

Virginia Water Central

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FEATURE ARTICLE

Going to School for Virginia's Water Issues

What if you could address the members of the Virginia General Assembly and tell them the water-related issues you believe to be the most important for Virginia and its citizens? *Water Central* recently put that question to participants in a telephone survey following our annual review of water related legislation in the Virginia General Assembly. (This year's inventory of water-related legislation begins on page 5.) Each year since 1998, *Water Central* has sought opinions from various groups of Virginians on water-resource issues covered by the year's General Assembly session. We ask people to tell us about the water-related legislation—whether passed or failed—that they considered important and to look ahead to potential future measures. Whenever participants state that they haven't closely followed the General Assembly, we ask them instead to identify the water-resource issues of most concern to them. In past years, the groups have included business people, legislators,

lobbyists, newspaper editors and other journalists, non-profit organization representatives, water-resource professionals, and randomly selected *Water Central* readers. (Previous, similar articles were published in *Water Central* issues of August 1998, June 1999, June-Aug. 2000, and June 2001.)

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Publication Schedule Note: This long issue of *Water Central* covers two normal publication periods. The next issue will be scheduled to reach readers in August.

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This year, in our ongoing effort to reach people who might bring a different perspective and awareness to our annual discussion, we sought out Virginia college and university teachers, focusing on those teaching environmental sciences, biology, and civil engineering. We attempted by e-mail and phone to reach 25 teachers at 15 institutions (the schools are listed at the end of this article). We present below comments from the seven faculty members whom we were able to interview at length. **[Ed. note: The views expressed in the next two sections are not necessarily those of the Water Center.]**

Not Much On This Session's Water Table

The participants in this year's survey were quite knowledgeable about recent years' water-related legislation. This year, however, they did not pay attention to any particular water-related measures. Most felt that the water-related measures considered by the 2002 General Assembly weren't particularly noteworthy. Some commented that the tight state budget confronted by Virginia for two straight sessions has probably prevented much attention-getting legislation on any other front.¹

The one exception to this was Fred Dobbs, who teaches oceanography at Old Dominion University (ODU) in Norfolk. Dr. Dobbs readily cited this year's SB 115 as an important piece of legislation. The measure designates the Hampton Roads Maritime

¹ One big issue from the 2002 legislature took place after this year's survey was finished: the effort by Governor Mark Warner to amend SB 592 to place a \$5-ton state fee for depositing solid waste at Virginia landfills. Forty percent of the funds generated would have been designated for the Virginia Land Conservation Foundation; 35 percent for local conservation and resource-protection efforts; 19 percent for the Virginia Water Quality Improvement Fund; and five percent for the Virginia Brownfields Restoration and Economic Redevelopment Assistance Fund. In its reconvened session on April 17, the General Assembly refused to accept the proposal, instead carrying over the measure to the 2003 session.

Association as the agent to receive **ballast water control reports** from operators of commercial, ocean-going vessels. Under a law passed in 2001 (SB1072 in that General Assembly session; now in the *Virginia Code* at Sec. 62.1-44.17:5 to 17:7), commercial vessels that discharge ballast water in Virginia waters must file a report detailing the origins and possible ingredients of the ballast water; and the Virginia Department of Environmental Quality is to submit copies of these reports quarterly to the National Ballast Water Information Clearinghouse, maintained by the Smithsonian Environmental Research Center.² These laws are in response to concerns voiced nationwide in recent years that ballast waters being carried into American ports from other parts of the world can contain invasive, non-native species of marine life.

Beyond Dr. Dobbs' comment, participants had little to say about other water-related measures from this year's legislative session. But they had *a lot* to say about issues they felt the General Assembly must address soon.

Issues Advancing on Richmond?

Joseph Rule, associate dean of the College of Sciences at ODU, said continued **development pressure on freshwater wetlands** is a problem that should be dealt with soon by stricter and more uniform wetlands protection. Given the state's commitments under the Chesapeake Bay Agreement 2000, Dr. Rule maintained that the state should be policing this issue better than it does. (Freshwater wetlands perform various functions that enhance water quality in the Bay tributaries.)

Thomas Allen, also at ODU, teaches geography and specializes in the use of satellite imagery to monitor surface water quality. Dr. Allen seconded his colleague's

² Operators are exempt from the requirement if the vessel's previous port of call was within the United States Exclusive Economic Zone and a report had been previously filed there. The text of SB115 is available on-line at the Legislative Information System, leg1.state.va.us, or by phoning the Legislative Bill Room at (804) 786-6984.

view that urban and suburban sprawl around the Bay and on the Atlantic coast are having water-resources impacts that the state needs to address. “We may need something like a regional water authority,” Dr. Allen said. “I don’t know that the state should be imposing regional cooperation, but somehow we need to collectively address a number of water-related problems that are going to be very serious very soon—issues like conservation as well as continued development threatening wetlands and groundwater quality.”

At Randolph-Macon College in Ashland, Brian Moores, who teaches chemistry and chairs the college’s Environmental Sciences Council, said **continued development and the need for water to support it** are likely to be contentious issues in the near future for central Virginia. “Here in Hanover County we’re a kind of microcosm of what you might see on the whole state level,” Dr. Moores said. “One side of the county is pretty rural, with lots of wells and septic systems. [O]n the eastern and southern ends of the county, closer to Richmond, suburban growth is pushing water and sewer lines further in, with calls from drawing more water out of the James, the Pamunkey, and the North Anna rivers. At either end we’re getting thirstier, and the current drought is just going exacerbate it. The legislature probably needs to look at some statewide conservation measures, and soon, because I don’t know if the counties will do it except in emergency situations.”

At Shenandoah University in Winchester, Woody Bousquet teaches botany and chairs the Environmental Studies Program. Dr. Bousquet said that in the past he has assigned students to pay close attention to legislative activity in Richmond, particularly the 2000 General Assembly, when a number of wetlands-protection bills were considered and ultimately one was passed.³ “This year there wasn’t that concentrated amount of activity on an issue of such importance, so it wasn’t as easy to

assign the legislative session as a teaching tool,” Dr. Bousquet said. He expected that would change soon, however. “The next big thing ought to be **control of non-point sources of pollution**,” he said. “There are still lots of questions about how this next part of following through with the federal Clean Water Act is going to be implemented, and it’s time for those questions to be answered, because non-point source control is a huge factor in making surface waters safe for all the uses we’re demanding of them.”

At Lynchburg College, Thomas Schahady teaches environmental law and freshwater biology. Dr. Schahady echoed Bousquet’s concern that **surface-water quality** be addressed more ambitiously by the state. “In the studies my classes do, and those I read about in other parts of the state, **sedimentation** is growing problem. It’s everything from agricultural run-off of soil and nutrients to solids that flow into streams from paved urban surfaces after storms, and they’re clouding our streams and silting them up. There are sedimentation restrictions on the books already,” he said, “but they are enforced locally, and that means levels of enforcement can vary greatly. I think we need to look at uniform, statewide sedimentation control.”

At the University of Virginia in Charlottesville, Environmental Sciences Department Chair Bruce Hayden said the **stresses of population growth on water resources** should be foremost on the minds of Virginia’s legislators. “This is already a problem, and it isn’t going to go away on its own,” said Dr. Hayden. He said he has attended a number of conferences in recent years that have shared a similar theme: that water resources are going to present high-profile and politically tough issues globally in the next few decades. The same will be true in Virginia, Dr. Hayden said, and added, “It’s already past the time that the state develop a serious understanding of its water supply and the best methods of allocation.”

That conviction was echoed by Carl Hershner, director of the Center for Coastal Resources Management at the Virginia Institute of Marine Science in Gloucester

³ HB1170/SB648, now in the *Va. Code* in Sections 62.1-44.3, 62.1-44.5, 62.1-44.15, 62.1-44.15:5, and 62.1-44.29.

Point. Dr. Hershner said he seriously wonders if development in the state's coastal regions is already at the peak of what the natural **water supply** can support. "We just don't know a lot about surface water science, and about the needs of all the estuaries in these regions," he said, "and yet the state still has a kind of 'first come, first served' attitude about development." What the state needs, he said (only half in jest, he pointed out), is a "good three- to four-year drought." He said that may be the quickest way of alerting policy makers and others to what he believes is already a crisis in surface water flow and contamination in Virginia's coastal and marine environments.

"Water supply is the big thing, and not just for people and industry, but for natural areas, too," Dr. Hershner continued. "We need to know how much can be diverted from estuaries before they suffer, and how they might suffer if reduced flows of surface water are augmented with discharges from water-treatment plants." He maintained that these factors need more study, and the legislature should be working to curb development until they are better understood. Dr. Hershner said he was aware the General Assembly passed a joint resolution this year (HJ 202) calling for

the State Water Commission to conduct a study into the effectiveness of all the state's water policies and report its findings by 2004, but he contended it was an inadequate response to a troubling situation.

Vying for Attention on the Virginia Water Docket

The faculty members we spoke with identified four main areas of concern:

- monitoring and regulation of ballast-water discharges;
- development pressure on freshwater wetlands;
- managing demands on water supplies; and
- control of non-point source pollution of surface waters.

Within these broad areas are a host of issues and questions about Virginia's water resources. The state has confronted some of these issues (such as water-supply management) at various times over many years; other issues (such as ballast-water discharges) are relatively new. According to the voices recorded here, the ongoing challenges and the brand new ones offer plenty of water work for Virginia citizens and their General Assembly.

—By David Mudd

The author sought opinions from faculty members at the following institutions, listed in alphabetical order:

George Mason University (Fairfax)
James Madison University (Harrisonburg)
Lynchburg College
Mary Washington College (Staunton)
Old Dominion University (Norfolk)
Randolph-Macon College (Ashland)
Roanoke College (Salem)
Shenandoah University (Winchester)
University of Richmond
University of Virginia
UVA's College at Wise
Virginia Commonwealth University (Richmond)
Virginia Institute of Marine Science (Gloucester Point)
Virginia Military Institute (Lexington)
Washington & Lee University (Lexington)

Water-related Legislation in the 2002 Virginia General Assembly

Introduction

In 2002, the Virginia General Assembly convened on January 9 and adjourned on March 9, with a reconvened (“veto”) session on April 17. The legislature considered 2907 bills; 1587 were passed, 804 failed, and 517 were carried over to the 2003 session.

Starting below, we list 64 distinct measures related to water resources (with references to additional measures that were identical or very similar). We compiled the list using information available on the General Assembly’s Legislative Information Service (LIS) Web-site, at leg1.state.va.us. The bill summaries below are taken directly from LIS, with editing for space and occasionally for clarity or emphasis. LIS categorizes bills and resolutions, and this year we searched for water-related legislation under the following nine categories: 1) Conservation; 2) Drainage, Soil Conservation, Sanitation, and Public Facilities Districts; 3) Fisheries and Habitat of Tidal Waters; 4) Game, Inland Fisheries and Boating; 5) Health; 6) Mines and Mining; 7) Waste Disposal; 8) Waters of the State, Ports, and Harbors; and 9) Water and Sewer Systems.

In the following we list first the water-related measures that *passed*, grouped according to the categories listed in the previous paragraph; next, the measures that *failed*, group in the same manner; and finally the measures that were *carried over* to 2003, again grouped the same way. The consecutive numbers to the left of each measure are for cross-referencing within this article and have no *legislative* significance. The actual bill or resolution numbers use the following abbreviations:

HB = bill started in House of Delegates;

HJ = joint resolution started in the House;

SB = bill started in the Senate; and

SJ = joint resolution started in the Senate.

PASSED

Conservation

1. **HB 49 Soil and water conservation district boards:** Provides for *four*-year, rather than three-year, terms of office for elected and appointed directors. Identical to **SB 114**, which also passed.
2. **HB 148 Closure of Solid waste landfills:** Allows municipal solid waste landfills utilizing double synthetic liner systems that had been permitted between December 21, 1988, and October 9, 1993, by the Department of Environmental Quality, to continue to accept solid waste after 2020. The bill would allow the Wise County landfill, specifically, to accept waste after 2020.
3. **HB 178 Flood assistance fund:** Expands the uses of the Flood Prevention and Protection Assistance Fund to include grants *or* loans to public bodies owning dams and loans to private dam owners.
4. **HB 211 Soil and water conservation district boundaries:** Requires the Virginia Soil and Water Conservation Board to consider funding as one of the factors in establishing boundaries of a new soil and water conservation district.
5. **HB 646 Exemption, sand dune standards:** Exempts the Sandbridge Beach Subdivision from existing requirements relating to construction on coastal primary sand dunes. These provisions shall expire on January 1, 2006. Similar to **SB 319**, which also passed.
6. **HB 870 Clinch-Guest Scenic River:** Extends the scenic river designation to approximately 9.2 miles of the Clinch River. The change in the name of the designated river from the Guest to the Clinch-Guest Scenic River reflects the inclusion of a segment of the Clinch River in the scenic designation.
7. **HB 1257 Waste and water permit fees:** Directs the Virginia Waste Management Board to develop new permit fee schedules sufficient to cover no more than 20 percent of the direct costs of the hazardous and solid waste programs, using as the base the amounts allocated to these programs in the 2002

Appropriation Act; however, no individual permit could increase more than 300 percent. The bill also triples the statutory caps on water permit fees.

8. **HJ 118 Study; future of Virginia's environment:** Continues the Commission Studying the Future of Virginia's Environment. Identical to **SJ 117**, which also passed.

Drainage, Soil Conservation, Sanitation and Public Facilities Districts

9. **SB 61 Soil Scientist and Wetland Professional Boards:** Adds certified professional wetland delineators to the current Board for Soil Scientists. The bill also (i) establishes certification standards for "wetland delineators"; (ii) prohibits a certified professional wetland delineator from performing professional engineering, landscape architecture, and land surveying; and (iii) provides that any person practicing or offering to practice wetland delineation and who represents himself as a certified professional wetland delineator *without* holding such a certificate shall be guilty of a Class 1 misdemeanor. The bill has a delayed effective date of July 1, 2004.

Fisheries and Habitat of Tidal Waters

10. **HB 613 Saltwater recreational fishing license:** Removes the seaside exemption from the requirement to have a saltwater fishing license when fishing in tidal waters. The bill exempts a person fishing from property he owns or rents; it also exempts property owners' nonpaying guest(s) and immediate family.
11. **HB 921 Oyster grounds:** Removes Public Ground Number 8, located in the Elizabeth River, from the Baylor Survey public oyster grounds and allows the bottomland to be used for private purposes. Similar to **SB 468**, which also passed.
12. **HB 978 Fishing Class II Guide License:** Creates a fishing Class II guide license for owners of recreational headboats or charterboats. An applicant must complete an apprenticeship program under a captain holding a Virginia guide license.
13. **HB 1293 Oyster grounds:** Removes 0.39 acres of Public Ground Number 6 and 0.40 acres of Public Ground Number 7, located in the Lafayette River, from the Baylor Survey public oyster grounds and allows the bottomland to be used for private purposes.
14. **HJ 164 Commercial oyster production:** Proclaims support for the commercial production of genetically sterile *Crassostrea ariakensis* oysters within guidelines and parameters established by the Virginia Institute of Marine Sciences and the Virginia Marine Resources Commission.
15. **SB 115 Ballast water reporting system:** Designates the Hampton Roads Maritime Association as the Virginia Marine Resources' agent for collecting the Ballast Water Control Report forms filled out by ship operators. Exempts an operator from having to file a report if the vessel's previous port of call is within the United States Exclusive Economic Zone and a report had been previously filed there.
16. **SB 326 Marine Police; safety zones & restricted areas:** Changes the name of Virginia Marine Patrol to Virginia Marine Police. Adds the protection of federal and state water-related installations from terrorist attack to the Virginia Marine Police's powers and duties.

Game, Inland Fisheries and Boating

17. **HB 301 Regulation of Sight-seeing Carriers:** Repeals regulation of sight-seeing carriers by boat, special or charter party carriers by boat, and motor carriers by launch by the Department of Motor Vehicles except for insurance requirements. Passed with amendments by the Senate and by the Governor.
18. **SB 74 Special lifetime trout fishing license:** Provides for special lifetime trout-fishing licenses applicable to specially stocked trout waters as designated by the Board of Game and Inland Fisheries.

Water and Sewer Systems

19. **HB 225 Liens for local water and sewer charges:** Allows Goochland County to provide that charges for water or sewers or use thereof shall be a lien on the real estate served by such waterline or sewer.
20. **HB 251 Septic system inspectors:** Changes the effective date for beginning minimum requirements for a person to use the title "accredited septic system inspector" from July 1, 2002, to July 1, 2003.

- 21. HB 1103 Regulation of sewage sludge:** Moves responsibility to regulate the land application of sewage sludge to the State Water Control Board and the Department of Environmental Quality (DEQ). This bill brings all land applications of sewage sludge under the regulatory authority of DEQ.
- 22. HB 1189 Mandatory water and sewer, Buckingham Co.:** Adds Buckingham County to those counties with authority to require connection to their water and sewage systems by owners of property that may be served by such systems.
- 23. HJ 202 Study; state water policies:** Requests the State Water Commission to conduct a two-year study of the effectiveness of the Commonwealth's water policies. The Commission must report its written findings and recommendations to the Governor and the 2004 Session of the General Assembly.
- 24. SB 269 Contracting for water and waste services:** Provides that localities and water and waste authorities may contract for, and contract to provide, meter reading, billing and collections, leak detection, meter replacement, and any related customer-service functions.
- 25. SB 682 Companies providing sewage services:** Provides that any governmental entity established pursuant to the laws of another state or other entity and that owns, manages, or controls any plant or equipment located within the Commonwealth that is used to provide sewage treatment services to a Virginia public service authority, shall be subject to regulation as a public utility.

Waters of the State, Ports and Harbors

- 26. HB 91 Dredging project mitigation:** Allows the State Water Control Board to require demonstration of financial responsibility for the completion of compensatory mitigation requirements for dredging projects (such as in wetland areas). Identical to **SB 327**, which also passed.
- 27. HB 276 Rappahannock River Basin; definition:** Updates the definition of the Rappahannock River Basin to reflect new legislative districts (the commission includes General Assembly members whose legislative districts include a portion of the Basin). Identical to **SB 116**, which also passed.
- 28. HB 497 Water quality analysis, citizen involvement:** Requires the Department of Environmental Quality to establish a citizen water-quality monitoring program to provide technical assistance and authorizes the agency to provide grants to support water-quality monitoring organizations. Forbids the results of such citizen monitoring to be used as evidence in any enforcement action.
- 29. HB 910 Advanced Shipbuilding and Carrier Integration Center:** Names the carrier integration center the Herbert H. Bateman Advanced Shipbuilding and Carrier Integration Center. The bill also would have changed the date by which an operations grant for the Center is to be awarded from no later than June 30, 2004, to no later than June 30, 2006, but an amendment by the Governor kept the original date (June 30, 2004) in place.
- 30. HB 1002 Nontidal wetlands program:** Eliminates any duplication of state and federal permitting requirements for those activities covered by a federal nationwide or regional permit. Once the State Programmatic General Permit is approved by the U. S. Army Corps of Engineers, only a state permit will be required for activities in nontidal wetlands.
- 31. HB1279ER Roanoke River Basin Advisory Committee and Bi-state Commission:** Establishes the Virginia Roanoke River Basin Advisory Committee and the Roanoke River Basin Bi-State Commission. The Roanoke River Basin Bi-State Commission will have nine members representing Virginia and nine members representing North Carolina. The bill contains specific guidelines regarding the qualifications required of committee members. The final bill was a conference committee version reconciling **HB 1279** and **SB 460**. **SB 460** had previously incorporated **HB 1278** and **SB 553**.
- 32. SJ 91 Study; Shipbuilding industry:** Continues the Joint Subcommittee Studying Economic Incentives to Promote the Growth and Competitiveness of Virginia's Shipbuilding Industry. The joint subcommittee shall continue to examine (i) development of a water-treatment process that consistently meets Virginia's 50 parts per trillion TBT discharge standard; (ii) additional methods for providing better training to, and reducing turnover among, shipyard workers; and (iii) promotion of Norfolk's piers as an original point of departure for cruise ships as a means of developing new business for Virginia's shipyard companies. This resolution was identical to **HJ 69**, which failed.

FAILED

Conservation

- 33. HB 387 Air, water, and solid waste standards:** Would have required the Air Pollution Control Board, the State Water Control Board, and the Solid Waste Management Board to find scientific and technological evidence indicating that any proposed regulation establishing standards for air emissions, water quality, and solid waste could be met by a permit holder.
- 34. HB 389 Tributyltin compliance schedules:** Would have provided that the State Water Control Board establish schedules requiring compliance on and after January 1, 2008, with numerical effluent limitations for tributyltin (TBT) included in any Virginia Pollution Discharge Elimination System Permit issued by the Board. Similar to **SB 147**, which also failed.
- 35. HB 1220 Environmental Stewardship Bonds:** Would have authorized the issuance of Commonwealth of Virginia Environmental Stewardship Bonds in an amount not exceeding \$488,495,075, subject to approval by a majority of the qualified voters of the Commonwealth voting thereon at the November 5, 2002, general election. The purpose of the bonds would have been to provide funds for capital projects for (i) biological nutrient removal at sewage treatment facilities; (ii) rehabilitation to dams owned by soil and water conservation districts; (iii) combined sewer overflow projects; (iv) renovation of state parks and acquisition of real estate for parks; and (iv) acquisition of permanent interests in real estate for conservation purposes. Similar to **SB 563**, which also failed.
- 36. HJ 260 Occoquan Watershed Commendation:** Would have commended the Fairfax County Board of Supervisors for creating the Occoquan Watershed and expressed support for its opposition to attempts to permit or require paved trails in the watershed.
- 37. SB 621 Waste and water permit fees:** Would have directed the Virginia Waste Management Board and the State Water Control Board to develop new permit fee schedules that reflect the costs of implementing their waste-management and water permit programs that are not covered by general fund appropriations and federal grants.

Fisheries and Habitat of Tidal Waters

- 38. HB 363 Wetlands mitigation banking:** Would have considered portions of U. S. Geological Survey cataloging units 02080108, 02080208, and 03010205 that are south of the James River to lie within the same river basin (watershed) for purposes of wetlands-mitigation banking.

Game, Inland Fisheries and Boating

- 39. HJ 83 Study; Waterfowl-blind licensing statutes:** Would have required that a joint subcommittee be established to study the Commonwealth's waterfowl-blind licensing statutes.
- 40. SB 47 Personal flotation devices for children:** Would have made it unlawful for a person operating a motorboat, other than a vessel required to have a certificate of inspection issued by the U. S. Coast Guard, to permit a person twelve years of age or younger to be in the motorboat while it was underway if such minor was not wearing a personal flotation device and was not below deck or in an enclosed cabin.

Mines and Mining

- 41. HB 860 Local severance tax revenues for water systems:** Would have authorized counties and cities to impose an additional local severance tax on persons engaged in the business of severing gases from the earth, at a rate not to exceed one percent of gross receipts. The revenues from this increase would have been used for constructing new and improved water systems and lines in areas with natural water supplies that are insufficient in quality or quantity.

Public Service Companies

- 42. HB 240 Railroads; utility crossings:** Would have limited, to \$500 per crossing, the amount a railroad company can charge a county, city, town, or other political subdivision for allowing its water or sewer

utility facilities to cross the railroad's facilities. Similar to **HB 859** (# 59, below), which was carried over to 2003.

Water and Sewer Systems

- 43. HB 191 Sewage disposal; Commissioner's immunity:** Would have prohibited any action from being taken against the Commissioner of Health or his designee for trespass, if they were carrying out their responsibilities under on-site sewage-disposal laws.
- 44. HB 1044 Unauthorized waste or oil:** Would have required a person who, without authorization, discharges sewage, waste, or any noxious or deleterious substance into state waters, or with a reasonable expectation of the material entering state waters, to notify the emergency services director or coordinator of the affected locality within 24 hours of the discharge.
- 45. HB 1130 Mandatory connection to water and sewer:** Would have allowed an owner of undeveloped land in certain counties to use a private system for providing a supply of water and for the disposal of sewage.
- 46. HB 1204 Drainfield guidelines:** Would have authorized the Board of Health to issue guidelines in determining equivalency of drainfield sizes for types of on-site septic systems.
- 47. SB 142 Water permit fees:** Would have removed the caps on the amounts the State Water Control Board can charge for the processing of applications for the various types of water permits.
- 48. SB 630 Mandatory connection to water and sewer:** Would have provided that an owner of undeveloped land, located in a county with the authority to require connection to the county's water and sewer systems, may elect to use private systems for providing a supply of water and for the disposal of sewage so long as such systems met the requirements of the Virginia Department of Health. Such owner would not have been required to pay a connection fee, a frontage fee, or a monthly nonuser service charge.

Waters of the State, Ports and Harbors

- 49. HB 982 Condemnation of wetlands:** Would have required the Commonwealth, before it could acquire compensatory wetlands by condemnation, to exhaust all reasonable mitigation options within the same cataloguing unit (as defined by the U. S. Geological Survey's Hydrologic Unit Map of the United States) in which a wetlands loss occurs; or, if those efforts proved ineffectual, then within the immediately adjacent cataloguing unit or units located in the same river watershed as the impacted wetlands.
- 50. SB 531 Sales and use taxes; refunds in shipbuilding:** Would have provided refunds of sales and use taxes to an industrial development authority that has reimbursed its contractors for such taxes imposed on tangible personal property for use in the Advanced Shipbuilding and Carrier Integration Center.

CARRIED OVER TO 2003 SESSION

Conservation

- 51. HB 234 Beach Maintenance and Development:** Would expand the purposes of a current fund that awards matching grants to local governments to pay the costs of erosion-abatement measures. Would also provide grants for the construction or maintenance of public beach-related support structures or facilities and the creation or restoration of beach landscapes.
- 52. SB 617 Erosion and sediment control certificates:** Would grant plan-approving authorities the option to waive the certificate of competence requirement for land-disturbing activity and substitute "agreements in lieu of a plan." Agreements in lieu of a plan are contracts between the plan-approving authority and the landowner that are used for ensuring proper implementation of conservation measures during construction of a single-family residence.
- 53. SB 592 Waste and water permit fees:** This bill was identical to HB 1257 (# 7, above), which passed, until it (SB 592) was amended by Governor Warner and returned for consideration in the reconvened session. His amendment would have increased dumping permit fees at landfills to generate funds for several land-conservation and water-quality efforts. The measure was unsuccessful but will be considered again in the next session.

Fisheries and Habitat of Tidal Waters

- 54. HB 975 Crab pot tagging program:** Would require the Virginia Marine Resource Commission to implement by regulation a crab-pot tagging program to facilitate the enforcement and identification of crab-pot licenses. The act would be effective only if reenacted by the 2003 Session of the General Assembly and if adequate funds are appropriated.
- 55. SB 297 Protection of certain female crabs:** Would make it unlawful to catch, hold, possess, offer for sale, or sell an egg-bearing female crab or a female crab from which the egg pouch, sponge, or unioin had been removed.
- 56. SB 333 Marine Patrols Fund; tax revenues:** Would provide for an amount generated by a two-percent sales and use tax, collected from the sale of fishing and auxiliary fishing equipment purchased for saltwater use, to be deposited into the Marine Patrols Fund.

Game, Inland Fisheries and Boating

- 57. HB 201 Waterfowl sanctuaries and blinds:** Would repeal a number of local Acts of Assembly, due to duplication, that provide for the establishment of waterfowl sanctuaries in various localities.
- 58. HB 202 Hunting of waterfowl from duck blinds:** Would clarify the definitions of stationary and floating blinds and the procedures for their placement; eliminate the practice of setting up "dummy blinds" in order to reserve certain locations from use by other waterfowl hunters; and require licensing agents to record the location of the blind site on a map and make such a record available to the public.

Public Service Companies

- 59. HB 859 Railroads; utility crossings:** Would limit to \$1,000 per crossing the amount a railroad company can charge a county, city, town, or other political subdivision for allowing water or sewer utility facilities to cross the railroad's facilities. Similar to **HB 240** (# 42, above), which failed.

Water and Sewer Systems

- 60. HB 226 Construction permits; local option:** Would allow localities to establish reasonable testing requirements to determine compliance with existing federal or state drinking-water standards and require that such testing be done prior to the issuance of building permits.
- 61. HB 480 Mandatory water connection legal payments:** Would provide that, when legal action is required to compel a property owner in Virginia Beach to comply with any mandatory water and sewer connection ordinance, the locality shall be entitled to recover its reasonable attorneys' fees from hiring outside counsel in such action.
- 62. SB 618 Sewage sludge; local authority, fees:** Would provide authority for localities to enact ordinances to prohibit, restrict, or regulate the land application of sewage sludge, and allow for the collection of local fees to cover testing and monitoring costs.

Waters of the State, Ports and Harbors

- 63. HB 388 Maritime Investment Act:** Would establish a grant program to be paid, subject to appropriation, from the Virginia Maritime Investment Partnership Grant Fund. The program would provide grants to eligible ship-repair companies making a capital investment of at least \$50,000 (eligible ship-repair companies would be companies that have continuously been repairing ships in Virginia for at least five years.) Similar to **SB 13**, which was also carried over.
- 64. SB 331 Permit; maintenance dredging:** Would exempt, from additional wetlands compensation as part of Virginia Water Protection Permits, maintenance dredging undertaken to mitigate the adverse impact of sedimentation and to restore the natural contours of Virginia's waterways.

—By David Mudd

Bottom-dwellers Tell Stories about the Water Above

“Storm Water, Sewage Spill in Sugar Creek”

“A manhole overflowed Monday [Oct. 11, 1999] at a Charlotte [N.C.] sewage plant, spilling an estimated 100,000 gallons of storm water and sewage...At least some of the overflow...reached a storm drain that feeds into [Sugar Creek]. No fish kills were reported, utilities officials said.”

—Charlotte Observer, Oct. 12, 1999

No doubt about it—dead fish are a bad sign. A fish kill in a stream, lake, or other water body obviously indicates that something’s wrong. Assessing the impact of a water-pollution event, such as the one in Charlotte noted above, by the visible impacts on fish is a straight-forward example of an aquatic **biological assessment**. Aquatic biological assessment, or simply aquatic bioassessment, is defined by the U. S. EPA as “an evaluation of the condition of a waterbody using biological surveys and other direct measurements of the resident biota [living organisms] in surface waters.”⁴ The term **biomonitoring** is often used interchangeably with bioassessment.⁵

Bioassessment uses the responses of living organisms to indicate environmental conditions, such as water quality or the availability of suitable aquatic habitat. Fish clearly provide important signs about aquatic conditions. But, because fish can swim away from an unsuitable area and then return when conditions change, fish don’t tell the

⁴ M. T. Barbour *et al.*, *Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish*, 2nd Edition, U. S. EPA, Washington, D.C., July 1999.

⁵ “Monitoring,” which involves keeping track of and documenting conditions, is not strictly the same as “assessment,” which refers to an *evaluation* of conditions. Ideally, ongoing monitoring allows for assessments to be made when needed.

whole story of the long-term health of a water body. So biomonitors often look below the water to the bottoms of lakes and streams for the presence, absence, and relative numbers of the many kinds of aquatic creatures that can’t readily swim away from unfavorable conditions. This article, after a look at bioassessment in general, examines several groups of such creatures and the characteristics that make them valuable biological signs.

Aquatic Bioassessment In General

Bioassessment studies were first reported in the mid-1800’s, when diminishing fish populations in the River Soar in Great Britain were found to be caused by pollution.⁶ In the early 1900’s, German scientists used bacteria and plankton (floating, microscopic animals and algae) to analyze pollution zones downstream of a known pollution source. Scientists in Illinois expanded bioassessment efforts to include fish and other organisms, and the U. S. Public Service Health Act of 1912 addressed federal bioassessment efforts in interstate waters.

Today, many state agencies have some sort of bioassessment effort in place, and volunteer programs across the country monitor various biological resources. Bioassessment is one of three major ways to evaluate aquatic resources, the others being assessment of the chemical conditions of water and assessment of the physical features of the aquatic habitat. Each of the three types of assessment has certain advantages and disadvantages in cost, time required, training required, and information provided. But one fundamental reason for using *biological* assessment is that living

⁶ Information on the history of bioassessment comes from W. S. Davis, “Biological assessment and criteria: Building on the past,” pp. 15-29 in Davis, W. S. and T. P. Simon, eds., *Biological Assessment and Criteria*. Lewis Publishers, Boca Raton, Fla., 1995.

organisms, in effect, record the *impacts* of varying environmental conditions. Because the living things in an aquatic system are continually exposed to pollutants and other stresses, bioassessment provides a historical perspective on the condition of the water body, unlike the instantaneous view given by chemical sampling. Bioassessment also helps reveal the effects of multiple stresses, which is not readily apparent from chemical or physical studies alone.

Bioassessment can tell us about aquatic conditions because of the varying **tolerances** of organisms to environmental conditions. As a U. S. EPA manual on stream monitoring states, “The basic principle behind the [use of organisms for water-quality assessment] is that some are more sensitive to pollution than others.”⁷ By their physical structures, biochemical make-up, behaviors, and life cycles, all organisms are adapted to different ranges of environmental conditions, and they respond differently to contaminants, habitat changes, or other environmental disturbances. Through study of the presence (or absence) and abundance of organisms in relation to environmental factors, scientists are able to determine whether a certain kind of organism is **pollution-tolerant** or **pollution-intolerant** (“sensitive” is another term used synonymously with “intolerant”). More specifically, scientists have assigned **tolerance values** to a large number of species, based on the conditions in which the species are typically found. These values vary from one region or state to another, and are always subject to being updated as scientists gather additional information.⁸

In aquatic bioassessment studies, the presence of a large number of intolerant or sensitive organisms indicates that the water

body in question is largely free of pollution and stress. On the other hand, a relative lack of sensitive organisms and an abundance of tolerant organisms indicate more difficult environmental conditions, including *perhaps* some kind of past or present contamination. In the next section, we’ll learn about the tolerances of several kinds of organisms used in aquatic bioassessment.

Evidence from Animals That Can’t Swim Away

Though bioassessment investigations can focus on organisms from the smallest algae to the largest fish, many use **benthic macroinvertebrates**. These are organisms that live on the bottom of streams or other water bodies (*benthic*), are large enough to see without a microscope (*macro-*), and have no backbone (*invertebrate*). Benthic macroinvertebrates are popular in bioassessment for at least three reasons:

- Compared to much smaller or much larger organisms, it is relatively easy to collect, process, and identify a sample of benthic macroinvertebrates;
- Benthic macroinvertebrates have a fairly stationary lifestyle, meaning they do not easily move out of polluted areas;
- As a group, benthic macroinvertebrates exhibit a wide range of tolerances to pollution and stress.

I’ve selected six groups of benthic macroinvertebrates to illustrate how these creatures indicate environmental conditions. Each group includes dozens of North American species, living in a variety of waterbodies and habitats within those waterbodies. The first three groups—**stoneflies**, **mayflies**, and **caddisflies**—all include intolerant or sensitive species whose presence indicates good water quality. Three other groups—**midges**, **lung-breathing snails**, and **aquatic worms**—include much more tolerant species, including some that are found in water of the very worst quality.

As mentioned above, scientists have assigned tolerance values to many aquatic macroinvertebrates, typically using a scale of 0 (least tolerant) to 10 (most tolerant). The

⁷ U. S. EPA, *Volunteer Stream Monitoring: A Methods Manual* (EPA 841-B-97-003, 1997), p. 38.

⁸ Typically tolerance values are based on professional judgment. Scientists judge organisms’ tolerance on the basis of observations of the overall environmental conditions in which organisms are found. Few organisms have tolerance values based on *experimental* responses to specific types of environmental stress, such as low dissolved oxygen, high sediment, or contamination by toxins.

following table shows *median*⁹ tolerance values for the organisms in each of the six groups we're considering here, based on values reported in a 1993 study of stream macroinvertebrates in North Carolina.¹⁰ The group medians (middle column) show that stoneflies, mayflies, and caddisflies on the whole are noticeably *less* tolerant (*lower* tolerance value) than midges, lung-breathing snails, and aquatic worms, even though some species in each group are relatively tolerant (shown by the *high-end* values for each group in the right-hand column).

Group	Median tolerance values (0 = least tolerant; 10 = most tolerant)	Range of tolerance values
Stoneflies	1.4 (for 56 species)	0—6
Mayflies	2.2 (for 91 species)	0—9.3
Caddisflies	2.2 (for 102 species)	0—8.1
Midges	6.2 (for 130 species)	0—10
Lung-breathing snails	6.7 (for 17 species)	1.6—9.1
Aquatic worms	8.8 (23 species)	2.8—10

The following sections present some details on the six groups, with cartoons to highlight particularly distinctive features.

Stoneflies

The most sensitive of all benthic macroinvertebrates are the stoneflies, an **order**¹¹ of insects known as Plecoptera (meaning “plaited winged,” referring to the

adults’ hind wings being folded beneath the forewings¹²). Approximately 150 species of stoneflies are found in Virginia.¹³ Immature stoneflies (called **nymphs**¹⁴) are aquatic, while the adult form is not; the nymphs, therefore, are the most useful form for aquatic bioassessment. Stoneflies need clean, silt-free rocks and water with a high level of dissolved oxygen. Consequently, streams with an increased sediment load that covers the streambed and clogs the spaces between rocks have less habitat suitable for stoneflies. Stoneflies are also susceptible to chemical pollutants. Studies have shown a decrease in stoneflies downstream of oil spills, mine drainage, and aerial pesticide applications.

In a stressful situation, stoneflies will use behaviors to try to improve the situation. When flow or oxygen levels decrease in the water (whether due to physical or chemical changes), some stonefly species will do “push-ups” to force water—and therefore more dissolved oxygen—past their gills. If conditions get too bad, stoneflies also may release their hold on the streambed and float downstream in an attempt to find better conditions—a behavior called **drift**.



⁹ In a sample of values, the **median** is the value for which an equal number of observed values occur both above and below.

¹⁰ D. R. Lenat, “A biotic index for the southeastern United States: derivation and list of tolerance values, with criteria for assigning water-quality ratings,” *Journal of the North American Benthological Society* 12(3): 279-290, 1993.

¹¹ Scientists classify the insects into 27 orders. Below the level of order, the classification levels are **family**, **genus**, and **species**.

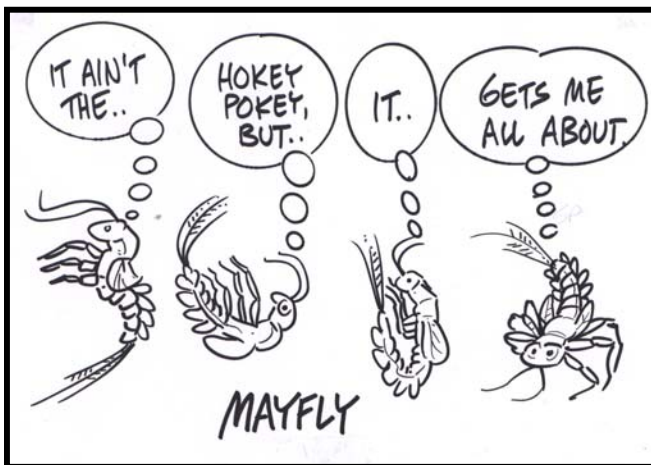
¹² The meanings of insect-order names are quoted from J. R. de la Torre-Bueno, *A Glossary of Entomology*. New York Entomological Society, New York, 1978.

¹³ Estimates of the number of stonefly, mayfly, caddisfly, midge, and aquatic worm species in Virginia were provided by Reese Voshell, Virginia Tech Dept. of Entomology, May 1, 2002.

¹⁴ Immature stoneflies and mayflies are also sometimes called “naiads.”

Mayflies

Another intolerant group is the **mayflies**, the insect order **Ephemeroptera** (meaning “briefly winged,” referring to the very short life span of the winged adult forms—as short as 90 minutes for some species). Approximately 150 mayfly species are found in Virginia. Like stoneflies, the nymph stage is aquatic and is most valuable for bioassessment. Many mayfly species have been found to be as sensitive as stoneflies to pollutants and stresses, but other species are more tolerant of certain kinds of pollution, such as increased organic matter (which leads to reduced dissolved oxygen levels). In response to insufficient dissolved oxygen, mayflies also try behaviorally to improve their situation by increasing drift and by using body movements (fish-like swimming motions in some species) to increase the flow of water past their gills.

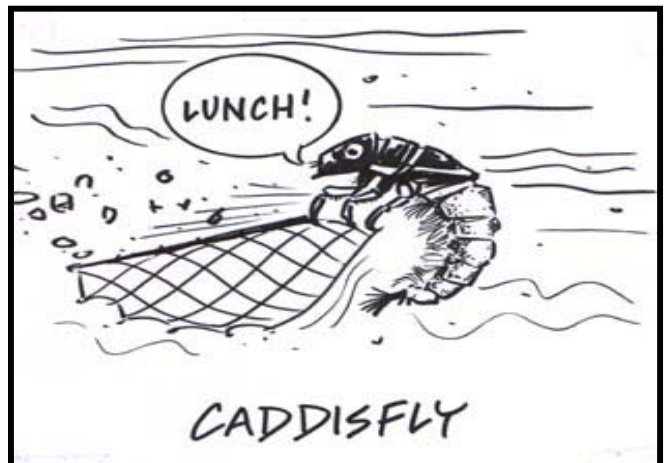


Caddisflies

A third group of relatively intolerant organisms is the **caddisflies**, the insect order **Trichoptera** (meaning “hairy winged,” referring to hairy forewings of the adults). Approximately 250 caddisfly species are found in Virginia. Caddisflies undergo **complete metamorphosis**, so they have a larval stage, and the **larva** is the key aquatic stage. Caddisfly species have been found to be intolerant of high levels of sedimentation, pesticides, industrial pollutants, mine wastes, road salt, and other such pollutants. While the order *as a whole* is considered intolerant,

it includes one fairly *tolerant* family, the Hydropsychidae, or common net-spinners. As their name implies, these organisms build nets of silk-like material that the insect produces. They use the nets to collect food by filtering organic material from the water. Some types of pollution add moderate levels of nutrients to a waterway, in turn leading to an increase in the kinds of material net-spinners can capture. Such pollution can therefore result in increased numbers of this kind of caddisfly, compared to other species that feed in a different manner.

Caddisflies are also distinctive for the many kinds of cases that different species construct from their “silk” and a variety of other materials (such as stones, leaves, and sticks). Besides providing shelter, cases increase the ability of certain kinds of caddisflies to get oxygen from water, allowing the insects to live in relatively low-oxygen waters (such as ponds, rather than streams).

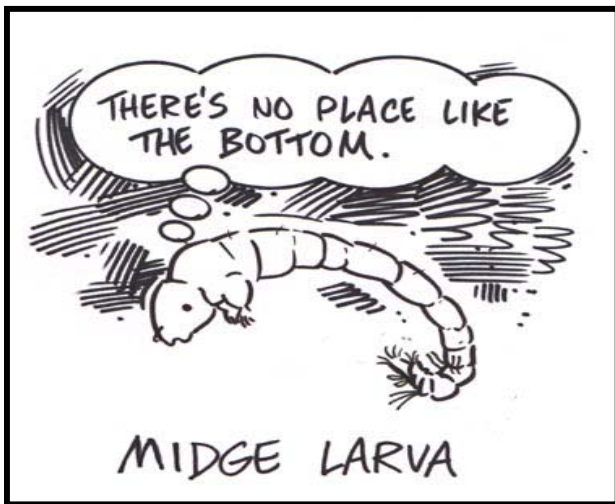


Midges

One of the largest (approximately 250 species in Virginia) and most tolerant groups of aquatic macroinvertebrates is the midges, the family Chironomidae in the insect order Diptera (meaning “two-winged,” referring to the adults having only two wings as opposed to the four wings of most winged insects). This order contains the “true flies,” including mosquitoes, blackflies, houseflies, and many others. As with caddisflies, the larva is the key aquatic stage in midges. Midge larvae can survive high levels of many chemical pollutants and can even survive oil spills.

Midge larvae's burrowing lifestyle allows them to survive high levels of sedimentation and to colonize lake bottoms in vast numbers. Some midge species also have a physiological adaptation to living in sediments: hemoglobin, giving them a bright red appearance and allowing them to extract more of the low levels of oxygen available in sediments and store it for a few minutes.

While midges can be found in virtually any type of water body, there are limits to what even they can survive. Road salt, which alters water-regulation abilities, can be a fatal pollutant to freshwater midges, and some species in this diverse group are considered intolerant of poor water-quality generally.



Lunged Snails

A second group of organisms that are tolerant of pollution and stress are the lunged snails, in the mollusk order Pulmonata. Approximately 150 lung-breathing freshwater snails are found in North America, according to the 1982 U. S. EPA report *Freshwater Snails of North America*. These snails, some of which are able to inhabit "grossly polluted sites,"¹⁵ have a biological adaptation that allows them to survive in low-oxygen conditions: their mantle cavity functions as a lung. Lunged snails do not rely on gills to absorb dissolved

oxygen from the water; rather, the Pulmonata fill their lung with air at the water's surface. Therefore, lunged snails can survive in waters with pollution—such as sewage or manure—that creates oxygen-depleting conditions. Under such conditions, organisms that rely on moderate or high levels of dissolved oxygen will decrease, leaving less competition (for food and space) for the Pulmonata.

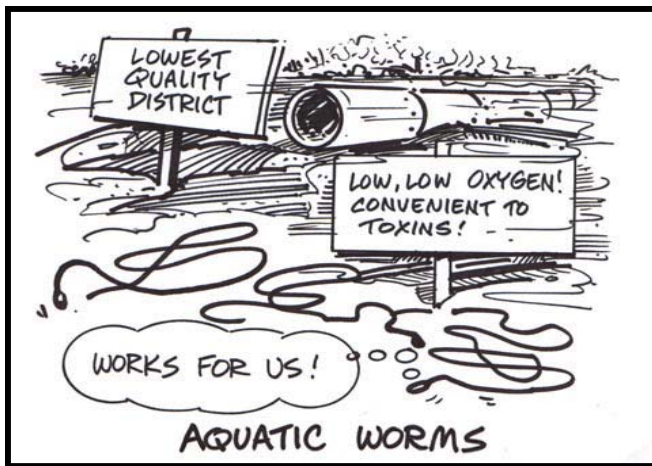


Aquatic Worms

The final group of pollution- and stress-tolerant macroinvertebrates we'll consider is the aquatic worms, in the segmented-worm class Oligochaeta. (This class also includes the familiar terrestrial earthworm and many other species.) There are about 50 species of aquatic worms, in Virginia. Some of the species live among plants, but most live among sediments, and some species are particularly common in sediments contaminated by organic pollution (such as untreated sewage). The latter are members of the family Tubificidae and are commonly referred to as **tubificid** worms. Like midge larvae, some tubificid worms are able to withstand high levels of sedimentation, low levels of oxygen, and even avoid some heavy metals associated with various industrial pollutants (by burrowing below them).

[The aquatic worm cartoon follows on the next page.]

¹⁵ B. L. Peckarsky *et al.*, *Freshwater Macroinvertebrates of Northeastern North America*, Cornell Univ. Press, Ithaca, N.Y., p. 335.



Evidence from Invertebrates Assembled

We have talked about a few groups of benthic macroinvertebrates, but biomonitors look at all the macroinvertebrates at a site, or the macroinvertebrate **assemblage**. A macroinvertebrate bioassessment considers what kinds of organisms are present, the relative numbers of the organisms present, and what kinds are missing. Typically one assumes that a “healthy” stream will be highly diverse—that is, have many different kinds of organisms, both tolerant and intolerant kinds—and no one species will greatly outnumber the others. In contrast, in polluted or otherwise impacted streams the diversity is expected to be greatly decreased, usually with many individuals of a very few (tolerant) species outnumbering the others.¹⁶

Real life, however, is not always typical. There is great natural variation in what organisms would be present at a clean or healthy site based on stream size, geography,

¹⁶ Bioassessments of benthic macroinvertebrate communities can involve a large variety of measurements and calculations to summarize sample data; these data summaries are known as **metrics**. A metric is a calculation that tells us something about the biotic community from which a sample has been taken. Much research has been done to identify useful metrics and the appropriate combination of them for accurately assessing aquatic conditions in different geographic areas. For more on metrics used with benthic macroinvertebrates, see Barbour *et al.*, listed in the References section.

and geology. A clean site in the headwaters of the Jackson River in Bath County, Virginia, would be very different from a clean site in the Nottoway watershed in Sussex County, Virginia. Both would be expected to be different from a clean site in my home watershed, the Little Miami in Greene County, Ohio. Many studies therefore collect data not only from the stream in question but also from a comparable **reference site**. Reference sites are sites that have similar size, geology, and geography as the study site but are considered to be mostly free from human impacts or impairments. Ideally the reference site and study site should be in the same watershed. In practice it can be very difficult to find reference sites in the necessary location and with the desired conditions.

Conclusion

Despite the sometimes-tricky issue of reference sites, bioassessment is a strong tool for assessing aquatic conditions, especially when used in conjunction with chemical monitoring and physical habitat assessments. The roll call of organisms in an aquatic system gives an overall idea about the system’s general health. If bioassessment indicates a problem in the biological community, increased or more-targeted chemical and physical monitoring can often identify the cause of the problem. With bioassessment in the monitoring toolbox, we are better able to understand, assess, and protect water resources.

Because bioassessment is relatively easy, volunteers with little scientific background can—with a little training—conduct various bioassessment methods. This makes it an excellent educational tool, exposing children and adults alike to living aquatic worlds that many people may have never seen or even know exist.

Benthic macroinvertebrates are a key component of bioassessment. Although most of these organisms are unfamiliar to most people, these bottom-dwellers with no backbones contain a world of information about the conditions of our waterways. That’s why even when a news report ends

with “no fish kill,” someone’s usually thinking, “Better go check on the bugs!”

—By Sarah Engel

Sarah Engel, a native of Ohio, is currently a subcontractor for Environmental Services & Consulting in Blacksburg, Va. She obtained a master’s degree in aquatic entomology from Virginia Tech in December 2000.

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More Information On-line

“**Freshwater Benthic Ecology and Aquatic Entomology Homepage.**” Soil and Water Conservation Society of Metro Halifax, Nova Scotia, Canada, at www.chebucto.ns.ca/Science/SWCS/ZOOBENTH/BENTHOS/benthos.html. The site has information and good photos about many groups of aquatic invertebrates.

“**Biological Indicators of Watershed Health.**” U. S. EPA, at www.epa.gov/bioindicators/. This site has sections on key concepts, indicator species, state programs, statistics, and other resources. Through the “state programs” link at this site, you can reach information about the Va. Department of Environmental Quality’s biomonitoring efforts.

“**Bioassessment and Biocriteria,**” maintained by the EPA’s Office of Science and Technology, at www.epa.gov/ost/biocriteria/, has some of the same information as the site just mentioned, but it also has specific information about bioassessment in *five types of habitats*: streams and rivers; lakes and reservoirs; estuaries and coastal areas; wetlands; and coral reefs.

Virginia Save Our Streams: The Virginia Izaak Walton League’s Save Our Streams (SOS) program is a leader in benthic macroinvertebrate monitoring by citizen volunteers in Virginia. The program’s Web-site is www.sosva.com.

TEACHING WATER

Especially for Virginia's K-12 teachers

This Issue and the Virginia Standards of Learning

Below are suggested Virginia Standards of Learning (SOLs) supported by this issue's Feature (pp. 1-10), Science Behind the News (pp. 11-17), and For the Record (p. 27) sections. Abbreviations: BIO=biology; C/T=computer technology; ES=earth science; LS=life science.

Feature Article—Virginia General Assembly 2002 (Parts 1 and 2)

Science SOLs: 6.11, LS.12.

Social Studies SOLs: 7.2, 7.4, 12.8.

Science Article—Aquatic Macroinvertebrates

Science SOLs: 4.5, 4.8, 5.5, LS.4, LS.5, LS.7, LS.12, BIO.9.

For the Record—Drinking-water Information Sources

Science SOLs: 6.11, LS.12, ES.9.

Social Studies SOLs: 7.2, 7.4, 12.7, 12.13.

Computer Technology SOLs: C/T5.3, C/T8.4.

Science SOLs Comment Period Open

The Virginia Department of Education is accepting comments on the Science Standards of Learning for K-12 (which were last approved in 1995). You can make comments on-line at the department Web-site, www.pen.k12.va.us/VDOE. The department's mailing address is Virginia Department of Education, P. O. Box 2120, Richmond, VA 23218; the main phone number is (800) 292-3820. (As of May 13, the department site did not indicate how long the comment period would remain open.)

Internet Resources for Chesapeake Bay Education

ChesSIE, from the Chesapeake Bay Program located at www.bayeducation.net/. Short for "Chesapeake Science on the Internet for Educators," ChesSIE offers background information about the Bay's natural resources, Bay-related government programs in Virginia

and other Bay states, real-time data on Bay weather, and access to K-12 teaching activities at various linked Web-sites.

Ask the Bay Experts, from the Alliance for the Chesapeake, located at www.acb-online.org/asktheexperts.htm. At this site, people can send questions to professionals knowledgeable about Bay water quality, living resources, restoration activities, and other topics. The service replaces the Chesapeake Bay Regional Information (CRIS) toll-free telephone-inquiry service, but people may call any Alliance office for more information about this service. The Virginia office phone number is (804) 775-0951.

Understanding Invasive Aquatic Weeds

This 16-page activity book from the Aquatic Plant Management Society, Inc., deals with aquatic plants that can displace native species and cause serious problems for recreation and other resources uses. The book is designed for 5th grade, but Virginia teachers may find it useful in teaching science SOLs 4.5, 5.5, 6.11, and LS.9. The book is available for downloading from www.apms.org. You can request a printed copy (free, but with a postage fee) by sending e-mail to scott.aquarium@usm.edu, or write to APMS, P. O. Box 1477, Lehigh Acres, FL 33970-1477; phone (941) 694-1129.

Geology in the Southern Appalachians

"The Southern Appalachians: A Changing World," a 25-minute video plus 16-page teacher's guide, describes the geologic forces that shaped the mountains from Virginia to Georgia and the associated climate, soils, and living resources. The grade level is not specified, but the information applies to Virginia science SOLs 5.7, ES.8, LS.10, and BIO.8. The video and guide cost \$15; the guide alone is available on-line at pubs.usgs.gov/gip/so_app (underscore between "so" and "app"). To order the video, phone (202) 512-1800; e-mail: orders.gpo.gov; or go on-line to bookstore.gpo.gov.

IN AND OUT OF THE NEWS

Newsworthy Items You May Have Missed

The following summaries are based on information in the source(s) indicated at the end of each item. Selection of this issue's items ended May 8, 2002. Unless otherwise noted, all localities mentioned are in Virginia and all dates are in the year 2002.

Drought News

May 2002 brought improvement in some places but deterioration in others in the widespread drought conditions, which have continued to some degree and in some states for three years or more. As of April 30, only 12 states—mostly between the Appalachians and the Great Plains—did *not* have a substantial portion

under at least “abnormally dry” conditions, according to the U. S. Drought Monitor (a national map of drought conditions, produced by a collaboration of federal agencies and state climatological centers, and available on-line at www.drought.unl.edu/dm/monitor.htm).

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Sorting Out the Drought Story

With a large amount of drought information coming out from government agencies and news media, some explanation of the kinds of information available may help readers sort it all out.

Scientists and water-resource managers distinguish four kinds of drought: **climatological** (or **meteorological**), **hydrological**, **agricultural**, and **socioeconomic** (“socioeconomic drought” is a less frequently used term than the other three). The characterization of a drought depends on three main factors: the **status** of water resources, that is, the levels of precipitation, streamflows, and groundwater; **impacts** on public water supplies, agriculture, forest fires, aquatic ecosystems (such as the Chesapeake Bay), and recreation; and **responses**, such as drought declarations, conservation measures, water-use restrictions.

The U. S. Drought Monitor (at www.drought.unl.edu/dm/monitor.html) combines several drought-rating indexes to categorize *climatological* drought conditions.

D0—Abnormally dry: Going into drought—short-term dryness slowing planting, growth of crops or pastures; fire risk above average; Coming out of drought—some lingering water deficits; pastures or crops not fully recovered.

D1—Moderate Drought: Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low; some water shortages developing or imminent; voluntary water use restrictions requested.

D2—Severe Drought: Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.

D3—Extreme Drought: Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.

D4—Exceptional Drought: Exceptional and widespread crop/pasture losses; exceptional fire risk; water emergencies created by shortages of water in reservoirs, streams, and wells.

Hydrologic drought refers to lowered stream flow, groundwater levels, or both (compared to long-term averages) resulting from a precipitation deficit.

Agricultural drought refers to the effects of precipitation deficits on soil moisture, crop conditions, and livestock.

Socioeconomic drought, according to the National Drought Mitigation Center Web-site (5/7/02), “occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.”

State and local responses to drought of any kind include declaring a drought **watch**, **warning**, or **emergency**. According to the National Weather Service, a *watch* calls for increased monitoring; a *warning* is issued to prepare people to respond to “imminent drought conditions and potential water supply shortages; and an *emergency* “imposes mandatory water restrictions on non-essential water use and can only be declared by [a] governor” (NWS Baltimore/Washington Forecast Office Drought/Water Supply Statement, 4/24/02)

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In Virginia, September 2001 to February 2002 was the driest six-month fall/winter period on record for the state as a whole. On March 13, Governor Mark Warner directed state agencies to develop and implement conservation plans and encouraged citizens to reduce their water use, particularly outdoor use.

Rain during March and April improved agricultural conditions, but long-term rainfall deficits remained, according to the April 24th and May 1st "Drought/water Resource Statements" from Virginia's three National Weather Service forecast offices, in Blacksburg, Sterling, and Wakefield (the statements are available on-line at www.nws.noaa.gov/oh/hic/current/drought/).

Virginia's Drought Monitoring Task Force, comprising several state and federal agencies and coordinated by the Va. Department of Environmental Quality (DEQ), released its latest drought status report on May 2 (available on-line through the DEQ Web-site at www.deq.state.va.us). The overview in that report made the following points:

- Drought conditions improved since the Task Force's last report of April 9. Precipitation during March and April "greatly ameliorated agriculture and forest-related problems over most of the state, with the exception of the southern Piedmont of Virginia." But "moderate hydrological drought continues in Northern Virginia, and severe hydrological drought remains over the Shenandoah Valley and the southern Piedmont."
- Streamflows over most of the state increased to normal (except in the Roanoke River Basin), but the increased flows "are expected to be short-lived absent periodic precipitation."
- It was "[u]nlikely that April rainfall produced any appreciable groundwater recharge."
- "Farm ponds...have recharged...but are generally still at low levels."
- Forest conditions improved somewhat in April but "over the next month forest fuels will dry out quickly resulting in the potential for significant forest fire threats if periodic rainfall does not continue."
- "In addition to wildfire concerns, extended drought conditions have left forests very susceptible to insect and disease problems."
- "Public water supplies, both groundwater and surface water based, are in relatively good condition."
- The Task Force had little information about private wells but noted that "individual domestic users...have been or will be impacted by low ground water levels." (News reports from

February to April show that this has indeed been occurring in several Virginia counties.)

- "April rainfall significantly improved the recreational boating and fishing situation throughout most areas of the state."

As a final note on the strength of the current drought nationwide, here's a quote from James Laver, director of the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center: "In many places, the current drought is a 1-in-20 to a 1-in-50-year event. It's not unprecedented, but it's pretty unusual." (*Christian Science Monitor*, 3/7/02)

Other Extreme-weather News

- On April 28, powerful storm systems caused at least 30 **tornadoes** and damaging straight-line winds from Missouri to Maryland. The twisters caused six deaths, many injuries, and damage to hundreds of homes, businesses, and other property. This was the fourth time in the previous two weeks that strong tornadoes had struck parts of the United States. Virginia localities that sustained damage from the April 28 event are Bedford city and the counties of Bedford, Campbell, Greensville, and Shenandoah. (American Red Cross Web-site, www.redcross.org, 5/6/02; and Va. Dept. of Emergency Management [VDEM] Web-site, www.vdem.state.va.us, 5/7/02)

- Flash flooding occurred in southwestern Virginia** on March 16—17 and again on May 2. The March floods destroyed at least 121 homes and damaged over 400 more, while destroying or damaging about 40 businesses, in Dickenson, Lee, Russell, Scott, Smyth, Washington, and Wise counties. The May 2 event affected parts of southeastern Kentucky and southern West Virginia, as well. In the three states, at least five people had died and several more were missing as of May 6. In Buchanan County, Va., two people died and an estimated 600 homes and businesses were destroyed or sustained major damage. (*Richmond Times-Dispatch*, 3/19/02; *Roanoke Times*, 3/22/02, 5/4/02, and 5/7/02).

- On May 3, Governor Warner requested a **federal disaster declaration** for 10 localities affected by the late-April/early May tornadoes and flooding. On May 5, President Bush granted the declaration for Buchanan and Tazewell counties. The declaration makes available to residents and businesses a variety of federal assistance to recover from the May 2 floods and to implement measures to reduce future flood damage. (VDEM Web-site, www.vdem.state.va.us, 5/7/02)

Other News in Virginia...

•The **Tennessee Valley Authority (TVA)**, is **conducting a study of its reservoir operations** and is seeking input from water and electricity users. TVA manages 47 flood control and hydroelectric reservoirs in Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia (two reservoirs). A series of public meetings was held in March and April. Another round of public meetings will be offered after the publication of a draft report in early 2003. To submit comments at any time or for more information, phone (888) 882-7675, or visit the TVA Web-site at www.tva.com. (TVA Web-site, 5/7/02)

•Residents of the **Leesville Road community in Campbell County**, who have had “**dry or near-dry**” wells for 10 years, are facing at least half of a \$2-\$3 million bill to bring nine miles of water lines to the area. The number of people without adequate water in the area is not clear, but in February 65 people met with the county’s Utility Service Authority to demand some action on the situation. After that meeting, the residents formed a committee to seek assistance from the county board of supervisors. (*Lynchburg News & Advance*, 2/26/02)

•**VIMS & SOFeX**: Even for acronym-attuned readers, this one might be tricky. The Virginia Institute of Marine Science (VIMS) is participating in the Southern Ocean Iron Experiment (SOFeX; Fe is the chemical symbol for iron). VIMS researchers traveled to Antarctica in January and February to help study how the southern polar ocean might respond to additions of iron. Iron is an essential element for the growth of phytoplankton (microscopic, free-floating algae). Phytoplankton are scarce in some large areas of the oceans, and one proposed explanation is a shortage of iron in those waters. This scientific mystery has gained new attention because, if iron fertilization significantly stimulates phytoplankton growth, the phytoplankton could remove a large amount of carbon dioxide from the atmosphere, potentially reducing the “greenhouse effect” and global atmospheric warming. Because large-scale iron fertilization would most likely be attempted in Antarctica (if anywhere), SOFeX is investigating the potential impacts on the marine environment there. The study involves 16 other oceanographic institutions besides VIMS.

Another current VIMS research effort seeks to identify so-called “**erosional hotspots**”—

relatively short beach areas that erode severely during storms. Such places can make beach protection or refilling projects more costly and less effective, especially if the spots are undetected beforehand. The VIMS research project is using time-lapse video cameras and sonar-equipped amphibious vehicles to map hotspots. (*The Crest* newsletter from VIMS, Winter/Spring 2002)

•The Va. Marine Resources Commission (VMRC) has proposed to reduce the **recreational harvest of Summer Flounder** in 2002 by about 44 percent. This would be done to comply with the flounder management plan developed by the Atlantic State Marine Fisheries Commission (the Summer Flounder fishery has been managed federally since 1989). The VMRC took no action on this matter at its April 23 meeting; the next VMRC meeting is scheduled for May 28. (*The Crest*, Winter/Spring 2002)

•**Alternatives to large, regional stormwater ponds** have been under scrutiny in Fairfax County, as the February 2002 *Water Central* (p. 12) reported. In its March/April 2002 newsletter (*Conservation Currents*), the Northern Virginia Soil and Water Conservation District presented a detailed look at the pros and cons of regional ponds in general and at the specific situation in Fairfax. For a copy of the article, contact the newsletter editor at (703) 324-1460; e-mail: conservationdistrict@co.fairfax.va.us; or view it on-line at www.fairfaxcounty.gov/nvswcd.

•News about the **Chesapeake Bay**:

Blue Crabs—In 2000, Virginia and Maryland agreed to phase in a 15-percent reduction in the Blue Crab harvest over three years. The states took steps to accomplish a five-percent reduction in 2001. In February, the VMRC passed regulations to reach an 11-percent reduction this year, and the Commission will hold a public hearing on May 28 to consider other steps that would reach a 14-percent reduction this year. In March, the Maryland Department of Natural Resources accelerated that state’s reductions to accomplish the entire 15-percent reduction this year. Maryland has also formed a task force to study biological, social, and economic issues related to the Blue Crab fishery that the state will face over the next 10 years; the task force’s report is due by Summer 2003. (*Bay Journal*, April 2002; and VMRC Web-site, www.mrc.state.va.us, 5/4/02)

Nonpoint Source Pollution—For the first time, the Bay Program will give money to support nutrient- and sediment-reduction efforts in the Bay headwater states of Delaware, New York, and

West Virginia. Each state will receive \$250,000 over the next two years. Because these states are not signatories of the Bay Agreements among Virginia, Maryland, Pennsylvania, and the District of Columbia, before now they have not received Bay Program funds. But recently the governors of Delaware and New York signed a separate agreement committing those states to work towards the water-quality goals of the 2000 Bay Agreement, and West Virginia was expected to do so soon. The three headwater states contribute an estimated 11 percent of the nitrogen, and about eight percent of the phosphorus, reaching the Bay annually. (*Bay Journal*, April 2002)

Bald Eagles—Improved habitat and water quality helped increase the number of active nests in the Bay watershed to 618 (with 908 eaglets), up from 533 nests (with 813 eaglets) in 2000. In the latest annual survey, Virginia had 300 active nests, Maryland had 297, Pennsylvania had 20, and the District of Columbia had one. Scientists estimate that over 3,000 nesting pairs of eagles once inhabited the Bay watershed; the all-time low of 72 nesting pairs occurred in 1977. (*Bay Journal*, April 2002)

Non-native Oysters—A National Academy of Sciences panel has been assembled to study the ecological, social, and economic risks and benefits of using the Asian oyster *Crassostrea ariakensis*, also known as the Suminoe oyster, in the Bay. The panel, which is to begin work on June 1 and report by May 31, 2003, is to study three alternatives: using sterile non-native oysters in culture; placing a reproducing population in the Bay; or barring the use of the non-native oysters. (*Bay Journal*, April 2002)

Oyster Diseases—Reduced freshwater flows into the Bay as a result of the drought have resulted in higher salinity levels in the upper (northern) Bay areas. Higher salinity in turn is more conducive to the two parasitic diseases of Bay oysters, Dermo and MSX. For the first time, oyster fishers in Anne Arundel County, Md. (in which Annapolis is located) have been finding a high percentage of disease-caused oyster mortality. (*Washington Post*, 4/4/02)

Harmful Algae—The drought and increased salinity are also suspected in the first-ever appearance in the lower Potomac River of *Dinophysis acuminata*, one of a group of algae known as dinoflagellates. This is the first known instance of a large quantity of the microbe in the normally more freshwater portions of the Bay watershed. The species produces a toxin that causes diarrhetic shellfish poisoning, an illness

(not fatal nor permanently harmful) in people who eat shellfish from infected waters. (*Baltimore Sun*, 2/20/02)

Bacterial Infection in Striped Bass—Mycobacteriosis, a bacterial disease that causes internal and external lesions in fish, has been seen recently in a relatively high percentage of Virginia's and Maryland's Striped Bass (or Rockfish) populations. The disease's first appearance in the two states—and indeed anywhere on the East Coast—was in 1997. Eating diseased fish apparently poses no danger, but the same kind of bacteria is sometimes transmitted to humans via breaks in the skin, causing "fish handler's disease" (resulting in skin lesions of, if not properly treated, more serious joint problems). It's unclear what affect the disease has on wild populations of Striped Bass. The Sarbanes Oxford Cooperative Laboratory in Oxford, Md., VIMS, and the U. S. Geological Survey are jointly studying the causes and effects of the disease in fish. (*Washington Post*, 4/4/02)

•As of mid-April, the **city of Roanoke** was seeking approval from the Virginia Department of Health to use **ultraviolet (UV) light to disinfect drinking water**. Although UV technology is already used for *wastewater* treatment in Virginia, this would be the first use in a *drinking-water* system in the state (the technology is already in use for drinking water in other states). Roanoke sought approval for the technology so that the city could, if necessary due to the drought, use water this summer from a reservoir that has been shut down due to contamination and will not be usable again until December (when a new filtration system is in place). (*Roanoke Times*, 4/17/02)

•In **Roanoke County**, a brush fire that was evidently the work of an arsonist set **fire to about four million tires**. The tires burned from March 23 until April 16, causing some short-term air pollution but apparently no pollution of nearby streams or groundwater. Water monitoring is to continue, and a private company will examine soil and debris to determine what residues may remain. The huge collection of tires was the largest tire pile in Virginia before the fire. The Va. Department of Environmental Quality (DEQ) estimates that there are 340 piles around the state holding about three million tires, with over 2.6 million of them in five piles in Charles City, Washington, Caroline, Chesterfield, and Nottoway counties. (*Roanoke Times*, 4/19/02 and 5/8/02)

•**Wetlands Permit Ruling**: In April, U. S. District Court Judge Henry Morgan ruled that

neither the U. S. Army Corps of Engineers, the Virginia State Water Control Board (SWCB), nor the Va. DEQ had the authority to require Newdunn Associates of Norfolk to obtain permits before draining and filling about 38 acres of wetlands. In the case of *U.S. v. Newdunn*, the judge ruled that the wetlands in question were isolated (that is, not connected to navigable waters of the United States) and therefore not subject to Corps regulation (following a January 2001 decision by the U. S. Supreme Court). In the more sweeping part of his ruling, the judge held that the Corps had insufficient authority to issue regulations in 1986 that expanded the definition of wetlands covered by the Clean Water Act. The SWCB had ruled in October 2001 that Newdunn violated state law by filling in the wetlands, and both the U. S. Justice Department and the Va. DEQ filed suit against the Newdunn. On May 7, Virginia filed an appeal of Judge Morgan's ruling with the 4th U. S. Circuit Court of Appeals. (*Inside EPA's Water Policy Report*, 4/22/02; and Associated Press, 5/8/02)

•On April 24, attorneys for Virginia and Maryland continued arguments in their **dispute over rights to the use of the Potomac River**. After hearings last year, Special Master Ralph Lancaster, appointed by the U. S. Supreme Court to arbitrate the dispute, held that Virginia does have a historical right to use the entire river, which is actually owned by Maryland under a grant from the king of England in 1632. But Lancaster had requested the sides return to pursue two related questions: whether Maryland has the authority to regulate Virginia's use of the river, and whether Virginia had forfeited its right to object to Maryland regulation by not challenging it. Lancaster will submit his ruling to the Supreme Court, which may hold its own hearings before deciding the questions. The interstate dispute began in 1997 when the Fairfax County Water Authority applied to Maryland for a permit to move its water-intake point from the Virginia shore to the middle of the river. In 2001, Maryland was ordered by its own courts to issue the permit, and the pipeline project is expected to be finished in December. (*Washington Post*, 4/25/02)

•The U. S. Army is considering **closing a four-mile section of the New River adjacent to the Radford Army Ammunition Plant** in Montgomery and Pulaski counties. The plant manufactures explosives and propellants used by the military. Since September 11, 2001, the plant commander has had the authority to close the

river section, but he has sought an option that would allow boating to continue under normal circumstances. Under most active consideration is a *removable* buoy system that could be employed when increased security was ordered but removed at other times. A *permanent* closure remains an option, though. About 150 local residents attended an April 24th meeting that officials with the plant and the Army Corps of Engineer held to discuss the possibilities and get public comment. A formal public hearing would occur if the Army officially proposes a closure option. The Army expects to take about 18 months to evaluate its options. (*Roanoke Times*, 4/25/02)

...and Outside of Virginia

•Through "**Eyes on the Bay**," citizens who use Tampa Bay are being asked to watch out for invasive, non-native species. The Tampa Bay Estuary Program is coordinating the project. The project will include various public information tools to inform people of precautions to help prevent the spread of non-native species and to enlist people in monitoring efforts. (*Coastlines*, Univ. of Mass. Urban Harbors Institute, January 2002) (**For more information on non-native aquatic species, please see the Aug.-Sept. 2001 Water Central, pp. 7—20.**)

•In February, 72 members of the Maryland General Assembly signed a letter to Gov. Parris Glendening requesting a special commission to study how to respond to **long-term declines in aquifers that supply four southern Maryland counties and parts of Virginia**. The state's Department of Natural Resources has already been coordinating a federally funded study investigating the status of groundwater in the area; that study is scheduled to be finished by June. (*Washington Post*, 2/20/02)

•What's the only cereal native to North America? The answer is **Wild Rice** (*Zizania palustris*), the state grain of Minnesota, an important food source for Native Americans and European settlers, and a food and habitat source in aquatic ecosystems. Wild Rice used to grow over a large part of the eastern United States, but it is now found in only about half of its historic range. Researchers at the University of Minnesota are investigating the decline by trying to identify factors associated with decreased rice populations in Rice Lake National Wildlife Refuge in McGregor, Minn. (*Minnegram*, Minn. Water Resources Center, March 2002)

•In March, the EPA released a draft of its “implementation guidance” for the new **arsenic standard for drinking water** (10 parts per billion, reduced from 50). As part of the guidance, EPA addressed the rule’s affordability for small systems (those serving fewer than 3,300 customers), as Congress expressly requested the agency to do. EPA plans to allow small systems to request a series of two-year exemptions from the standard, up to a total of 14 years. Larger systems have to comply by 2006. EPA’s report to Congress on affordability for small systems, and the draft implementation guidance, are available on-line at www.epa.gov/safewater/arsenic.html.

In the report to Congress, EPA also announced that its Science Advisory Board will conduct a broader **review of the entire process for assessing the economic impacts of drinking-water rules on small systems.** (*Inside EPA’s Water Policy Report*, 3/11/02 and 3/25/02)

•In mid-March, over 80 leaders of water systems traveled to Washington to ask Congress for **\$2.1 billion to improve water-system security.** The request included \$500 million for vulnerability reviews and \$1.6 billion for alarms, fences, and other equipment. In 2001, Congress authorized only \$83 million for vulnerability reviews, and President Bush’s proposed budget for the coming year included only \$22 million for drinking-water security. (*USA Today*, 3/18/02)

•Over the past 15 years, North Carolina dry cleaners have **reduced by 75 percent their use of the hazardous solvent perchloroethylene (PERC)**, according to a study required by the state’s General Assembly. Improper disposal can allow PERC to contaminate groundwater, and North Carolina has over 100 known sites contaminated with PERC. The study attributed the reduction to dry cleaners’ installation of new solvent-recovery dryers and other equipment. (*WRRRI News*, North Carolina Water Resources Research Institute, Mar.-Apr. 2002)

•On March 28, the U. S. District Court for the District of Columbia ruled that **restrictions under the 1977 Surface Mining and Reclamation Act also apply to underground mining activities** if they cause collapse of the land above an underground mine. The case was *Citizens Coal Council, et al. v. Gale Norton*. An appeal is expected. (*Inside EPA’s Water Policy Report*, 4/8/02)

•On April 2, U. S. Environmental Protection Agency (EPA) Director Christine Whitman announced **Great Lakes Strategy 2002.** A

committee of federal, state, and tribal agency representatives developed the plan to coordinate environmental management in the lakes. The plan is available through the EPA Great Lakes Web-site, at www.epa.gov/glnpo.

•Each spring brings **clam-relay season to North Carolina.** The state’s Marine Fisheries Service allows people to take clams from shellfishing areas that are closed due to contamination and transfer the animals to uncontaminated private waters. After about a month in the cleaner water, the animals have cleansed themselves enough to be harvested for food. (*Wilmington Morning Star*, 4/11/02)

•In April, the U. S. Army Corps of Engineers **suspended work on a \$311 million project to deepen the channel of the Delaware River** from 40 to 45 feet. An upcoming report by Congress’ General Accounting Office is expected to call into question the Corps’ economic justification of the project, and the project has been criticized by a number of politicians and interest groups. It’s unknown whether the Corps will seek to resume the project. The Delaware channel project is one of several that the Corps has suspended or reviewed over the past two years in the wake of widespread criticism of its economic analyses. (*Washington Post*, 4/24/02)

•The **Nature Conservancy** has reached agreement with the E. S. Adkins timber company of Salisbury, Md., to **purchase 3,500 acres in the Nassawango Creek watershed**, located in the Eastern Shore counties of Wicomico and Worcester. Once completed, the purchase will double the amount of land in the Conservancy’s Nassawango Creek Preserve. The land in the preserve is protected from development but is open for hiking, canoeing, and other recreation. (Information provided by the Maryland Chapter of the Nature Conservancy, 5/10/02)

.....

•Finally, in the December 2001 the **Buchanan County, Va., communities of Jewell Valley and Pea Patch** completed a 20-mile **self-help water – line project.** (The February 2002 *Water Central*, p. 16, described the Self-Help Virginia program, through which communities help build their own local water projects.) Evaluating their accomplishment, one of the local project leaders noted that the project ought to be in the *Guinness Book of World Records* for the most water line installed in a community self-help project. (*Clinch Valley News*, 4/3/02)

—By Alan Raflo

N O T I C E S

“Phase II” Stormwater Permits

Public hearings on storm water permits for small municipalities and construction activities will be held in Roanoke on June 11 and Richmond on June 13. For more information, contact Burt Tuxford, e-mail: brtuxford@deq.state.va.us, or by phone at the DEQ Central Office in Richmond, toll-free in Virginia, (800) 592-5482.

Potomac Sojourn

From Shepherdstown, W. Va., to Washington, D.C., starting June 23, this week-long expedition is for novices and experienced paddlers alike. Participants may paddle all or part of the trip, and non-paddling programs are also offered. For more information, contact Karen Fligger at the Interstate Commission on the Potomac River Basin, (301) 984-1908, x103; e-mail: kfligger@icprb.org.

James River History and Natural History

If you're going to be near Richmond this summer and want to explore the James River, the James River Association (JRA) offers several daytime and evening events. For a recorded list of events, phone (888) 727-8850; or visit the JRA Web-site at www.jamesriverassociation.org/home.html. The JRA main phone number is (804) 730-2898, 8:30 a.m.—5:00 p.m., Mon.—Fri.

National Marina Guidelines

The U. S. EPA released in Dec. 2001 *National Management Measures to Control Nonpoint Source Pollution from Marinas and Recreational Boating*. Available on-line at www.epa.gov/owow/nps/new.html, or request a printed copy from NSCEP, 11029 Kenwood Road, Building 5, Cincinnati, OH 45242; FAX (513) 489-8695 (specify EPA 841-B-01-005 and the number of copies, and provide your name, mailing address, daytime phone number).

Non-native Oysters in the Chesapeake

The Va. Institute of Marine Science has two new reports on the potential use of non-native oysters to revive the Chesapeake Bay oyster industry. The reports, *Statement on the Use of Crassostrea ariakensis in Chesapeake Bay* and *Standing Policy for Non-native Oyster Research in Virginia*, are available on-line at www.vims.edu/newsmedia/pubs/index.html.

At the Water Center

For more information on any item listed below, please contact the Water Center at phone (540) 231-5624; or e-mail: water@vt.edu.

Virginia Water Research Symposium 2002.

Nov. 6—7 in Richmond. Please see the full-page notice, next page.

Regional Coalfield Water Resource Symposium.

Sept. 4, 2002, at the University of Virginia's College at Wise. To present a paper, please submit an abstract (250 to 300 words) by **June 15, 2002**, to Tamim Younos, e-mail: tyounos@vt.edu.

New Publications

- Younos, T. (editor). “Universities' Contribution to TMDL Program Development.” This special issue of *Water Resources Update* (Issue #122, Mar. 2002) presents various examples of projects by university researchers to develop Total Maximum Daily Load (TMDL) reports for impaired waters. To obtain copies, phone (618) 536-7571; e-mail: ucowr@siu.edu.
- De Leon, R. and T. Younos. “Integrating Student Service-Learning and University Knowledge into Watershed Management Programs: The Stroubles Creek Watershed Case Study.” Pages 93—102 in *Proceedings (CD) of the 7th National Watershed Conference* (held May 2001 in Richmond).

CORRECTIONS FROM PREVIOUS ISSUES OF WATER CENTRAL

- The photograph on p. 16 of the February 2002 issue (Issue #20) misspelled the locality name. The correct spelling is McClure.
- The cartoon for Feature Article in the December 2001 issue (Issue #19), p. 1, showed a mean-looking bear labeled “Consent Degree.” The correct label is “Consent Decree.”
- Footnote #3, also in the December 2001 Feature Article, p. 2, incorrectly identified the *Va. Code* reference for the Virginia Water Quality Monitoring, Information and Restoration Act of 1997. The correct *Code* citation is Sections 62.1-44.19:4 through 62.1-44.19:10.
- In the June-August 2000 issue, p. 4, the bill number for the non-tidal wetlands protection program passed by the Virginia Senate in 2000 was SB 648, *not* SB 684. (The number for the House version, HB 1170, is correct.)



**VIRGINIA WATER RESEARCH SYMPOSIUM
2002**

**DRINKING WATER SUPPLIES ASSESSMENT
AND MANAGEMENT STRATEGIES
FOR THE 21st CENTURY**

**November 6-7, 2002
Sheraton Richmond West (Formerly the Hyatt)
Richmond, Virginia**

Over the last 30 years, there has been an increased awareness among water planners and governmental administrators on the local, state, and federal level, research scientists, and water professionals that water has an economic and environmental value and is a vulnerable resource. This heightened awareness highlights the need that water assessment, management, and planning, in combination with new policies and strategies, must be adopted within the next decade to address the drinking water issues facing Virginia and the nation. Problems that confront water users, planners, researchers, and policy makers are the lack of adequate water supplies due to droughts and regional water management conflicts, pollutants, aging infrastructure and water distribution systems, groundwater supply and availability, alternative water sources, unsafe and inadequate water in rural and isolated communities, and source water protection.

VIRGINIA WATER RESEARCH SYMPOSIUM 2002 is hosted by the Virginia Water Resources Research Center. The purpose of the symposium is to provide an opportunity for the presentation of the most recent research and technical reports and to facilitate the discussion of mutual issues and problems across a wide range of disciplines among those individuals interested in water supply and drinking water issues. The symposium will consist of invited panels and solicited papers covering presentations on research findings, technical innovations, regulations and guidelines, monitoring, reporting, and a broad range of water supplies and drinking water problems.

Any one involved in drinking water supply, management, or affected by regulatory policy, consulting engineers, government regulators, municipal utility managers and private operators, researchers, students, and others concerned with drinking water should attend this symposium. **Please note the dates on your calendar and watch for the full symposium schedule in the next issue of Water Central.**

Potential Presenters: Research abstracts are being accepted for oral presentations in all areas related to water environment, water supply, decision support systems, irrigation water management and planning, residential and rural water resources and management, wastewater treatment and management, quality and pollution control, pipe flow and replacement analysis, hydrological modeling, groundwater flow, reservoirs and lakes, and water resources management. The abstract heading should include: Presentation title, author(s) name and affiliation, address, office phone and fax numbers, email address, and 3-5 keywords. Abstracts should not exceed 350 words. The deadline for abstract submission is **May 31, 2002; but if you are reading this in the April-June 2002 issue of Water Central, we'll give you an extension if necessary!** Please call or e-mail Judy Poff (see contact information below) to request an extension. Acceptance of the paper will be confirmed by email in late June and presenters will receive the author's guide for manuscript preparation and guidelines for oral presentations. The deadline for submission of full manuscripts to be included in the symposium proceedings is **September 1, 2002. ALL PRESENTERS MUST REGISTER FOR THE SYMPOSIUM.**

FOR MORE INFORMATION

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Phone (540) 231-8030; FAX (540) 231-6673; E-mail: jupoff@vt.edu.
Abstracts may be sent by mail, e-mail, or FAX.**

FOR THE RECORD

Sources for Selected Water Resources Topics

Drinking-water Information Sources

(Please see the August 1998 *Water Central*, p. 14, for a previous article on sources of drinking-water information.)

• ***A Guide to National Drinking Water Standards and Private Water Systems*** (1996, 71 pages), available from the Water Center, is an excellent introduction to drinking water regulation, testing, and information sources.

• **The Va. Department of Health's (VDH) Division of Drinking Water** regulates public water systems in Virginia (a public water system serves 15 or more connections, or 25 or more people). This agency can be reached at Room 109, 1500 E. Main Street, Richmond 23219; (804) 786-5566. The office's Web-site is www.vdh.state.va.us/ddw/.

• Since October 1999, public water systems have been required (under the federal Safe Drinking Water Act) to provide annual "**Consumer Confidence Reports**." These reports note and explain any contaminants detected at the water system over the previous year. If you are a public water-system customer, your system will send you the report each year. To request a copy from another system, contact the particular system. Reports from some large Virginia water systems are available on-line through the American Water Works Association's Web-site, www.awwa.org (click on "Water Utility Sites").

• **The U. S. EPA**, specifically the **Office of Ground Water and Drinking Water**, is a key source of drinking-water information. The **Safe Drinking Water Hotline**, at (800) 426-4791, can answer general questions, direct you to other sources for more specific questions, and direct publication requests. The Hotline operates from 9 a.m.—5:30 p.m. (Eastern Time). For those with Internet access, similar information is available at www.epa.gov/ogwdw/.

Through a companion EPA Web-site, www.epa.gov/safewater/dwinfo.htm, you can get information on **state drinking-water programs**.

States are required to submit to the EPA **annual reports about drinking-water standards compliance**. The latest edition (April

2000) is *Providing Safe Drinking Water in America: 1998 National Public Water Systems Compliance Report*, EPA 305-P-00-002, available on-line at www.epa.gov/safewater/annual/. For a printed copy, check your local public library or write to U. S. EPA Office of Enforcement and Compliance Assurance (2201A), Washington, D.C. 20460. Virginia's annual report is not available on-line, but summary information is available in the national report.

The 1997 EPA publication, *Water On Tap: A Consumer's Guide to the Nation's Drinking Water* (EPA 815-K-97-002), is available on-line at www.epa.gov/safewater/wot/ontap.htm.

Finally, the EPA maintains the **National Drinking Water Contaminant Occurrence Database (NCOD)**; Web-site: www.epa.gov/ncod/. The purpose of the database is to support EPA decisions related to regulation of contaminants. The NCOD contains data from public water systems and other sources on the occurrence of physical, chemical, microbial, and radiological contaminants. *No data analysis is provided*. Due to the lack of data analysis and other limitations, the Web-site warns that "the NCOD may not be the database to answer questions from some users...[f]or instance, a user trying to determine the quality of their drinking water." The Web-site suggests alternative sources for specific, frequently asked questions.

• **The National Drinking Water Clearinghouse** at West Virginia University seeks to offer information to help rural and small communities maintain safe drinking-water supplies. Among other items, the Clearinghouse produces "Tech Briefs," a drinking-water products catalog, and the quarterly magazine *On Tap*. Many of these items are available at the Clearinghouse's Web-site, www.nesc.wvu.edu/ndwc/; or phone the Clearinghouse at (800) 624-8301.

Upcoming "For the Record" Schedule

Aug. 2002 (Issue 22): Weather and Climate
 Oct. 2002 (Issue 23): Water Use
 Dec. 2002 (Issue 24): Wetlands
 Feb. 2002 (Issue 25): Water Law and Rights

Schedule subject to change

Virginia Water Central

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On gossamer from a glossosomatid?

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1. Would you rate the content of this issue as good, fair, or poor?
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