs were taken from [http://www.sercc.com/climateinfo/precip\\_maps](http://www.sercc.com/climateinfo/precip_maps) on 1/7/09.



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](mailto:climate@virginia.edu).



## Groundwater Levels at Selected Virginia Wells, January 2009

As of January 7, 2009, 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 450 wells in 64 Virginia counties and cities. At 81 of these observation wells in 35 localities, *real-time data* (updated every 5 to 60 minutes) were being recorded. The table below shows the January 6, 2009, daily average 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 January level, the deepest (driest) level, and shallowest (wettest) level for each well's period of record. Historical information on groundwater is also available from the USGS' annual reports of groundwater. Annual reports for Water Years (October through September) 2002 to 2008 are available online at <http://wdr.water.usgs.gov/>; for previous years, check your local library.

Well (Local #)	1/6/09 Level	10/6/08 Level	7/7/08 Level	January Median	Record Deepest (Driest)	Record Shallowest (Wettest)	Period of Record
Accomack (66M 19 SOW 110S)	8.81	10.1	9.3	9.4	11.3 (Nov. 1981)	7.4 (Nov. 2006)	Since Sep. 1978
Buckingham (41H 3)	26.4	26.7	24.6	22.4	36.7 (Jan. 2002)	7.4 (Apr. 1973)	Since Mar. 1971
Clarke (46W 175)	38.4	38.8	37.5	37.5	45.7 (Sep. 2002)	23.5 (Sep. 2003)	Since Mar. 1987
Fairfax (52V 2D)	15.5	15.8	14.0	13.3	24.9 (Dec. 1998)	6.5 (Mar. 1984)	Since Oct. 1976
Frederick (46X 110)	41.2	39.2	37.1	37.2	47.9 (Jun. 2006)	18.2 (Sep. 2004)	Since Nov. 2002
Hanover (53K 19 SOW 080)	18.3	20.8	19.0	17.9	22.9 (Aug. 1984)	5.1 (Aug. 2004)	Since Jan. 1978
Loudoun (49Y 1 SOW 022)	60.3	60.4	59.8	58.9	66.5 (Oct. 2008)	48.0 (June 1972)	Since Nov. 1963
Montgomery (27F 2 SOW 019)	6.3	6.8	6.3	3.8	7.3 (Dec. 1969)	0.0 (Mar. 1993)	Jul. 1953, then since Apr. 1969
Northampton (63H 6 SOW 103A)	7.3	8.2	6.9	6.8	10.0 (Oct. 2002)	0.8 (Aug. 2004)	Since Sep. 1977
Orange (45P 1 SOW 030)	28.4	31.2	26.7	22.9	39.0 (Aug. 2002)	11.8 (Apr. 1973)	Since Feb. 1965
Prince William (49V 1)	8.8	10.0	10.3	8.9	13.1 (Sep. 1991)	6.6 (May 2008)	Since Nov. 1968
Roanoke City (31G 1 SOW 008)	18.7	18.8	18.7	17.7	19.3 (Jun. 1987)	12.4 (Feb. 1986)	Since Aug. 1966
Rockbridge (35K 1 SOW 063)	27.0	28.6	27.7	24.0	30.4 (Sep. 2002)	14.3 (Apr. 1987)	Feb. 1964, then since Jun. 1972
Rockingham (41Q 1)	83.4	81.1	70.8	68.4	99.0 (Oct. 2002)	57.7 (Feb. 1998)	Since Aug. 1970
Suffolk (58B 13)	8.2	11.6	11.0	8.9	13.4 (Jan. 1981)	2.0 (Sep. 1999)	Since Mar. 1975
Surry (57E 13 SOW 094C)	8.2	10.1	9.7	7.5	11.2 (Dec. 1981)	3.9 (May 1980)	Since Jul. 1978
Virginia Beach (62B 1 SOW 098A)	6.8	3.4	4.7	1.9	12.0 (Sep. 1980)	0.9 (Aug. 2004)	Since Jun. 1979
Westmoreland (55P 9)	8.5	9.5	4.7	0.5	12.8 (Dec. 1988)	0.0 (May 2008)	Since Jul. 1977
York (59F 74 SOW 184C)	8.5	11.1	11.2	3.3	14.1 (Jan. 2002)	0.9 (Nov. 2006)	Since Jun. 1990

## Stream Flow in Virginia, November 2008-January 2009

The graphs on this page, 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>, 1/7/09), compare recent Virginia stream flow to historical records.

The data in the graphs come from 102 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;

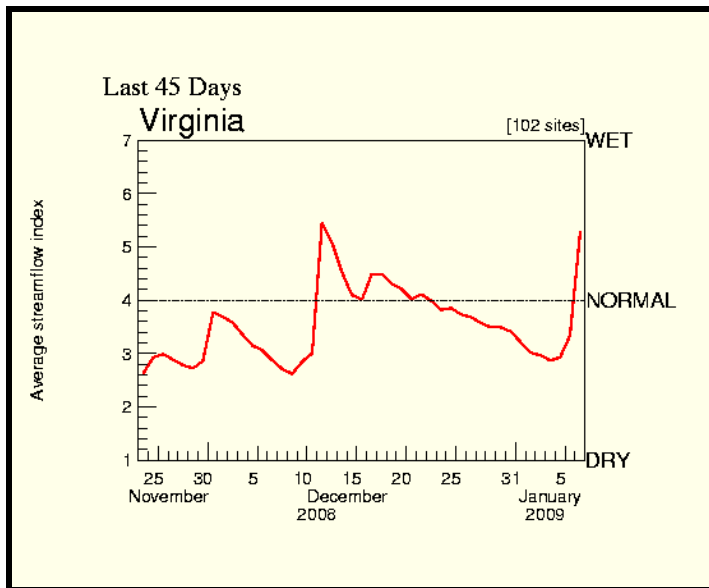
7 = average daily flow for the graphed date is record high for that date.

**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.

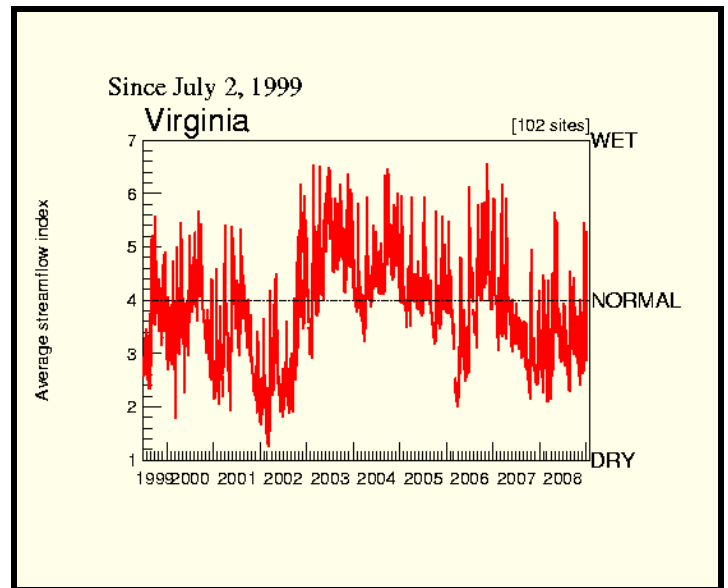
A USGS **map of current stream flow conditions** (with links providing access to details for each measuring station) compared to historical flows is available online at <http://water.usgs.gov/waterwatch/?m=real&r=va>. This Web site also has maps that show average flows over the previous 7-, 14-, and 28-day periods.

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

For November 23, 2008—January 7, 2009

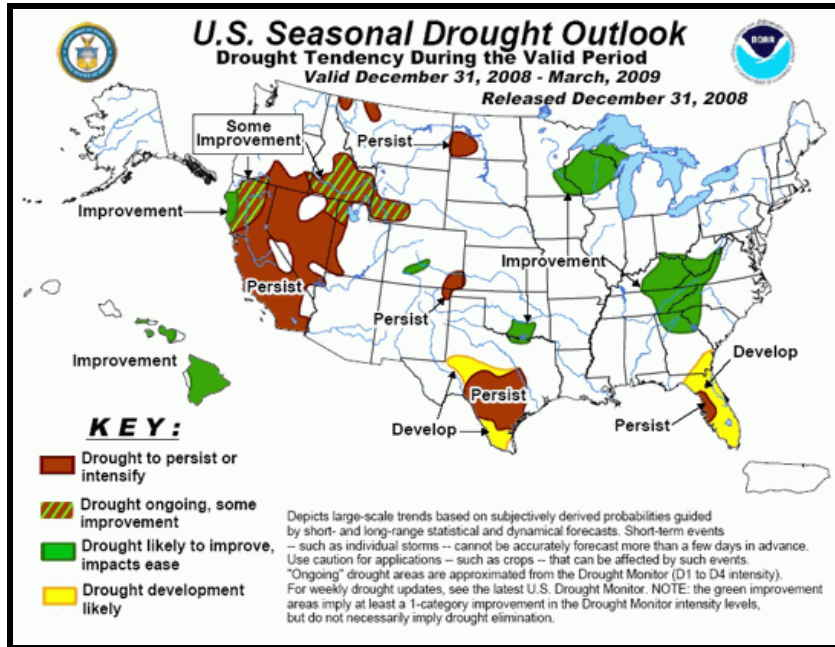


For July 1999—January 2009





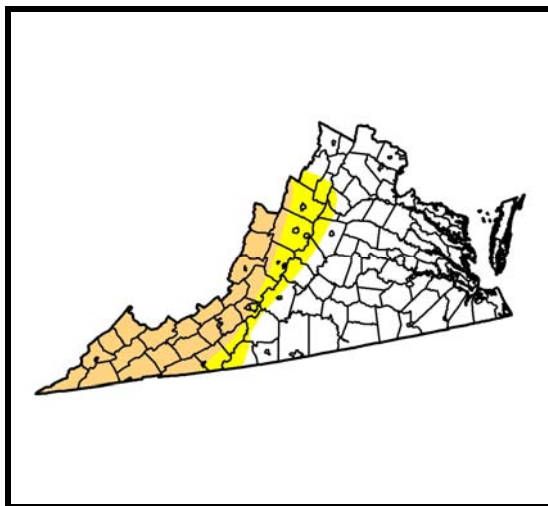
# Drought Update



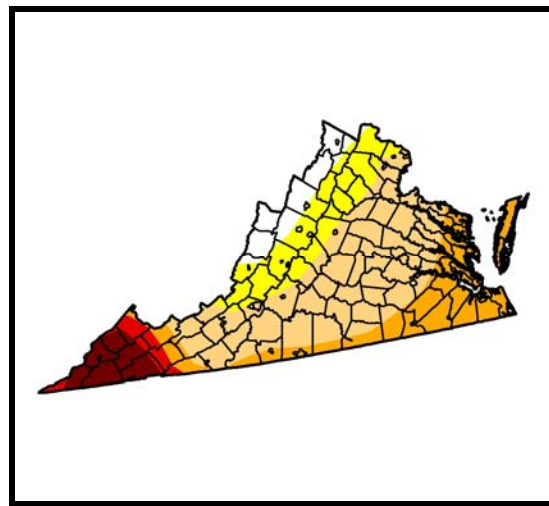
The national drought outlook for January-March 2009, according to the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center Web site, [www.cpc.ncep.noaa.gov/products/expert\\_assessment/seasonal\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html), accessed 1/7/09.

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

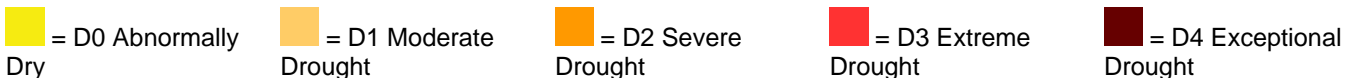
The U.S. Drought Monitor, available online at [www.drought.unl.edu/dm/monitor.html](http://www.drought.unl.edu/dm/monitor.html), is a weekly nationwide drought assessment by federal agencies and state climatological centers. The following graphs show Drought Monitor assessments of Virginia conditions on December 30, 2008 compared to December 25, 2007. Note the much better conditions overall in Virginia in 2008, but also note the persisting drought in the southwest.



December 30, 2008



December 25, 2007



**Source:** Images taken from archive of U.S. Drought Monitor, [www.drought.unl.edu/dm/archive.html](http://www.drought.unl.edu/dm/archive.html), 1/7/09. Authors: Brian Fuchs, National Drought Mitigation Center, for 12/30/08 image; Richard Helm, NOAA, for 12/25/07 image.

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 at various times between December 2007 and December 2008. Note the significant reduction in the extent of drought (percentage of area covered) in Virginia from one year ago (as also shown in the graphs on the previous page).

Drought Monitor Report Date	Percentage of area rated “abnormally dry” (D0) or worse	Percentage of area rated “severe drought” (D2) or worse
12/30/08	U.S. = 39% Va. = 37%	U.S. = 5% Va. = 0%
11/25/08	U.S. = 41% Va. = 33%	U.S. = 7% Va. = 17%
10/28/08	U.S. = 38% Va. = 36%	U.S. = 8% Va. = 17%
1/1/08	U.S. = 51% Va. = 92%	U.S. = 17% Va. = 27%

### From the Virginia Drought Monitoring Task Force

As of January 7, 2009, the latest report from the Virginia Drought Monitoring Task Force was issued November 25, 2008. Conditions in Virginia improved significantly in December 2008 (as the table above shows). The November report indicated, however, some **long-term precipitation deficits**. As of that report, the following drought evaluation regions were currently below normal for the **period beginning October 1, 2006** (precipitation greater than 85 percent of average is considered to be in the normal range.): Big Sandy, 72 percent of average; New River, 77 percent; Roanoke, 78 percent; Upper James, 79 percent; Middle James, 83 percent; Northern Piedmont, 81 percent; Chowan, 82 percent; Northern Coastal Plain, 80 percent; and York-James, 74 percent. The Shenandoah region (85 percent), Southeast region (85 percent), and Eastern Shore region (92 percent) were normal or above. The state as a whole was below normal, at 79 percent.

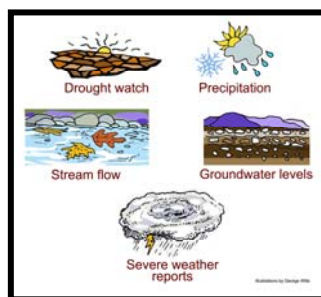
**Drought disaster declarations:** The November report indicated that thirty-six counties had requested the governor’s assistance in obtaining federal agricultural disaster designation due to drought conditions. On October 15, 2008, the U.S. secretary of agriculture eleven localities “primary disaster areas” due to drought and excessive heat: Amelia, Amherst, Bedford, Campbell, Dinwiddie, Halifax, Louisa, Nelson, Nottoway, Pittsylvania, and Prince Edward. As of November, Governor Kaine had also requesting a disaster designation for 21 more localities: Albemarle, Brunswick, Buckingham, Caroline, Charlotte, Fluvanna, Franklin, Gloucester, Goochland, Greene, Hanover, Henry, Isle of Wight, Lunenburg, Mecklenburg, Patrick, Prince George, Powhatan, Rockbridge, Scott, and Surry. At that time, the Farm Service Agency was preparing loss assessment reports for four other localities: Craig, King and Queen, King William, and Russell.

The complete November report and previous monthly reports from the Drought Monitoring Task force are available online at [www.deq.virginia.gov/waterresources/drought.php](http://www.deq.virginia.gov/waterresources/drought.php).

### Other Useful Sources of Information Online

- U.S. Geological Survey “Drought Watch” for Virginia: <http://va.water.usgs.gov/drought/>.
- Virginia Forestry Department list of burn bans: <http://www.dof.virginia.gov/fire/burn-bans.shtml>.
- Virginia Department of Environmental Quality water-conservation tips: [www.deq.virginia.gov/waterresources/waterconservation.html](http://www.deq.virginia.gov/waterresources/waterconservation.html).

### Don’t Forget the Water Center’s Online Water Status Page!



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. Look for the image at the left, at [www.vwrrc.vt.edu/water\\_status.html](http://www.vwrrc.vt.edu/water_status.html). Please let us know how you like this resource (via e-mail to [araflo@vt.edu](mailto:araflo@vt.edu) or phone to 540-231-5463).



## IN AND OUT OF THE NEWS

### Newsworthy Items You May Have Missed

This is a limited edition of this section, containing mostly only headlines and brief notes from news stories that were reported primarily between October and December 2008. Headlines are followed by hyperlinks to the original article, but please note that some hyperlinks may no longer work when you try to access an article, because some news sources maintain links longer than others. Except as otherwise noted, all localities mentioned are in Virginia and all dates are in 2008. All Web sites listed were functional as of January 7, 2009.

### For More Virginia Water News: Try Some “Grouper”



If you're looking for news articles on a particular water-related topic (for example, dams, groundwater, or water supply), please visit Water Central's news item annotation and compilation service, the News Grouper, at [www.vwrrc.vt.edu/va\\_water\\_grouper.html](http://www.vwrrc.vt.edu/va_water_grouper.html). From there, you can access the Grouper's article collection at the social bookmarking Web site, delicious.com. Each Grouper entry includes the article title, Internet link (functional as long as the publisher maintains the link), notes on the article's contents, key words, and the date of the article. The key words and the month of publication are **tags** in delicious.com terminology (the Grouper uses similar tags to the sub-headings in this section of *Water Central*). Users can click on a tag to see the articles in a specific category or for a specific month. For example, fisheries articles that were published in November 2008 are grouped at <http://delicious.com/araflo/Fisheries+11-08>.

I hope that this service will help readers keep up with water-related news, and I would like to know what you think about this approach. Please provide any comments you have to me at (540) 231-5463; [araflo@vt.edu](mailto:araflo@vt.edu); or 210 Cheatham Hall (0444), Blacksburg, VA 24061. Thank you!

—Alan Raflo, *Water Central* editor

## In Virginia

### Dams

• **Water control board OKs Appalachian permit** - <http://www.roanoke.com/news/roanoke/wb/180897>, *Roanoke Times*, 10/18/08: In October, after weeks of local debate, the State Water Control board approved a **relicensing permit** for Appalachian Power Company for the **Smith Mountain Lake Hydroelectric Project**, addressing reservoir levels and downstream releases into the Staunton River. For more background, see **Smith Mountain Lake, Staunton River: What's behind the water war?**- [http://www.newsadvance.com/lna/news/local/article/sml\\_staunton\\_river\\_whats\\_behind\\_the\\_water\\_war1/9323/](http://www.newsadvance.com/lna/news/local/article/sml_staunton_river_whats_behind_the_water_war1/9323/); **Years of low water levels are at heart of dispute** - [http://www.newsadvance.com/lna/news/local/article/years\\_of\\_low\\_water\\_levels\\_are\\_at\\_heart\\_of\\_dispute/9320/](http://www.newsadvance.com/lna/news/local/article/years_of_low_water_levels_are_at_heart_of_dispute/9320/), *Lynchburg News & Advance*, 10/12/08.

### Drinking Water

• **Halifax firm contributes to green movement** - <http://www.inrich.com/content/cva/ric/news.apx.-content-articles-RTD-2008-09-25-0117.html>, *Richmond Times-Dispatch*, 9/25/08: Since 2007, the U.S.

Capitol in Washington has composted much of its cafeteria materials. Now Grand Springs, a Halifax company, is providing **bottled water in compostable bottles** to the Capitol.

## Energy and Climate

•**Poll: Majority of Virginians worried about climate change** - <http://hamptonroads.com/2008/10/poll-majority-virginians-worried-about-climate-change>, *Virginian-Pilot*, 10/22/08: Between September 4 and 24, the Miller School of Public Affairs at the University of Virginia conducted the **Virginia Climate Survey** of 660 Virginians; the article provides several highlights from the survey.

•**Suffolk to allow residents to build personal wind turbines** - <http://hamptonroads.com/2008/11/suffolk-allow-residents-build-personal-wind-turbines>, *Virginian-Pilot*, 11/6/08: In November, the Suffolk City Council voted to allow **residential wind turbines**, and the cities of Chesapeake and Virginia Beach were considering a similar measure.

•**Uranium mining to be studied—Panel to consider economic, health and other impacts of tapping Pittsylvania sites** - <http://www.inrich.com/cva/ric/news.apx.-content-articles-RTD-2008-11-07-0153.html>, *Richmond Times-Dispatch*, 11/7/08: In November, the Virginia Commission on Coal and Energy voted unanimously to conduct a **study of potential uranium mining** in Virginia.

•**Agency begins process to allow drilling off Va. coast** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/11/12/AR2008111202866.html> - *Washington Post*, 11/13/08; and **Williamsburg conference goes slowly on offshore drilling** - <http://hamptonroads.com/2008/12/williamsburg-conference-goes-slowly-offshore-drilling>, *Virginian-Pilot*, 12/4/08. On November 12, the U.S. Minerals Management Service (MMS) announced the start of 45-day public comment period, to be followed by environmental impact study, on **oil and gas exploration beyond 50 miles off the Virginia shore**. On December 3-4, MMS organized a workshop in Williamsburg on the regulatory process, state of scientific knowledge, infrastructure needs, and environmental considerations of oil/gas exploration off the Atlantic coast; MMS and the Virginia Institute of Marine Science (VIMS) will develop a report from the workshop.

•**Surry County town weighs impact of proposed coal plant** - <http://hamptonroads.com/2008/12/surry-county-town-weighs-impact-proposed-coal-plant>, *Virginian-Pilot*, 12/15/08; and **Activists pledge “all-out war” to block power plant** - <http://hamptonroads.com/2008/12/activists-pledge-allout-war-block-power-plant>, *Virginian-Pilot*, 12/8/08: Old Dominion Electric Cooperative **proposed coal-fired power plant in Surry County**. The plant would also use biomass for two to three percent of its fuel stock; 2016 is the Cooperative’s target for beginning operations. The Town of Dendron and Surry County are to begin considering the proposal in early 2009.

## Fishing and Fisheries

•**With hurricane damage in Gulf, blue crabbers catch a break** - <http://hamptonroads.com/2008/10/hurricane-damage-gulf-blue-crabbers-catch-break>, *Norfolk Virginian-Pilot*, 10/8/08; and **Virginia can get \$10 million for watermen hurt by crab woes** - <http://hamptonroads.com/2008/11/virginia-can-get-10-million-watermen-hurt-crab-woes>, *Norfolk Virginian-Pilot*, 11/19/08: After being declared as a federal fishery disaster by the U.S. Commerce Department in September, the **Chesapeake Bay Blue Crab fishery** was one of several situations around the country competing for \$75 million allocated by Congress; in November, \$10 million was approved for Virginia crabbers.

•**In other Blue Crab matters: New state ban on dredging of crabs upheld by judge** - <http://hamptonroads.com/2008/11/new-state-ban-dredging-crabs-upheld-judge>, *Norfolk Virginian-Pilot*, 11/25/08: In November, a Norfolk Circuit Court judge decided against removing Virginia’s ban on winter dredging for Blue Crabs, prior to a trial on a watermen’s lawsuit in February 2009; and **800-plus Virginia watermen could lose crabbing licenses** - <http://hamptonroads.com/2008/11/800plus-virginia-watermen-could-lose-crabbing-licenses>, *Norfolk Virginian-Pilot*, 11/27/08: The Virginia Marine Resources Commission (VMRC) voted on Nov. 26 to suspend unused crabber licenses (licenses of watermen who did not catch any crabs from 2004 to 2007).

•**Fish kill task force evaluates results of latest study** - <http://www.deq.virginia.gov/info/srfishkill.html>, Virginia Department of Environmental Quality, 11/18/08: In November, the Virginia Department of



Environmental Quality (DEQ) reported the latest results from studies of the multi-year **fish kills in the Shenandoah River basin**.

## Groundwater

• **Cave critters linked to quality of water** - <http://www.inrich.com/cva/ric/news.apx.-content-articles-RTD-2008-10-15-0095.html>, *Richmond Times-Dispatch*, 10/15/08: The endangered **Madison Cave Isopod** is being studied in western Virginia caves and wells as an indicator of groundwater quality and connections among aquifers.

• **Luck Stone drops quarry in Clarke** - <http://www.inrich.com/cva/ric/news.apx.-content-articles-RTD-2008-11-07-0135.html>, *Richmond Times-Dispatch*, 11/7/08: Luck Stone Corporation of Richmond has decided not to pursue a **limestone quarry in Clarke County**. Local residents had raised concerns over potential impacts to groundwater, among other issues.

## Land Use

• **Overlay district will protect streams** - <http://fredericksburg.com/News/FLS/2008/102008/10262008/419269>, *Fredericksburg Free Lance-Star*, 10/26/08: Stafford County will apply buffer-zone regulations—already in effect for perennial streams and tidal shorelines—to **intermittent streams** and slopes along those streams.

• **Revisions to Bay Act would help smaller lots** - <http://www.delmarvanow.com/article/20081203/ESN01/812030379/-1/ESN>, *Eastern Shore News*, 12/3/08; and **Supervisors postpone Bay Act decision** - <http://www.delmarvanow.com/article/20081220/ESN01/812200307/-1/ESN>, *Eastern Shore News*, 12/20/08: Accomack County is considering a proposal to apply **Chesapeake Bay Act protection zones to ocean-side areas**. The County board of supervisors decided on December 17 to postpone a decision on the ordinance until after holding two public information meetings.

## Mining

• **New Regulation Would Ease Disposal of Mountaintop Mining Debris** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/12/02/AR2008120203055.html?tid=informbox>, *Washington Post*, 12/3/08: In December, the U.S. Office of Surface Mining approved a regulation on disposal of material generated by **mountaintop-removal coal mining**; the regulation follows several years of litigation over disposal of material in small stream valleys.

## Solid Waste Management

• **A bargain for recyclers** - <http://www.inrich.com/content/cva/ric/news.apx.-content-articles-RTD-2008-10-10-0104.html>, *Richmond Times-Dispatch*, 10/10/08: Goodwill Industries and the Dell, Inc., computer company are collaborating to offer **electronic-device recycling** at 100 Goodwill locations across Virginia.

## Spills

• **Safety board pinpoints cause of tank collapse - says other tanks in danger** - [http://www.wvec.com/news/topstories/stories/wvec\\_top\\_120808\\_tank\\_collapse.41dc3974.html](http://www.wvec.com/news/topstories/stories/wvec_top_120808_tank_collapse.41dc3974.html), WVEC-TV, 12/8/08: The November 12 **fertilizer-tank collapse in Chesapeake** was one of largest of its kind in the country. The U.S. Chemical Safety and Hazard Investigation Board report identified faulty welds as cause of tank failure and found no clear regulatory authority over non-petroleum, above-ground tanks. Three other nearby tanks present a risk. The report found that the spill increased nitrogen levels in the Elizabeth River.

## Stormwater Management

• **Chesapeake's storm-water fee increases to go on** - <http://hamptonroads.com/2008/10/chesapeake-stormwater-fee-increases-go>, *Virginian-Pilot*, 10/29/08: In October, the Chesapeake city council approved keeping an annual automatic increase in the **stormwater utility fee**. Funds from the fee have helped reduce a backlog of citizen complaints about stormwater problems.

•**Lynchburg study will help streamline water projects -**

[http://www.newsadvance.com/lna/news/local/article/lynchburg\\_study\\_will\\_help\\_streamline\\_water\\_projects/11558/](http://www.newsadvance.com/lna/news/local/article/lynchburg_study_will_help_streamline_water_projects/11558/), *Lynchburg News & Advance*, 12/13/08: The City of Lynchburg plans to seek a coordinated study of project needs related to **sewer overflows, stormwater, and impaired streams**.

## Wastewater

•**Wastewater bond money coming to Harrisonburg -**

<http://www.whsv.com/news/headlines/29952764.html> - WHSV Television, 9/30/08: \$187 million in **Clean Water Revolving Loan Fund bonds for 2008** from the Virginia Resources Authority will help fund 10 wastewater-treatment projects in nine Virginia localities.

•**Where will Middlesex County put sewer lines -**

[http://www.ssentinel.com/index.php/news/article/where\\_will\\_middlesex\\_county\\_put\\_sewer\\_lines/](http://www.ssentinel.com/index.php/news/article/where_will_middlesex_county_put_sewer_lines/), *Southside Sentinel*, 10/8/08: Spurred by recent development, Middlesex County is examining issues related to installing **centralized wastewater systems**.

•**New revenue needed for water, sewer service in Bedford County -**

[http://www.newsadvance.com/lna/news/local/article/new\\_revenue\\_needed\\_for\\_water\\_sewer\\_service\\_in\\_bedford\\_county/9981/](http://www.newsadvance.com/lna/news/local/article/new_revenue_needed_for_water_sewer_service_in_bedford_county/9981/), *Lynchburg News & Advance*, 10/30/08: Bedford County is facing **\$12.5 million in water and wastewater project needs**. The county's current revenue for its public service authority is \$200,000 per year.

•**Tours give up-close look at water control plant's revamp -**

<http://www.sungazette.net/articles/2008/11/26/arlington/news/nw825b.txt>, *Sun Gazette*, 12/1/08: A \$538-million **upgrade to Arlington County's wastewater treatment plant**—the largest public works project in the county's history—is due to be completed in 2011.

## Water Quality and Aquatic Habitat

•**Norfolk works to rid Willoughby Spit of damaging plant -** <http://hamptonroads.com/2008/10/norfolk-works-rid-willoughby-spit-damaging-plant>, *Virginian-Pilot*, 10/4/08: The **invasive plant Beach Vitex** has been found in Norfolk; major problem in N.C. and S.C. sand dunes; eradication efforts are being developed by local officials.

•**James River Tributary to get "Extreme" attention -** <http://www.inrich.com/content/cva/ric/news.apx.-content-articles-RTD-2008-10-07-0151.html>, *Richmond Times-Dispatch*, 10/7/2008: In October, **Horsepen Branch in Richmond** was the site of week of clean-up, restoration, and stormwater-reduction activities. The efforts was a collaboration of the James River Association, four local garden clubs, and several other local agencies, business, organizations, and schools.

•**EPA's plan would wall off toxins along Elizabeth River -** <http://hamptonroads.com/2008/10/epas-plan-would-wall-toxins-along-elizabeth-river>, *Virginian-Pilot*, 11/2/08: In November, the U.S. EPA described its recommended **alternative for a Portsmouth, Va., section of the South Branch of Elizabeth River** that has been contaminated by years of disposal of petroleum-based wastes. The site has been on federal Superfund list since 1990. The recommended plan—one of seven considered by EPA—would use walls to contain contaminants within the river. Virginia officials have raised several objections.

•**Three methods vie to restore oysters to Chesapeake Bay -** <http://hamptonroads.com/2008/11/three-methods-vie-restore-oysters-chesapeake-bay>, *Virginian-Pilot*, 11/10/08. On October 17 the U.S. Army Corps of Engineers' draft environmental impact statement on pros and cons of introducing reproducing populations of **non-native oysters into Chesapeake Bay**.

•**Lynnhaven River's oysters may be up, but grades down -**

<http://hamptonroads.com/2008/11/lynhaven-rivers-oysters-may-be-grades-down>, *Virginian-Pilot*, 11/21/08: In November, the non-profit group Lynnhaven River Now released its annual report on the **state of the Lynnhaven River** in Virginia Beach, showing some improvements and some setbacks in the various measures of the river's habitat and water quality.

•**Environmental coalition plans lawsuit to speed Bay cleanup -**

<http://hamptonroads.com/2008/10/environmental-coalition-plans-lawsuit-speed-bay-cleanup>, *Virginian-Pilot*,

10/29/08; and **Foundation sues to force EPA to clean up Chesapeake Bay** - <http://hamptonroads.com/2009/01/foundation-sues-force-epa-clean-chesapeake-bay>, *Virginian-Pilot*, 1/5/09: In January, the Chesapeake Bay Foundation, the Virginia State Watermen's Association, former Virginia secretary of natural resources Tayloe Murphy, former Maryland governor Harry Hughes, and former Washington, D.C. mayor Anthony Williams filed a **lawsuit against the U.S. EPA** to enforce the Clean Water Act in the Chesapeake Bay.

•**Broken promises on the bay** - <http://www.washingtonpost.com/wp-dyn/content/story/2008/12/26/ST2008122601782.html>, *Washington Post*, 12/27/08; **Scenes of an effort impeded unfold across the Chesapeake watershed** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/12/26/AR2008122601710.html>, *Washington Post*, 12/27/08; and **Optimism over saving the bay bonded local jurisdictions** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/12/26/AR2008122601422.html>, *Washington Post*, 12/26/08: In late December, the *Washington Post* published three detailed articles on the **history of Chesapeake Bay restoration efforts since 1983**, focusing on whether federal Bay Program officials at the U.S. EPA exaggerated progress and potential to reach stated goals in order to continue receiving federal funds.

## Water Supply

•**Authority studies rising water need** - [http://www.winchesterstar.com/showarticle\\_new.php?sID=6&foldername=20081022&file=Authority%20studies\\_article.html](http://www.winchesterstar.com/showarticle_new.php?sID=6&foldername=20081022&file=Authority%20studies_article.html), *Winchester Star*, 10/22/08; and **Water plan gets "enthusiastic" response** - [http://www.winchesterstar.com/showarticle\\_new.php?sID=6&foldername=20081119&file=Water%20plan\\_article.html](http://www.winchesterstar.com/showarticle_new.php?sID=6&foldername=20081119&file=Water%20plan_article.html), *Winchester Star*, 11/19/08. The Frederick County Sanitation Authority is looking at new **options for providing water**, particularly in light of a newly expanded urban development area. A recent study predicts a county water shortage by 2012, given only current sources. As one option, the county plans to study using water from quarries in Shenandoah County.

## Wetlands

•**Wetlands issue with Edinburgh project heading to court** - <http://hamptonroads.com/2008/09/wetlands-issue-edinburgh-project-heading-court>, *Virginian-Pilot*, 9/26/08: The U.S. Army Corps of Engineers and Precon Development Corporation of Chesapeake are in dispute over whether **nontidal wetlands** in a proposed development area are subject to **Clean Water Act (CWA) permit requirements**. The Corps maintains they are and has refused to issue a permit; the company filed suit in U.S. District Court challenging CWA jurisdiction.

•**After 3 years of debate, Back Bay marina makes progress** - <http://hamptonroads.com/2008/10/after-3-years-debate-back-bay-marina-makes-progress>, *Virginian-Pilot*, 10/16/08: In October, the Army Corps of Engineers approved a permit for a **76-slip marina near Back Bay National Wildlife Refuge** in southeastern Virginia.

## Outside of Virginia

•**Emission rights for sale in auction** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/09/24/AR2008092403588.html>, *Washington Post*, 9/25/08: In September, Maryland and five other eastern states in the Regional Greenhouse Gas Initiative held an **online auction of carbon emission credits**, marking the first time that governmental entities in the United States acted to establish a price for carbon emissions.

•**A mandatory sewage plan in search of federal funding** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/09/25/AR2008092504055.html> - *Washington Post*, 9/26/08: The Washington, D.C., city council is trying to find way to pay for a **\$2.2-billion wastewater-management plan** required by U.S. EPA under the Clean Water Act.

•**Water supply questioned for growing population** - <http://www.americanfarm.com/TopStory11.18.2008d.html>, *Americanfarm.com*, 11/18/08: At a November meeting, state officials in Maryland expressed **concerns about Maryland's long-term water supply**.



- **Old Wilson Bridge Finds New Life As Artificial Reef for Baby Oysters** - <http://www.washingtonpost.com/wp-dyn/content/article/2008/10/17/AR2008101703004.html>, *Washington Post*, 10/18/08: In the Chesapeake Bay near Calvert County, Maryland, **500,000 native oyster spat** were placed on 80 acres of concrete from the demolished, old Woodrow Wilson Bridge.

- **Pennsylvanians approve water, sewer upgrades** - <http://cbs3.com/topstories/pennsylvania.water.system.2.856738.html> - Associated Press on CBS3.com (Philadelphia), 11/5/08: In a November referendum, **Pennsylvania voters approved \$400 million in bonds** to fund water and wastewater infrastructure.

- **\$250,000 on sewage plant's wish list** - <http://www.pressconnects.com/article/20081202/NEWS01/812020341/1001>, *Binghamton (N.Y.) Press & Sun-Bulletin*, 12/2/08: The Binghamton-Johnson City Joint Sewage Treatment Plant in New York is seeking funds for a feasibility study of getting **electricity to run the plant from methane gas** (currently being burned off) and from **micro-turbines turned by the flow of the effluent** from the plant.

- **High Court Case Tests Power Plants' Water Rules** - <http://www.npr.org/templates/story/story.php?storyId=97651580>, National Public Radio, 12/2/08: On December 2, the U.S. Supreme Court heard oral arguments in three cases about whether existing power plants must implement best available technology to reduce harm to aquatic organisms drawn up in cooling water. A larger issue is whether a cost-benefit analysis is allowed in such circumstances. The cases are *Entergy Corp. v. EPA*, *PSEG v. Riverkeeper*, and *Utility Water Act Group v. Riverkeeper* (according to an Associated Press article published in the *Washington Post*, 12/2/08).

## Final Words

- “They’re like a million environmental barometers spread all over the place that have recorded everything that’s happened at that spot throughout their entire life history.”—Roger Mann, professor at Virginia Institute of Marine Science, referring to 400-year-old oyster shells found at Jamestown and being studied to reveal changes in water conditions and oyster size over the centuries. (*Enterprise [Ala.] Ledger*, 10/20/08)

- “Now that I know what I did and what it is going to do—to clean up the bay—well, I feel I did a great thing for everybody, not just for myself or for the governor, but for everyone in general that uses the bay and gets their livelihood from the bay.”—James Cotton, an inmate at Eastern Correctional Institution in Westover, Md., talking about his experience helping construct oyster cages for growing oysters below public and private piers in Maryland. (*Southern Maryland Online*, 10/26/08)

- “A two-year drought like the one we’re in now happens from time to time. But if we get a third year of it, then there will really be problems next year in a lot of different areas. Fish tend not to do well without any water.”—Va. Department of Game and Inland Fisheries fish biologist Scott Smith, talking about the impacts of multi-year drought on aquatic life in the James River. (*Lynchburg News & Advance*, 11/8/08)

- “You want people to see what we’re doing. Ninety percent of water quality is changing people’s thinking.”—Bill Johnston, City of Virginia Beach stormwater director, referring the city’s first stormwater facility that uses shrubs in soil as a filter and which was placed at a well-traveled location. (*Virginian-Pilot*, 11/21/08)

- “We can make it really easy for someone to wash their boat down when they pull it out of the water. We can educate our outreach people, our fisheries people, and our law enforcement people. I’m going to argue that we need to do more than just put up signs and hope for the best.” Jonathan McKnight, Maryland Department of Natural Resources, talking about possible responses to the November 2008 discovery of a Zebra Mussel in the Susquehanna River in Maryland. Zebra Mussels are an invasive species that has caused millions of dollars of damage to water-intake pipes and other structures in the Great Lakes. In December, more were found at Glen Cove Marina in Harford, Co., Md., and others were found in Muddy Run Reservoir in Pennsylvania. (*Baltimore Sun*, 12/9/08)

## WATER QUALITY and YOU/ LA CALIDAD de AGUA y USTED

In this section, *Water Central* offers suggestions for how individuals can help maintain and improve the condition of Virginia's waters and aquatic habitats. Unless otherwise noted, you are welcome to reproduce and distribute items in this section, but please retain the credits to the original source(s). All Web sites mentioned were functional as of 1/6/09. A Spanish translation is on the following page. *Para información en español, por favor vea la página proxima.*

### Drinking Water and Health

The following information and the Spanish translation on the following page were taken from the U.S. EPA's "Drinking Water and Health: What You Need to Know" Web site at [www.epa.gov/safewater/dwh/index.html](http://www.epa.gov/safewater/dwh/index.html) (last updated 11/28/06). Please visit that site for more information.

#### Where does drinking water come from?

A clean, constant supply of drinking water is essential to every community. People in large cities frequently drink water that comes from surface water sources, such as lakes, rivers, and reservoirs. Sometimes these sources are close to the community. Other times, drinking water suppliers get their water from sources many miles away. In either case, when you think about where your drinking water comes from, it's important to consider not just the part of the river or lake that you can see, but the entire **watershed**. The watershed is the land area over which water flows into the river, lake, or reservoir.

In rural areas, people are more likely to drink ground water that was pumped from a well. These wells tap into **aquifers**—the natural reservoirs under the earth's surface—that may be only a few miles wide, or may span the borders of many states. As with surface water, it is important to remember that activities many miles away from you may affect the quality of ground water.

Your annual drinking water quality report [if you are on a public water supply] will tell you where your water supplier gets your water.

#### What contaminants may be found in drinking water?

There is no such thing as naturally pure water. In nature, all water contains some impurities. As water flows in streams, sits in lakes, and filters through layers of soil and rock in the ground, it dissolves or absorbs the substances that it touches. Some of these substances are harmless. In fact, some people prefer mineral water precisely because minerals give it an appealing taste. However, at certain levels minerals, just like man-made chemicals, are considered contaminants that can make water unpalatable or even unsafe.

Some contaminants come from erosion of natural rock formations. Other contaminants are substances discharged from factories, applied to farmlands, or used by consumers in their homes and yards. Sources of contaminants might be in your neighborhood or might be many miles away. Your local water quality report tells which contaminants are in your drinking water, the levels at which they were found, and the actual or likely source of each contaminant.

Some ground water systems have established wellhead protection programs to prevent substances from contaminating their wells. Similarly, some surface water systems protect the watershed around their reservoir to prevent contamination. ...

#### How can I help protect drinking water?

Using the...information that is now available about drinking water, citizens can both be aware of the challenges of keeping drinking water safe and take an active role in protecting drinking water. There are lots of ways that individuals can get involved. Some people will help clean up the watershed that is the source of their community's water. Other people might get involved in wellhead protection activities to prevent the contamination of the ground water source that provides water to their community. These people will be able to make use of the information that states and water systems are gathering as they assess their sources of water.

Other people will want to attend public meetings to ensure that the community's need for safe drinking water is considered in making decisions about land use. You may wish to participate as your state and water system make funding decisions. And all consumers can do their part to conserve water and to dispose properly of household chemicals.

## **En Español**

En esta sección, *Water Central* le ofrece sugerencias de como individuales pueden mantener y mejorar la condición de las aguas y los habitats acuáticos de Virginia. Aprovechese de reproducir y distribuir esta pagina, pero por favor retenga los créditos a los originales. Todos los sitios de Web mencionados funcionaban el 6 Enero 2009.

## **El Agua Potable y la Salud**

**Fuente:** Sitio de Web de la Agencia de Protección Ambiental de EE.UU (por su siglas en inglés EPA), “El Agua Potable y la Salud: lo que usted debe saber,” a [www.epa.gov/safewater/agua/apsalud.html](http://www.epa.gov/safewater/agua/apsalud.html); por favor visite ese sitio de Web para mas información.

### **De dónde proviene el agua potable?**

Es esencial para cada comunidad contar con un abastecimiento limpio y constante de agua potable. Las personas en las ciudades grandes toman agua frecuentemente que proviene de fuentes de agua superficiales, tales como lagos, ríos, y embalses. Algunas de estas fuentes están cerca de la comunidad. En otros casos, los proveedores de agua potable obtienen su agua de fuentes ubicadas a varias millas de distancia. En cualquier caso, cuando piense de donde proviene su agua potable, es importante considerar no solamente la porción o parte del río o lago que usted puede observar, pero la cuenca completa. **La cuenca** es la área de tierra sobre la cual fluye el agua hacia el río, lago, o embalse.

En las áreas rurales, es más probable que las personas tomen aguas subterráneas que se bombearon de un pozo. Estos pozos se conectan a **acuíferos**—los embalses naturales debajo de la superficie terrestre—que puede que sean solamente unas pocas millas de ancho, o puede que abarquen las fronteras de varios estados. Igual que el agua superficial, es importante recordarse que las actividades que ocurren a varias millas de distancia de usted, pueden afectar la calidad del agua subterránea.

Su informe anual de calidad de agua potable [si usted obtiene su agua de una sistema de agua público] le explicará de donde obtiene el agua su proveedor de agua.

### **Cuáles son los contaminantes que se pudiesen encontrar en el agua potable?**

No existe tal cosa como agua pura natural. En la naturaleza, toda agua contiene algunas impurezas. A medida que el agua fluye en los arroyos, se estanca en los lagos, y se filtra a través de capas de suelo y roca en la tierra, disuelve o absorbe las sustancias con las cuales hace contacto. Algunas de estas sustancias son inocuas. De hecho, algunas personas prefieren agua mineral precisamente porque los minerales le dan un sabor agradable. Sin embargo, los minerales a ciertos niveles, igual que los químicos elaborados por el hombre, se consideran contaminantes que pueden causar mal sabor en el agua y hasta peligrosos.

Algunos contaminantes provienen de la erosión de formaciones de rocas naturales. Otros contaminantes son sustancias descargadas de las fábricas, se aplican a terrenos agrícolas, o se usan por parte de los consumidores en sus casas y jardines. Es posible que las fuentes de contaminantes estén en su vecindario o es posible que se encuentren a muchas millas de distancia. Su informe de calidad de agua local le explica cuales contaminantes se encuentran en su agua potable, el nivel de los mismos, y la fuente actual o posible de cada contaminante.

Algunos sistemas de agua subterránea (que obtienen el agua a través de pozos) han establecido programas de protección de áreas inmediatas de pozos de agua potable para evitar que las sustancias contaminen sus pozos. Asimismo, algunos sistemas de agua que utilizan fuentes superficiales (tales como los ríos) protegen la cuenca de agua alrededor de su embalse para evitar la contaminación. ...

### **¿Cómo puedo ayudar a proteger el agua potable?**

Utilizando la...información que está disponible ahora sobre el agua potable, los ciudadanos pueden estar conscientes de los retos en mantener el agua potable segura y tomar una posición activa para proteger el agua potable. Existen muchas maneras en que los individuos se pueden involucrar. Algunas personas ayudarían en la limpieza de la cuenca la cual es la fuente de agua de la comunidad. Otras personas pueden involucrarse en actividades de protección de áreas inmediatas de pozos para prevenir la contaminación de la fuente de agua subterránea que abastece a la comunidad con agua. Estas personas podrán utilizar la información que se está acumulando por parte de los estados y sistemas de agua, a medida que ellos evalúan su fuentes de agua.

Es posible que otras personas desearían atender reuniones públicas para asegurar que las necesidades de la comunidad de tener agua potable segura se consideren en tomar decisiones sobre el uso del terreno. Es posible que usted desee participar a medida que su estado y sistema de agua toman decisiones financieras. Además, todos los consumidores pueden aportar sus contribuciones para conservar el agua y desechar adecuadamente los químicos domésticos.



## VIRGINIA GOVERNMENT WATER ISSUES OVERVIEW

This section lists water issues under current consideration (study or regulation) by state boards, commissions, or agencies in Virginia. The first part identifies areas undergoing Total Maximum Daily Load (TMDL) processes. The second part covers other water-related topics of statewide concern that are currently being considered. The final part gives schedule and contact information for key water-related boards and commissions. Information in this issue is based on public meetings listed **October 1, 2008—January 7, 2009** on the **Virginia Regulatory Town Hall** Web site, at [www.townhall.state.va.us](http://www.townhall.state.va.us). The Town Hall site posts agendas of upcoming meetings and minutes of past meetings held by Virginia's boards, commissions, and departments. 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 [www.employees.state.va.us/directory-search.cfm](http://www.employees.state.va.us/directory-search.cfm). You can also request state employee phone numbers by calling (800) 422-2319. All Web sites listed in this section were functional as of 1/6/09.

### Total Maximum Daily Load (TMDL) Processes

Under the federal Clean Water Act, 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 [www.deq.state.va.us/tmdl/](http://www.deq.state.va.us/tmdl/).

Location	Water(s) & Impairment	Larger Watershed(s)	Most Recent Meeting Date	For More Information
Appomattox and Charlotte counties	Cub Creek, Big Cub Creek, Buffalo Creek, Little Cub Creek, and Turnip Creek, all for bacteria	Roanoke River	Oct. 15 (first public meeting on development of TMDL implementation plan)	Ram Gupta
Arlington County	Four Mile Run (tidal portion) for bacteria	Potomac River	Nov. 19 (first public meeting on TMDL development)	Katie Conaway
Buchanan County	Levisa Fork and Slate Creek for benthic (bottom-dwelling aquatic life) impairment, bacteria, and PCBs	Big Sandy River	Oct. 9 (first public meeting on TMDL development)	Shelley D. Williams
Fairfax County and City of Fairfax	Accotink Creek for benthic impairment	Potomac River	Dec. 15 (first public meeting of technical advisory committee)	Katie Conaway
Highland County	Strait Creek and West Strait Creek for benthic impairment	South Branch Potomac River/Potomac River	Nov. 12 (final public meeting on TMDL development)	Robert Brent
Lancaster County	Shellfish waters in tidal Mosquito and Oyster creeks and tributaries for bacteria	Chesapeake Bay	Nov. 14 (first public meeting on TMDL development)	Margaret Smigo
Lancaster and Northumberland counties	Shellfish waters in tidal Antipoison, Dymmer, Indian, and Tabbs creeks and their tributaries, all for	Chesapeake Bay	Nov. 14 (advisory committee meeting and final	Margaret Smigo

	bacteria		public meeting on TMDL development)	
Lee and Wise counties	Powell River and tributaries (North Fork Powell River, South Fork Powell River, Bailey's Trace, Butcher Fork, Ely Creek, Gin Creek, Lick Branch, Puckett Creek, Stone Creek and Wallen Creek) for benthic impairment and bacteria.	Upper Tennessee River	Oct. 21	Shelley D. Williams
Smyth County	North Fork Holston River for mercury	Upper Tennessee River	Nov. 4 and 6	Shelley D. Williams

### **Other Topics Under Current Consideration**

The following lists topics considered in public meetings held during the period noted at the beginning of this section. Items are listed alphabetically by topic, followed by the agency or group coordinating state study or action and then a contact name. Minutes of most meetings listed are available at the Virginia Regulatory Town Hall Web site, [www.townhall.state.va.us](http://www.townhall.state.va.us), Agency Abbreviations: DCR = Dept. Conservation and Recreation; DEQ = Dept. Environmental Quality; DGIF = Dept. Game and Inland Fisheries; DMME = Dept. Mines, Minerals and Energy; 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://legis.state.va.us/Laws/AdminCode.htm>. "NOIRA" stands for Notice of Intended Regulatory Action.

**Marine Resources Commission regular monthly meetings:** 10/28, 11/25, and 12/16/08. Minutes of VMRC meetings are available online at [www.mrc.virginia.gov/calendar.shtm](http://www.mrc.virginia.gov/calendar.shtm). More information: Jane McCroskey.

**State Water Control Board regular quarterly meetings:** 10/16 and 12/4/08. Minutes of SWCB meetings are available at the Virginia Regulatory Town Hall Web site, <http://www.townhall.state.va.us/L/meetings.cfm> (click on "Past Year" to access meeting minutes from the past 12 months). More information: Cindy Berndt.

**Boating**—Game and Inland Fisheries' Board's **Wildlife and Boat Committee** meeting: 10/8/08. Water-related agenda items in October included parasail regulations, boating education, and Fishery Division capital projects. More information: Beth Drewery.

**Biosolids Regulations (9 VAC 25-20, 25-31, and 25-32)—Expert study panel/joint work-group meetings:** 10/1 and 10/22/08. A state panel, established by the Secretary of Natural Resources and the Secretary of Health and Human Resources, is studying biosolids (sewage sludge) in Virginia. The SWCB published a Notice of Intended Regulatory Action (NOIRA) in the June 23, 2008, *Virginia Register* about several possible amendments to the biosolids regulations. More information: Jeff Corbin. Also, the **SWCB's advisory committee on biosolids regulations** met 10/3 and 11/3/08; more information: William K. Norris.

**Clean Water Revolving Loan Fund**—Public meeting on development of annual plan of projects to receive assistance: 11/20/08. Section 606(c) of the Water Quality Act of 1987 requires the Va. Dept. of Environmental Quality (DEQ) to develop an annual plan that identifies the intended use—including a project-priority list—of revolving loan funds for construction of publicly owned wastewater treatment facilities and other clean water projects. The public comment period on the Intended Use Plan for FY 2009 and FY 2009 draft list of targeted loan recipients began October 20 and ended at the conclusion of the public meeting on Nov. 20. More information: Walter Gills.

**Gas and Oil Regulations (4 VAC 25-150)**—Dept. of Mines, Minerals and Energy (DMME) Regulatory Advisory Panel meeting: 12/17/08. DMME is considering changes to these regulations as a result of mandatory review requirements. More information: David Asbury.

**Invasive Species**—Dept. of Conservation and Recreation (DCR) Invasive Species Working Group meeting: 12/18/08. More information: David Dowling.

- Mined Land Reclamation**—DMME’s Coal Surface Mining Reclamation Fund Advisory Board meeting: 12/3/08 More information: Ernest Barker.
- Onsite Sewage Disposal**—Engineering Design Review Panel meeting: 12/9/08. The Virginia Department of Health’s (VDH) Engineering Design Review Panel reviews disapproval VDH of onsite sewage system designs submitted by professional engineers. More information: David S. Tiller.
- Poultry Waste Management Regulation (9 VAC 25-630)**—SWCB advisory committee meeting: 10/8/08. The SWCB is considering amendments to the Virginia Pollution Abatement (VPA) General Permit Regulation on managing poultry waste. More information: Betsy K. Bowles.
- Recycling**—DEQ’s Recycling Markets Development Council meeting: 12/4/08. More information: Michael Ward, Virginia Petroleum Council, (804) 225-8248 or m.ward7@verizon.net.
- Sewage Handling and Disposal Regulations**—VDH’s advisory committee meetings: 11/7/08. More information: Donald Alexander.
- Stormwater from Construction Activities General Permit (4 VAC 50-60)**—Public hearings on proposed amendments to this General Permit: 12/2, 12/3, and 12/10/08. More information: David Dowling.
- Stormwater from Industrial Activities General Permit Regulation (9 VAC 25-151)**—Public hearing: 12/16/08. The SWCB is considering the reissuance and amendments of this regulation; the proposal was published in the Nov. 10, 2008, issue of the *Virginia Register of Regulations*; the public comment period ended Jan. 9, 2009. More information: Burt Tuxford.
- Underground Storage Tank Operator Training Requirements Regulation (9 VAC 25-580)**—Advisory committee meeting: 12/8/08. The SWCB is considering whether to amend this regulation, and an advisory committee is assisting in development of possible amendments. More information: Russ Ellison.

#### **Regular Meeting Schedule and Information for Statewide Boards and Commissions**

- Cave Board**—meets three times per year. More information: DCR (804) 786-7951; [www.dcr.virginia.gov/natural\\_heritage/cavehome.shtml](http://www.dcr.virginia.gov/natural_heritage/cavehome.shtml).
- Chesapeake Bay Local Assistance Board**—meets March, June, September, and December. More information: (800) CHESBAY; [www.dcr.virginia.gov/chesapeake\\_bay\\_local\\_assistance/board.shtml](http://www.dcr.virginia.gov/chesapeake_bay_local_assistance/board.shtml).
- Game and Inland Fisheries Board**—meets bimonthly. More information: [www.dgif.virginia.gov/about/](http://www.dgif.virginia.gov/about/).
- Gas and Oil Board**—meets the third Tuesday of each month. More information: Bob Wilson, DMME, (276) 5423, bob.Wilson@dmme.virginia.gov; <http://www.dmme.virginia.gov/divisiongasoil.shtml>.
- Groundwater Protection Steering Committee**—meets third Tuesday of odd-numbered months. More information: [www.deq.virginia.gov/gwpsc/](http://www.deq.virginia.gov/gwpsc/).
- Land Conservation Foundation**—meets about three times per year. More information: DCR, (804) 786-3218; [www.dcr.virginia.gov/virginia\\_land\\_conservation\\_foundation/index.shtml](http://www.dcr.virginia.gov/virginia_land_conservation_foundation/index.shtml).
- Licensing and Regulation Boards** for engineers, soil scientists, waterworks and wastewater works operators, and wetland delineators, under the Dept. of Professional and Occupational Regulation, (804) 367-8500, TDD (804) 367-9753; [www.dpor.virginia.gov/dporweb/boards.cfm](http://www.dpor.virginia.gov/dporweb/boards.cfm).
- Marine Resources Commission**—meets monthly. More information: (757) 247-2200, TDD (757) 247-2292; [www.mrc.state.va.us](http://www.mrc.state.va.us).
- Outdoors Foundation**—meets quarterly. More information: (540) 327-7727; [www.virginiaoutdoorsfoundation.org](http://www.virginiaoutdoorsfoundation.org).
- Scenic River Advisory Board**—meets at least two times a year. More information: Lynn Crump, DCR, (804) 786-5054 or lynn.Crump@dcr.virginia.gov; [www.dcr.virginia.gov/recreational\\_planning/srmain.shtml](http://www.dcr.virginia.gov/recreational_planning/srmain.shtml).
- Soil and Water Conservation Board**—meets bimonthly. More information: DCR (804) 786-1712; [www.dcr.virginia.gov/soil\\_&\\_water/vs&wcb.shtml](http://www.dcr.virginia.gov/soil_&_water/vs&wcb.shtml).
- State Water Control Board**—meets March, June, September, and December. More information: Dept. of Environmental Quality, (800) 592-5482; [www.deq.virginia.gov/cboards/homepage.html#water](http://www.deq.virginia.gov/cboards/homepage.html#water).
- Waste Management Board**—meets about three times per year. More information: Dept. of Environmental Quality, (800) 592-5482; [www.deq.virginia.gov/cboards/homepage.html#waste](http://www.deq.virginia.gov/cboards/homepage.html#waste).



# N O T I C E S

If you would like to receive 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.

All Web sites listed in this section were functional as of January 8, 2008.

## **Biosolids Guidance from DEQ**

In September 2008 the Virginia Department of Environmental Quality (DEQ) released a guidance document on how the DEQ should coordinate with the Department of Health on biosolids-related health complaints. The guidance also increased required buffers between residences and land-application of biosolids. The guidance and more information about biosolids regulation in Virginia is available online at [www.deq.virginia.gov/vpa/sewage.html](http://www.deq.virginia.gov/vpa/sewage.html). For questions or more information: Christina Wood at (804) 698-4263 or cmwood@deq.virginia.gov.

## **Mercury in Virginia**

In October, the Virginia DEQ released the final *Virginia Mercury Study*, including several previously completed component reports. The report is available online at [www.deq.virginia.gov/air/vamercury/vamercurystudy.html](http://www.deq.virginia.gov/air/vamercury/vamercurystudy.html). This Web site also describes the project history of the study, originating from Virginia General Assembly legislation in 2006.

## **Got Data on the Clinch or Powell Rivers?**

The U.S. Geological Survey (USGS) is seeking published or unpublished data on the Clinch/Powell basin for a survey of accomplishments by agencies, universities, and non-profit groups interested in these watersheds. Examples of desired data include cross sections, pebble counts or other bed-sediment analysis, bank-stability analysis, and geologic mapping. To submit data or for more information, contact Jen Krstolic at the USGS' Virginia Water Science Center, at (804) 261-2635 or jkrstoli@usgs.gov.

## **Water Efficiency Resource Library**

The non-profit Alliance for Water Efficiency and the U.S. EPA have developed an online library of water-conservation resources, located at [www.allianceforwaterefficiency.org/resource-library/default.aspx](http://www.allianceforwaterefficiency.org/resource-library/default.aspx). Users can search the library by key word(s) or select a section from a list provided at the site.

## **“Watershedology” for Grades 2-4**

The Western Virginia Land Trust in Roanoke has recently published *Watershedology*, an SOL-compliant lesson plan on watershed issues for Grades 2-4. *Watershedology* is authored by Judy Hensley, former exhibits director at the Science Museum of Western Virginia and a former biology instructor at Virginia Western Community College. *Watershedology* is available online at [www.westernvirginialandtrust.org/Docs/watershedology.pdf](http://www.westernvirginialandtrust.org/Docs/watershedology.pdf). For more information, contact David Perry at (540) 985-0000 or dperry@westernvirginialandtrust.org.

## **Chesapeake Bay Nitrogen Calculator**

The Chesapeake Bay Foundation has designed a nitrogen calculator to help Bay watershed residents determine how much nitrogen their activities contribute to the Bay—their “Bay footprint.” The calculator Web page is at [www.cbf.org/yourbayfootprint/](http://www.cbf.org/yourbayfootprint/).

## **An Online Chesapeake Bay Community**

The Chesapeake Watershed Network, at [www.chesapeakekenetwork.org](http://www.chesapeakekenetwork.org), is an online resource for communicating and connecting with other people and groups involved in Bay activities. The site has places for calendars, individual and group profiles, blogs, photos, and more.

## **Household Water Quality Web Site**

The Virginia Household Water Quality Program/Master Well Owner Network has launched a new Web site, at [www.wellwater.bse.vt.edu](http://www.wellwater.bse.vt.edu). The site describes these two programs and includes links to information on groundwater, drinking water, and private water-system maintenance. For more information, contact Erin James at (540) 231-9058 or wellwater@vt.edu. (Please see the June 2008 *Water Central*, p. 15, for an article about these programs.)

## **Recent Reports**

*Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast*, an October 2008 report by American Rivers, asserts that southeastern U.S. could save hundreds of millions

of dollars by better **water efficiency**; nine areas of efficiency are discussed, including cost structure. The report is online at [www.americanrivers.org/site/PageServer?pagename=AR7\\_Publications](http://www.americanrivers.org/site/PageServer?pagename=AR7_Publications).

*Bad Water and the Decline of Blue Crabs in the Chesapeake Bay*, a December 2008 report from the Chesapeake Bay Foundation, documents the impact of water pollution on Blue Crab populations. The report is online at [www.cbf.org/badwater2008](http://www.cbf.org/badwater2008). Contact CBF in Virginia at (804) 780-1392.

*Tackling Marine Debris in the 21<sup>st</sup> Century*, a September 2008 National Research Council report, is available at [www.nap.edu/catalog.php?record\\_id=12486](http://www.nap.edu/catalog.php?record_id=12486)

*Urban Stormwater Management in the United States*, an October 2008 National Research Council report, is available at [www.nap.edu/catalog.php?record\\_id=12465](http://www.nap.edu/catalog.php?record_id=12465). For questions about availability, phone the National Academies Press at (888) 624-8373.

*Nutrient Control Actions for Improving Water Quality in the Mississippi River Basin and Northern Gulf of Mexico*, a December 2008 National Research Council report, is available at [www.nap.edu/catalog.php?record\\_id=12544](http://www.nap.edu/catalog.php?record_id=12544). For questions about availability, phone the National Academies Press at (888) 624-8373.

## Energy/Climate Reports and Resources

*The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States*, a May 2008 report from the U.S. Climate Change Science Program, is available at [www.gcric.org/library/sap-final-reports.htm](http://www.gcric.org/library/sap-final-reports.htm). Several other “synthesis reports” on climate change are also available at that site.

*Voluntary Greenhouse Gas Reduction Programs Have Limited Potential*, a July 2008 report from the U.S. EPA Office of the Inspector General, is available at [www.epa.gov/oig/reports/2008/20080723-08-P-0206.pdf](http://www.epa.gov/oig/reports/2008/20080723-08-P-0206.pdf).

*Energy Future: Think Efficiency*, a September 2008 report from the American Physical Society, is available at [www.aps.org/energyefficiencyreport/report/index.cfm](http://www.aps.org/energyefficiencyreport/report/index.cfm).

The **Pew Center on Global Climate Change**, online at [www.pewclimate.org](http://www.pewclimate.org), provides a variety of information resources on national and international aspects of climate change. The Pew Center is located in Arlington; phone (703) 516-4146.

## Upcoming Conferences and Workshops

(Please see also the Water Center’s “Quick Guide to Water-related Meetings and Conferences in Virginia,” online at [www.vwrrc.vt.edu/VAConfQuickGuide.html](http://www.vwrrc.vt.edu/VAConfQuickGuide.html).)

### Events In Virginia

Jan. 31, Manassas: **7th Annual Landowner's Woods and Wildlife Conference**. Organized by Virginia Cooperative Extension. More information: Adam Downing, (540) 948-6881 or [adowning@vt.edu](mailto:adowning@vt.edu).

Feb. 19 or 20 (two one-day workshops; choose one day), Richmond: **Mapping Virginia Communities Workshop: An Introduction to GIS and Community Analysis**. Conducted by New Urban Research, Inc., of Portland, Ore. More information: [info@urban-research.info](mailto:info@urban-research.info); Web site: <http://www.urban-research.info/workshops/virginia-gis.htm>

Mar. 8-10, Richmond: **Virginia Lakes and Watersheds Association's annual conference**. More information: Stuart Stein, (703) 870-7000 or [sstein@gky.com](mailto:sstein@gky.com); Web site: [www.vlwa.org](http://www.vlwa.org).

Mar. 12-13, Charlottesville: **Ecosystem Services: Marketing Environmental Solutions**. Organized by the Virginia Department of Forestry, Virginia Cooperative Extension, and Virginia Department of Environmental Quality. More information: Neil Clark, (757) 657, 6450, ext. 406 or [southeast@vt.edu](mailto:southeast@vt.edu); or Buck Kline, (434) 220-9035 or [buck.kline@dof.virginia.gov](mailto:buck.kline@dof.virginia.gov); Web-site: [www.cpe.vt.edu/esmes/index.html](http://www.cpe.vt.edu/esmes/index.html).

Mar. 20, Keysville; or Mar. 27, Wakefield: **Investing in Sustainable Forestry: Profitable Forest Management in the 21st Century**. Organized by Virginia Cooperative Extension. More information: Jennifer Gagnon, (540) 231-6391 or [jgagnon@vt.edu](mailto:jgagnon@vt.edu).

Mar. 22-25, Roanoke: **Virginia Rural Water Association annual conference**. More information: (540) 261-7178; Web site: [www.vrwa.org](http://www.vrwa.org).

Mar. 31-Apr. 2, Lexington: **20th Annual Environment Virginia Symposium**. Organized by Virginia Military Institute. More information: Amy K. DeHart at [dehartak@vmi.edu](mailto:dehartak@vmi.edu) or (540) 464-7740; Web site: [www.vmi.edu/environmentva](http://www.vmi.edu/environmentva).

### Events Elsewhere

Mar. 22-25, 2009, Baltimore, Md.: **Ecosystem Based Management: The Chesapeake Basin and Other Systems**. Organized by the Chesapeake Research

Consortium. More information: (410) 798-1283; Web site: [www.chesapeake.org](http://www.chesapeake.org).

Apr. 1-2, 2009, Wilmington, N.C.: **Hydric Soils Short Course for Professionals.** Organized by North Carolina State University. More information: (706) 583-0347; Web site: [www.soil.ncsu.edu/wetlands](http://www.soil.ncsu.edu/wetlands).

Apr. 6-10, 2009, Austin, Tex.: **National Hurricane Conference.** More information: (850) 906-9224 or mail@hurricanemeeting.com; Web site: [www.hurricanemeeting.com](http://www.hurricanemeeting.com).

May 4-6, 2009, Anchorage, Alaska: **Managing Water Resources & Development in a Changing Climate.** Organized by the American Water Resources Association. More information, Michael Lilly, (907) 479-8891 or mlilly@gwscientific.com; Web site: [www.awra.org/meetings/Anchorage2009/index.html](http://www.awra.org/meetings/Anchorage2009/index.html).

May 11-14, 2009, Portland, Ore.: **Fifth National Conference for Nonpoint Source and Stormwater Outreach.** Organized by Tetra Tech, Inc., and the U.S. EPA. More information: Jen McDonnell at (703) 385-6000 or Jennifer.mcdonnell@tetrattech.com; or Don Waye at (202) 566-1170 or waye.don@epa.gov; Web site: [www.epa.gov/nps/outreach2009](http://www.epa.gov/nps/outreach2009).

May 21-23, 2009, Boone, N.C.: **New River Symposium.** Organized by Friends of the New River, National Committee for the New River, New River Gorge National River, New River Community Partners, New River Watershed Roundtable, and Appalachian State University.

More information: Amy Sanders at (828) 262-2744; Web site: <http://thenewriversymposium.org>.

May 29-Jun. 1, 2009, Baltimore: **National River Rally.** Organized by River Network. More information: (503) 241-3506; Web site: [www.rivernetnetwork.org/rally](http://www.rivernetnetwork.org/rally).

### Also Out There...

(Brief descriptions of some interesting items *Water Central* has recently discovered.)

**“Murky Waters of River, Bay Restoration”**—This short article discusses the history and impacts of excessive sediment in the Potomac River, along with the use of water clarity measurements to track sediment problems. *Potomac Basin Reporter*, Sept.-Oct. 2008, Interstate Commission on the Potomac River Basin, (301) 984-1908 or info@icprb.org; available online at [www.potomacriver.org](http://www.potomacriver.org).

**“Connecting Science and Management for Virginia’s Tidal Wetlands”**—This 8-page newsletter discusses the history of wetlands in Virginia from the 1970s to the 2000s, along with developments during those years of state regulatory programs for wetlands. *Rivers & Coast*, Center for Coastal Resources Management, Virginia Institute of Marine Science, Gloucester Point; (804) 684-7380 or dawnf@vims.edu; available online at <http://ccrm.vims.edu>.

## TEACHING WATER

### Especially for Virginia’s K-12 teachers

### This Issue and the Virginia Standards of Learning

Below are suggestions for Virginia Standards of Learning (SOLs) that may be supported by items in this issue. The SOLs listed below are from Virginia’s 2003 Science SOLs and 2001 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
Energy-Water Feature	4.8, 6.5, 6.9, LS.12, ES.7, ES.9	WG.7, GOV.16
Natural Gas in SW Virginia	4.8, 6.2, 6.9, LS.12, ES.7	CE.7, WG.7, GOV.8, GOV.9
Clean Water Act Guidance	6.7	CE.7, WG.7, GOV.7, GOV.9, GOV.10, GOV.16.
Water Status (precipitation, groundwater, stream flow, and drought)	4.5, 4.6, 4.8, 6.5, 6.7, LS.7, LS.12, ES.7, ES.9, ES.13	WG.2



## 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](mailto:water@vt.edu); Web site [www.vwrrc.vt.edu](http://www.vwrrc.vt.edu).

### National Science Foundation Research Experiences for Undergraduates

Applications are invited from qualified and motivated undergraduate students (sophomores, juniors and rising seniors) from all U.S. colleges/universities to participate in the third year of a 10-week (May 31-August 7, 2009) summer research in interdisciplinary watershed sciences and engineering at Virginia Tech. Application materials, possible research projects, and other program activities are posted online at [www.vwrrc.vt.edu/nsf\\_reu.html](http://www.vwrrc.vt.edu/nsf_reu.html). **The deadline to apply is March 2, 2009.** Successful applicants will be informed by March 20, 2009. For more information, please contact Tamim Younos at (540) 231-8039 or [tyounos@vt.edu](mailto:tyounos@vt.edu).

### 2009 William R. Walker Graduate Research Fellow Award

Graduate students from all Virginia's colleges and universities are invited to submit an application to the Virginia Water Resources Research Center for the 2009 William R. Walker Graduate Research Fellow Award. For eligibility and application requirements, please visit [www.vwrrc.vt.edu/walker\\_fellowship.html](http://www.vwrrc.vt.edu/walker_fellowship.html). **The deadline to apply is March 31, 2009.** For more information, please contact: Tamim Younos at (540) 231-8039 or [tyounos@vt.edu](mailto:tyounos@vt.edu).

### USGS/NIWR National Competitive Grants Program Request for Proposals for FY 2009

The U.S. Geological Survey (USGS) and the National Institutes for Water Resources (NIWR) request proposals for matching grants to support research on the topics of water supply and water availability, including investigations of possible new sources of supply, improvement of impaired waters to usable quality, conservation of existing sources, and limiting growth in demand.

Proposals are sought not only in the physical dimensions of supply and demand, but also quality trends in raw water supplies, the role of economics and institutions in water supply and demand, institutional arrangements for tracking and reporting water supply and availability, and institutional arrangements for coping with extreme hydrologic conditions. Any investigator

at an accredited college in the United States is eligible to apply for a grant through a Water Research Institute or Center. Proposals involving substantial collaboration between the USGS and university scientists are encouraged. Proposals may be for projects of 1-3 years and may request up to \$250,000 in federal funds. Successful applicants must match the federal grant (with non-federal resources).

Proposals must be filed on the Internet at <https://niwr.net/> by 5:00 PM, Eastern Standard Time, **February 20, 2009**, and must be approved for submission to the National Competitive Grants Program not later than 5:00 PM, Eastern Standard Time, March 6, 2009 by the Institute or Center through which they were submitted.

For information on applying through the Virginia Water Center, please contact Tamim Younos at [tyounos@vt.edu](mailto:tyounos@vt.edu) or (540) 231-8039.

### New Publications Available

The following new Special Reports are available online at

[www.vwrrc.vt.edu/special\\_reports.html](http://www.vwrrc.vt.edu/special_reports.html):

*Community-Based Sustainable Development Planning*, by Erica Adams and Tamim Younos, SR41-2008.

*Interdisciplinary Watershed Sciences and Engineering: 2007 NSF REU Proceedings of Research*, edited by Tamim Younos, Vinod K. Lohani, and Monica Licher, SR42-2008.

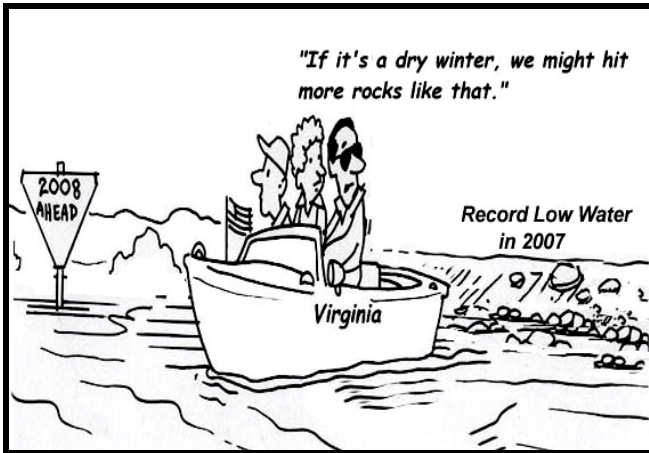
*Interdisciplinary Watershed Sciences and Engineering: 2008 NSF REU Proceedings of Research*, edited by Tamim Younos, Vinod K. Lohani, and Monica Licher, SR43-2008.

*Virginia's Stormwater Impact Evaluation Project: Developing an Optimization Tool for Stormwater Runoff BMPs*, by Kevin Young, Tamim Younos, Randy Dymond, and David Kibler, SR44-2009.

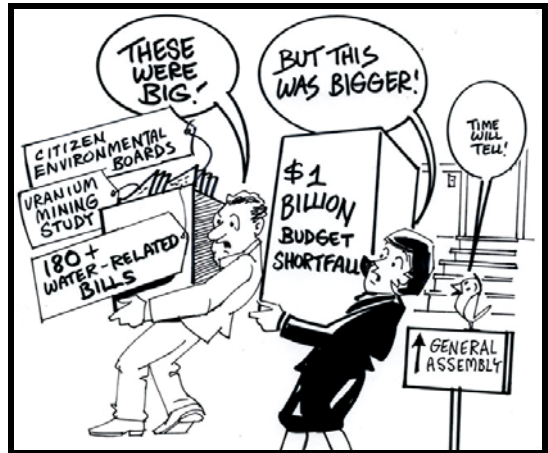
### New Soil-water Research Paper

"Calibrating Access-tube Time Domain Reflectometry Soil Water Measurements in Deep Heterogeneous Soils," by B. F. Schwartz, M. E. Schreiber, P. S. Pooler, and J. D. Rimstidt, was published in the July-August 2008 edition of *Soil Science Society of American Journal* (Vol. 72, pp. 917-930). The Water Center helped provide funding for this research.

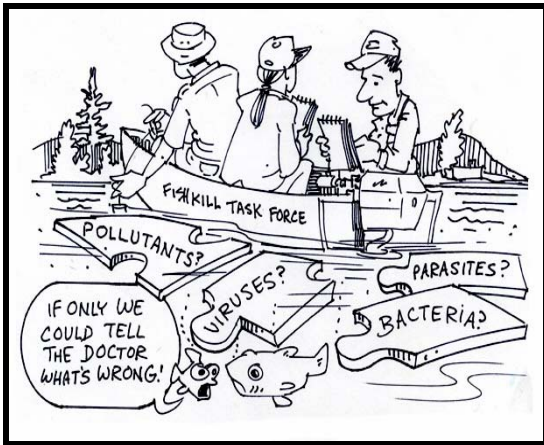
# AN ILLUSTRATED REVIEW OF 2008



December 2007



April 2008



June 2008



September 2008



## Virginia Water Central

Published by the Virginia Water Resources Research Center (0444), 210 Cheatham Hall, Blacksburg, VA 24061; (540) 231-5624; fax (540) 231-6673; Stephen Schoenholtz, director. *Water Central* staff: Alan Raflo, editor (araflo@vt.edu); George Wills, illustrator; photographs by Alan Raflo, unless otherwise noted.

Opinions expressed herein are not necessarily those of the Water Center or Virginia Tech, nor does the mention of trade names, commercial products, or services constitute an endorsement. Reproduction of articles, with proper credit, is welcomed.

Virginia Tech does not discriminate against employees, students, or applicants on the basis of race, color, sex, sexual orientation, disability, age, veteran status, national origin, religion, or political affiliation. Anyone having questions concerning discrimination or accessibility should contact the Equal Opportunity and Affirmative Action Office, 336 Burruss Hall, Blacksburg, Virginia 24061-0216, (540) 231-7500, TTY (540) 231-9460; eooffice@vt.edu; [www.oeo.vt.edu](http://www.oeo.vt.edu).

*Water Central* is available online at [www.vwrrc.vt.edu/watercentral.html](http://www.vwrrc.vt.edu/watercentral.html). If you would like an e-mail notification when new issues are posted, please notify us at (540) 231-5463 or araflo@vt.edu. Also, please let us know if your e-mail address has changed or if you no longer wish to receive the e-mail notification.

If you do not have Internet access and would like a photocopy of the newsletter, please contact us.  
Thank you!

### YOU GET THE LAST WORD

Please answer the following questions to let us know whether the newsletter is meeting your needs. Please mail this page to the Water Center address listed in the box above, or e-mail your responses to araflo@vt.edu. Thank you.

1. Would you rate the content of this issue as good, fair, or poor?
2. Would you rate the appearance as good, fair, or poor?
3. Would you rate the readability of the articles as good, fair, or poor?
4. Is the newsletter too long, too short, or about right?
5. Do the issues come too frequently, too seldom, or about right?
6. Please add any other **comments** you wish to make.