

Virginia Water Central

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Streams and other Virginia waters will be the focus at the 2003 Virginia Water Research Symposium. Details start on page 19. Photo by Rachel Price.

This issue's **Feature Article** discusses the use of "trading" and other efforts to apply economic market principles and practices to water-quality management.



"Now where did I put that basic economics book?"

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Science Behind the News does not appear in this issue.



"Just like California's newest actor-turned-politician says, I'll be back (next issue)!"

Ed. note: Due to my being called for jury duty, possibly for six weeks in September and October, *Water Central* may not appear again until the December 2003 issue.



VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Virginia Water Central August 2003 (#27)

FEATURE ARTICLE

Putting the “Market” in Market-based Water-quality Management

[Ed. note: Basic wastewater and water-quality terms, printed in bold when first used, are explained in the box on page 3.]

Virginia citizens expect good water quality—clean and ecologically productive rivers, lakes, and estuaries. But good water quality is not free. Limiting the **discharge** of pollutants into our water requires private investment in new pollution-control equipment and public commitments to monitor and enforce regulatory programs. As our desire for improved water quality increases, the search intensifies for more *cost-effective* strategies and policies.

Market-like water-quality policy is frequently advocated as an alternative to conventional regulatory programs that tend to be costly, prescriptive, and devoid of pollution-prevention incentives.¹ Market-like policies, in contrast, ideally provide dischargers with financial incentives and decision-making authority to explore, develop, and implement new ways to lower **effluent** discharges and costs. Advocates of market-like environmental reform believe that creating incentives for individuals to reduce pollutant discharges is essential to achieving water-quality goals in the face of future economic and population growth.

Effluent trading is frequently touted as a market-like policy. For example, in 2001 the Chesapeake Bay Program (the state-federal collaborative effort that has led efforts since 1983 to improve the Bay’s water quality) produced a set of trading guidelines for possible use to achieve the Bay Program’s nutrient-reduction goals in Virginia’s Bay tributaries. Most recently, in January 2003 the U.S. Environmental Protection Agency (EPA) issued a general policy statement broadly supporting effluent-trading programs. EPA’s trading policy is based on the premise that

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¹ See, for example, *Barriers to Environmental Technology Innovation and Use*, by Environmental Law Institute (ELI Project #960800), Washington, D.C., 1998.

Basic Wastewater and Water-quality Terms

Concentration/Load—*Concentration* is the amount of one substance dissolved in a given volume of water. A common unit of concentration in the water-quality field is milligrams per liter (mg/l), which is approximately equivalent to parts per million. Virginia water-quality standards, following U.S. EPA regulations, mandate minimum or maximum concentrations for many key substances dissolved in wastewater and in the natural waters that receive wastewater. *Load* refers to a total amount of a given substance reaching a given body of water in a given period of time. For example, if on any given day a stream received 100,000 gallons (378,500 liters), of water with a concentration of 1 milligram of nitrogen per liter, the daily load of nitrogen reaching that stream would be 378,500 milligrams, or about 8/10 of a pound.

Discharge/Effluent—*Discharge* is the release of wastewater or other substances into a receiving body of water. *Effluent* is the wastewater that is discharged.

National Pollution Discharge Elimination System— Under the Clean Water Act, a National Pollution Discharge Elimination System (NPDES) permit authorizes the discharge of effluent based on regulator-identified standards. Regulators establish standards for certain pollutants based on technically and economically achievable pollutant-control technologies for categories of sources, called *point sources* (typically industrial and municipal dischargers) (see below). After some negotiation with each particular discharger, some variant of the technology and its operation is designated to achieve an pollutant-concentration limit in that discharger's wastewater. The discharger is then issued an NPDES permit specifying the maximum permissible pollutant concentration in the effluent. Regulators typically prefer the certainty of basing permit compliance on technology already in place, so permits often specify the design and operation of whatever waste control technology is selected. Also, regulators are expected to periodically review technologies to revise standards downward (make more stringent) over time. The Clean Water Act does not require mandatory control requirements for *nonpoint sources* (see below).

Point and Nonpoint Source—A *point source* is either a fixed source of a pollutant discharge (such as an outflow pipe from an industry or a sewage-treatment plant) or a pollutant source that is otherwise readily identifiable. A *nonpoint source* does not occupy a single, fixed, identifiable point; common examples of nonpoint sources are agricultural operations and urban areas, which produce water pollutants from a widespread area and from many separate activities. In practice, the distinction between the two is as much legal and regulatory as it is physical.

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“market-based approaches such as water-quality trading provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches.”²

Not all trading programs, however, are market-like, and many trading programs now being implemented are better described as extensions of existing regulatory approaches. Interestingly, official trading policy guidelines and statements fail to identify the general requirements for “market-like” trading.

This article discusses what makes up a market-like trading program. Case studies illustrate how market-like trading programs differ from regulator-directed trading programs, and how these differences result in different outcomes. A better understanding of these differences among trading programs will help regulators, dischargers, and citizens recognize opportunities to put the power of markets to work for water quality.

² U.S. Environmental Protection Agency, “Water Quality Policy Statement, January 13, 2003,” p. 1. Accessed at www.epa.gov/owow/watershed/trading/tradingpolicy.html, 8/20/03. For over thirty years, federal law has allowed *air*-pollutant dischargers to use various types of market-like programs to attain air-quality goals.

Market-like Water-quality Management

Imagine designing a program to achieve specific water-quality goals for a watershed.³ As population grows and new sources of pollution are added to the watershed, the program must find a way to accommodate changes in the mix of pollution sources and increases in population and economic activity without violating water-quality goals. How could such a program work?

One option is for *regulators* to manage the total effluent **loads** among dischargers: regulators identify which sources must control pollutants and to what degree. Under this option, regulators act as a type of central planner, implementing their vision—or that of the governmental agency for which they work—of the best allocation of pollution-prevention resources. Such programs are not market-like.

On the other hand, a market-like policy would expect individual *dischargers* to make their own decisions, independent of regulators, on *how* they will meet their pollution-control obligations. This might include voluntary decisions to reallocate, or *trade*, pollution-control responsibility among dischargers while still meeting the overall water-quality goals. Trading programs that decentralize decision making about effluent management—that is, they move decision making from regulators to dischargers—are called *allowance markets*. The key feature that distinguishes market-like trading programs from other approaches called trading is *who decides*—dischargers or regulators—how effluents will be managed.

Effluent Allowance Markets

Before delving into the specifics of market-like trading, let's first consider the fundamental features of a market for a familiar economic transaction: buying a car.

In a car-market exchange, a potential buyer and seller freely negotiate about what type of car will be exchanged and at what price. The decision to buy or sell is purely voluntary, and if the car is purchased both the buyer and seller are (we presume) better off for having made the trade of money for car. But a full market *system* for cars involves more than just voluntary trading between a buyer and seller. In a market system, car makers have the discretion to determine how many passenger cars or minivans or trucks to produce, the types of capital investments make, and how the production process will be organized. The car buyer has the freedom to decide how much to drive, where to drive the car, and the general upkeep of the car.

While buyers and sellers largely determine the exchange, production, and use of cars, government still plays an important supporting role in a market system. Government has three main roles: facilitating exchanges, policing exchanges, and reducing “third-party effects.” Government can *facilitate* exchanges by devising standardized systems of weights and measurements. For example, car manufacturers are required to report the weight, horsepower, and fuel mileage information about each new car using standardized measurements. Such information reduces the cost and uncertainties for potential car buyers. Government *policies* exchanges by enforcing laws against fraud, false advertising, and the like, as well as by protecting car owners from illegal “exchanges”—that is, theft. Finally, government places broad boundaries on car use—such as license requirements and speed limits—to deter individual actions that might harm other people not directly involved in the exchange or use of the car; such impacts are often called “*third-party*” effects.

Effluent allowance markets transfer these general market principles to pollution management. Market-like trading programs begin with a product to be traded, called an *allowance*. An allowance is the legal permission to discharge a certain amount of a pollutant during a specific time period. Dischargers must own allowances in order to discharge effluents legally. If effluent loads (discharges) are less than allowance holdings, the unused or surplus

³ Specific water-quality goals would be based, at least in part, on state standards.

allowances can be sold to others or perhaps saved for use in the future. Under conventional water-quality management, regulators also give out permissions to discharge by issuing permits under the **National Pollutant Discharge Elimination System (NPDES)**. The two key differences between conventional and market-like “permissions” are, first, that market-like permissions are transferable among dischargers and, second, that allowances are expressed as a total load rather than an effluent **concentration**.

A market for allowances is created when dischargers are granted discretion to make two fundamental choices: *how much* to discharge and *how* discharges will be controlled. By buying allowances, dischargers purchase the permission to discharge more pollutants, while sellers forfeit a portion of their permission to discharge. Through private negotiations, dischargers voluntarily decide whether to buy and sell allowances and thereby determine how much effluent they may discharge. Equally important, an allowance gives a discharger the freedom to choose how pollution loads will be kept below or equal to allowance holdings—by altering a production process, installing a new piece of pollution-control equipment, or even reducing production levels. Such discretion is like that of a car manufacturer’s freedom to decide what cars to produce and what production processes will be used to make those cars.

The opportunity to trade and the flexibility to manage effluent discharges creates both the incentives and ability to engage in pollution-prevention activities. Because allowances can be traded for money or used in the future to reduce costs, allowances are a financial asset for dischargers. By investing in pollution prevention, dischargers can increase the value of that asset. For potential sellers of allowances, new investments in pollution equipment or control processes increase the number of allowances that can be sold to others or saved for future use. Potential buyers, on the other hand, can reduce their expenditures on allowances by developing ways to lower pollution levels.

Advocates of markets believe that the greatest potential for innovation rests with individual decision-makers—those who stand to gain the most from its application and those with on-the-ground experience and knowledge of productive activities. With market incentives and the ability to respond to those incentives, countless individuals who make decisions about pollutant generation, treatment, and discharge are more alert to the importance and value of pollution-prevention opportunities. Without such incentives, many opportunities simply go unrealized.

Government Role in Effluent Allowance Markets

Although effluent allowance markets make dischargers responsible for waste-management decisions, government plays a critical and necessary role in an allowance market system. Recall the three roles mentioned above: facilitating, policing, and reducing third-party effects. All three are crucial in allowance markets.

Let’s consider first the governmental role in reducing third-party effects of allowance markets, because this is probably the greatest concern of those critical of market approaches to water-quality management. A third-party effect would occur in an allowance market if a discharger’s actions harmed the overall water quality of the regulated area (a particular water body, a watershed, or a state). The most important way for government to avoid this type of third-party effect is by limiting, or “*capping*,” the total number of allowances issued for the area. An allowance cap establishes the maximum amount of pollutants that can be discharged. The size of the allowance cap (the number of allowances issued) is not based on the needs of the dischargers; rather, the cap is set low enough to achieve the public water-quality goals of the regulated area.

In a fully developed allowance market, *every* discharger—both **point** and **nonpoint sources**—would be required to own allowances in order to discharge pollutants legally. (For more on applying allowance markets to *nonpoint* sources, please see the box, “The Challenge of

Continued after box, next page

The Challenge of Nonpoint Sources

Many people claim that requiring nonpoint sources to hold allowances is impractical or infeasible because of the difficulty of measuring effluent loads in runoff from farms and urban areas. Measurement of nonpoint source loads is indeed difficult and expensive, but allowance markets create incentives for water-quality managers to find ways to bring nonpoint sources under a cap. The numerous ways this can be accomplished are beyond the scope of this article, but it is not an impossible task. Caps for nonpoint sources are being developed or have been developed in a number of programs, such as for control of selenium in the San Joaquin Valley in California and for control of nutrients in the Neuse River Basin in North Carolina and Lake Okeechobee in Florida.

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Nonpoint Sources,” next page.) With a definite cap and all dischargers required to hold allowances, dischargers then are free to pursue their own self-interest in managing their waste, without jeopardizing public water-quality goals. New pollution sources must purchase allowances from the existing fixed supply before being allowed to release pollutants. With a fixed cap, dischargers may come and go, but the total amount of pollutants discharged does not change. Because allowance markets begin with water-quality goals and a legally binding cap, they are sometimes called *cap-and-trade* programs.

Policing, government’s second role in allowance markets, involves monitoring discharges and applying effective penalties when dischargers exceed their allowances.

Finally, government can facilitate allowance market systems by lowering the costs and uncertainties associated with the exchange of allowances. For example, government may provide criteria and conditions for measuring and reporting of the total effluent load released by individual dischargers. Such policies would help “standardize” allowances, providing buyers, sellers, and the public with assurances about the legal soundness of an effluent allowance.

Regulator-directed trades: Offsets

As noted earlier, many current effluent-trading programs do not reflect the general principles of a market-like system, because they are *regulator-directed*. Such programs place the burden on regulators, rather than on dischargers, to identify appropriate pollution-control equipment and strategies. Regulators may direct “trades” among dischargers in such programs. Regulators may identify acceptable trading partners, impose special conditions that must be met before being allowed to trade, and establish the prices between buyer and seller; the trades might not even be voluntary, but rather a regulatory requirement. In the context of a car exchange, a regulator-directed trading program would be analogous to a government directive that mandated how cars are built, what type and quantity of cars are built, and which cars will be distributed to buyers. Reallocations are made, but such a situation cannot be called a market system for either cars or effluent trading.

An example of a regulator-directed trade is called an *offset*. Offsets are grafted onto conventional regulatory permitting programs. Offsets are sometimes used when strict point source permits alone cannot achieve water-quality standards. In such situations, unregulated nonpoint sources are also a significant source of pollutants. Where water-quality standards cannot be met by point source controls alone, regulators face unpleasant choices: 1) deny all new point source permit applications (unless zero additional discharge is achieved), prohibiting economic growth; 2) create a new set of permits and technology requirements for unregulated nonpoint sources, which is a costly, politically contentious process; or 3) take no action and let water-quality goals be compromised.

Offsets allow regulators to avoid these difficult choices. Faced with a water-quality problem, regulators may decide to lower point source permit limits to zero for a particular pollutant. If zero discharge of the pollutant is technically infeasible or cost-prohibitive, regulators require point sources—after limits-of-technology controls have been applied—to pay for effluent reductions at an unregulated nonpoint source. This offsets the difference between zero-pollutant discharge and what limits-of-technology controls can achieve. Regulators may then identify the types of nonpoint control practices that can be financed by the point source.

This scenario has been touted as an application of market-based approach. Whatever its merits, however, this is *not* a market-like policy, for several reasons:

- regulators determine and approve effluent-control technologies and strategies;
- regulators exert primary responsibility to determine who must trade and what type of additional controls will be implemented;
- payments from the point source are not voluntary, nor do the payments result in the point source being able to do less than limit-of-technology controls;
- regulators require offsets not as a way to lower control costs or create new pollution-prevention incentives, but rather as a way to finance additional nonpoint source controls.

Why does it matter that offsets do not reflect market-like conditions? The following two case studies will illustrate how the absence (in Minnesota) or presence (in North Carolina) of market-based principles affects water-quality *outcomes*.⁴

Offsets in Minnesota

The case of Minnesota's Rahr Malting Company illustrates a regulator-directed trading program using offsets. In 1997, the Rahr Company wanted to increase production at its plant on the Minnesota River. To enable this, the company planned to build a wastewater treatment facility adjacent to the plant. But the Minnesota Pollution Control Agency, citing phosphorus-caused water-quality problems on the river, prohibited Rahr from increasing permitted effluent discharges into the river. Instead, the state agency required Rahr's treatment facility to achieve zero phosphorus discharge in order to expand. When the highly advanced treatment technologies failed to achieve zero-phosphorus discharge, the agency instructed Rahr to pay for agricultural nonpoint source reductions upstream of its treatment facility. Any nonpoint source controls that were implemented became new conditions in the point source discharger's permit.

This scheme was expensive to implement and generated few pollution-prevention incentives. Specifying Rahr's responsibilities as technologies in a permit, rather than as effluent limits in an allowance, limited the company's ability and incentives to experiment with new pollution-control processes.⁵ Trading opportunities were limited, costly, and contentious. Rahr was *required* to purchase effluent from a regulator-identified menu of nonpoint source practices, and Rahr could not increase their discharges above their existing permit limit even if less costly reductions could be purchased from other sources. Finally, negotiating such a deal through the permit process was costly to the discharger and to the regulatory agency: Rahr's modified permit took over two years to negotiate.

⁴ For more details on these case studies, please see "Watershed-based Effluent Allowance Trading: Identifying the Statutory and Regulatory Barriers to Implementation," by Kurt Stephenson *et al.*, in *The Environmental Lawyer* 5:3 (June 1999), pp. 775-815.

⁵ In fact, dischargers often perceive *disincentives* to pursue pollution prevention below permit limits, because regulators might respond by *lowering* (that is, making stricter) the permit limits.

Market-like Trading in North Carolina

To date, the trading system that best incorporates the characteristics of an allowance market is North Carolina's Tar–Pamlico system. In the late 1980s, the Tar-Pamlico Sound faced a number of water-quality problems associated with excessive nutrients. In the Tar-Pamlico watershed, North Carolina determined that industrial and municipal dischargers should reduce aggregate nutrient loads by 30 percent from 1990 levels. The state allowed a group of 13 dischargers (primarily wastewater treatment plants) to form an association. North Carolina officials then assigned to the association an aggregate nutrient cap. Instead of requiring nutrient controls through the conventional permit process, state regulators established a legal obligation to meet the cap through an alternative contractual arrangement. This type of arrangement was allowed because nutrients are not specifically identified as pollutants in the Clean Water Act. Consequently, federal law does not currently require NPDES permits for nutrients.

The alternative legal agreement assigned the association a fixed number of nutrient allowances and established enforceable financial penalties if the total discharges exceeded the allowance cap. The association was responsible for allocating allowances among its members in a way that did not exceed the cap. Once members received their allowances, they could freely reallocate responsibility for meeting the cap among themselves under the association's internal exchange rules.

While the Tar-Pamlico program does not produce public trades and allowance prices that some might associate with markets, the program does show three key aspects of a market-oriented approach to water-quality management.

- 1) *Enforceable pollution limit*: The contractual arrangement focused on an aggregate cap rather than technology requirements; this meant also that association members who reduce nutrient discharges are not penalized by even more stringent individual permit requirements.
- 2) *Dischargers determine how to control pollution*: Individual dischargers are not required to use specific control practices, nor are their operational choices constrained by technology oriented permit requirements.
- 3) *Dischargers determine who controls pollution*: The state has granted broad power to the association to determine how the responsibility for meeting the aggregate cap would be shared among the association members without each member having to enter into a formal regulatory approval process with the government.

The results produced by the Tar-Pamlico program have exceeded expectations both of regulators and of dischargers. Association members have aggressively reduced nutrient discharges for a fraction of the original cost estimates. Over the past 10 years, during a period of prolonged economic growth, the association has not exceeded the discharge cap once. Such a compliance record itself is a remarkable achievement for a water quality program.⁶

Making Markets Work for Water Quality in Virginia

As noted in the North Carolina example above, market-like trading programs strive to achieve three fundamental principles:

- 1) enforceable requirements to limit the pollutant load (legally expressed as an allowance cap);
- 2) discharger freedom to decide how to best control pollutant loads;
- 3) discharger freedom to decide whether to transfer allowances.

⁶ The chief limitation of the Tar-Pamlico system is that the nutrient cap only includes point sources. Nonpoint sources face no legal requirements to hold allowances a condition to discharge. In addition, some observers believe the association's cap was not stringent enough. At the time that the program was designed, however, the potential costs of a 30-percent reduction were thought to be quite high.

The Rahr and Tar-Pamlico examples illustrate that the distinctions between regulator-directed offsets and market-like allowance trading are not just semantics. How trading programs are designed affects program outcomes. This should not be surprising. The car market would work much differently, too, if government officials were primarily responsible for the production, distribution, and use of cars.

Can the power of markets be used to improve water-quality programs in Virginia? We believe they can, but the use of a market-like trading program would represent a significant change in Virginia's approach to water-quality management. Below we offer a few practical steps that can be taken toward building a more market-like alternative.

Watershed Group Permits

Load caps and discharger flexibility are difficult to achieve under conventional individual permits. To provide market-like freedoms with strong public water-quality protection, Virginia can begin by implementing single "*watershed permits*" for groups of point source dischargers. Such permits, similar in concept to that used in the Tar-Pamlico program, could be used, for example, to achieve nutrient goals in the Virginia tributaries of the Chesapeake Bay. Such innovative permitting should be easier to implement in the future, because the U.S. EPA publicly endorsed the group watershed permit concept in January 2003.

Market Discretion Outside Caps

Allowance trading programs require caps, but if caps are not or cannot be implemented, market-like flexibility still could be used to improve existing voluntary programs. For example, cost-share programs are frequently used to encourage dischargers to adopt voluntarily specific technologies or nonpoint best management practices (such as riparian buffers). Market-like alternatives would use the cost-share incentive but focus it on what dischargers achieve (pollution-control performance), rather than on how they do it (technology or practices).

As an alternative to cost-sharing for a specific technology or practice, government agencies could create pollution-control *bidding programs*. Under a bidding program, a government agency would offer financial assistance to pollution-control projects that are able to control pollution at the least cost. Such a program would create incentives for the private sector to invest time and resources to seeking out and implementing low-cost pollution-control strategies. If the financial assistance were awarded based on pounds of pollutants reduced per dollar spent, all potential projects would have to measure, monitor, and verify pollution levels. This approach could also create incentives to improve the identification and measurement of hard-to-monitor discharges, such as those from nonpoint sources.

Develop a Prototype Program

Implementing a watershed permit, a bidding program, or some other kind of market-like program requires more than statements of philosophical support for markets or general guiding principles; it requires dealing with a number of practical issues. For example, what legal enforcement mechanisms would a watershed permit contain? How would the transfer of allowances occur under a group permit? What type of additional measurement and monitoring requirements would be necessary? To help resolve such issues, a *prototype plan* to address a specific water-quality issue in Virginia should be developed. Such a plan should include all the legal and technical details necessary for implementing caps and market-like flexibility.

Water-quality management is expensive and complicated. Government regulation will always have its place, but market-like programs have the potential to improve the water-quality returns we get for our investments of public and private time and money. Without proactive efforts in this direction, however, the power of markets to improve water quality will remain untapped.

—By Kurt Stephenson and Leonard Shabman

Kurt Stephenson is an associate professor in the Department of Agricultural and Applied Economics at Virginia Tech. Leonard Shabman, who was director of the Virginia Water Resources Research Center from 1996 to 2002, is now a resident scholar with Resources for the Future in Washington, D.C.

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VIRGINIA WATER STATUS REPORT

This section of *Water Central* presents recent and historical data on Virginia's precipitation, stream flow, and groundwater levels (one topic per issue, rotating among the three topics).

Stream Flow in Virginia, 1999—2003

The graphs on below, taken from the U.S. Geological Survey's Internet site, "WaterWatch—Current Water Resources Conditions,"⁷ compare recent Virginia streamflow to historical records. The 74 sites included in the graphs all have at least 30 years of records. The top graph covers July 10 to August 25, 2003; the bottom graph covers July 1999 to August 2003. Each graph uses a "streamflow index." The streamflow index measures how a site's average streamflow over 24 hours (the **average daily streamflow**) compares to the historical average streamflow *for that same site and date*. The graphs show a further average: the streamflow index averaged over all 74 of the state's monitoring stations.

Index values mean the following:

Values indicating dry conditions:

- 1 = average daily flow for the graphed date is a record low flow for that date;
- 2 = average daily flow for the graphed date exceeds less than 10 percent of historical values for that date;
- 3 = average daily flow on the graphed date exceeds 10—24 percent of historical values for that date;

Value indicating "normal" flow:

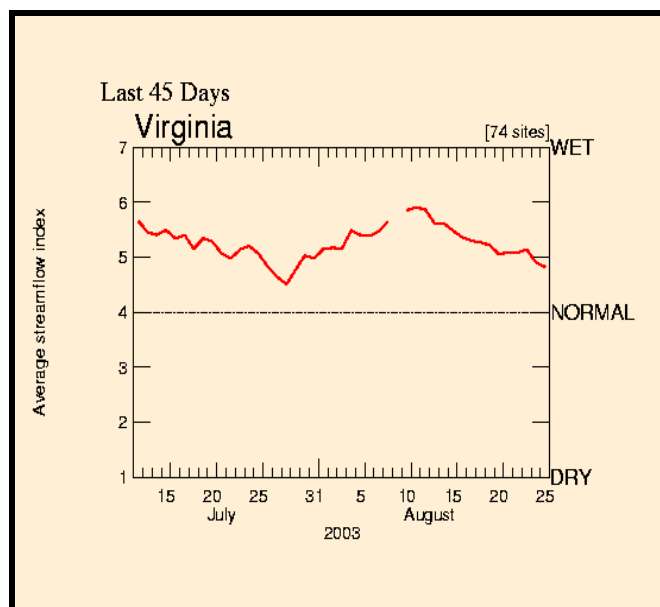
- 4 = average daily flow on the graphed date exceeds 25—74 percent of historical values for that date;

Values indicating wet conditions:

- 5 = average daily flow on the graphed date exceeds 75—89 percent of historical values for that date;
- 6 = average daily flow on the graphed date exceeds 90 percent of historical values for that date;
- 7 = average daily flow for the graphed date is a record high flow for that date.

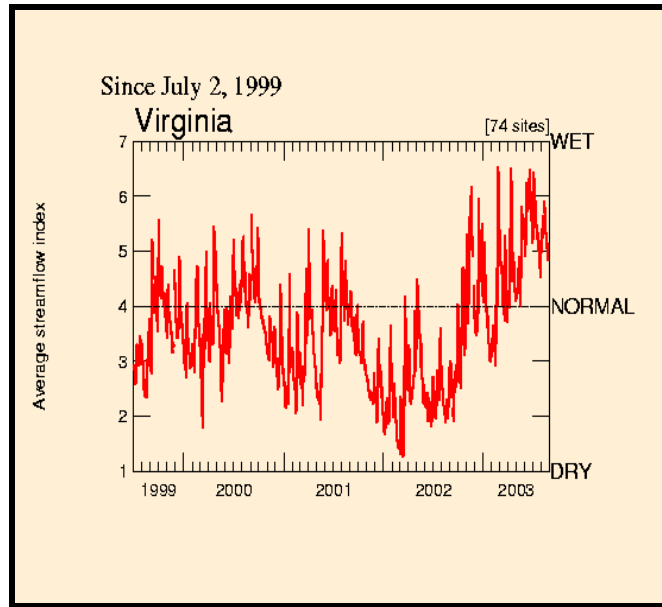
Gaps in the data: Gaps in the top graph represent days when fewer than two-thirds of the stations reported data (due to equipment or weather problems). On such days, plotting a statewide average value may misrepresent actual conditions.

Average Daily Streamflow Index, Compared to the Historical Average, July 10—August 25, 2003.



⁷ Graphs from water.usgs.gov/cgi-bin/dailyMainW?state=va&map_type=real&web_type=plot, 8/25/03.

Average Daily Streamflow Index, Compared to the Historical Average, July 1999—August 2003.



IN AND OUT OF THE NEWS

Newsworthy Items You May Have Missed

The following summaries are based on information in the source(s) indicated in parentheses, usually at the end of each item. Selection of this issue's items ended August 23, 2003. Unless otherwise noted, all localities mentioned are in Virginia and all dates are in the year 2003.

In Virginia...

•Some notable weather events recently:

Severe thunderstorms striking western Virginia on July 9 dropped 1.25 inches of rain in a half hour on the Winchester area and generated two tornados that touched down in Loudoun County (*Winchester Star*, 7/10/03; and *Washington Post*, 7/13/03)

Tornados were also reported in Roanoke County on August 5 and York County on August 7. (*Roanoke Times*, 8/6 and 8/8/03)

A severe thunderstorm on August 8 dropped about three inches of rain on the Staunton area, leading to flooding that caused over \$1.2 million in damages to the city's parking garage along with about 60 businesses and 90 residences. (*Richmond Times-Dispatch*, 8/12/03)

Pittsylvania County's experience highlights the difference between dry 2002 and wet 2003. In July, the county applied for declaration as a state agricultural disaster area, because of crop losses due to excessive rainfall. In Summer 2002, the county sought a disaster declaration due to drought. Rainfall for 2003 in the central portion of the county was 37 inches as of mid-July 2003, compared to 16 inches at that time in 2002. (*Danville Register & Bee*, 7/13/03)

•On June 2, Gov. Warner announced new awards of **\$18 million in grants and loans** from the Virginia Department of Health's (VDH) **Drinking Water State Revolving Fund** to 16 public water systems in 11 counties. The money will help 1,900 people get new connections and 6,200 other people get improved service. A week later, however, the VDH stated that it planned to **review how it administers the Revolving Fund**, in light of one award of over \$240,000 to a homeowners' association in Floyd County for an area that consists largely of vacation homes. The application review determined the area to be "disadvantaged," based on income information for the county as a whole. Income information is one factor in determining awards, along with health considerations. (*Richlands News-Press*, 6/4/03, and *Roanoke Times*, 6/10/03)

•Do you recognize this creature?



It's a **blackfly**, one of the common **gnat-like insects** that have had **excellent breeding conditions** in Virginia this spring and summer, due to the frequent rainfall and well-flowing streams. (Illustration by Kathy Borne, courtesy Virginia Tech Department of Entomology)

Wet conditions in Virginia have been good for another familiar aquatic breeder, too— **mosquitoes**. In late June, professional entomologists reported seeing unusually high numbers of various mosquito species, including those that carry West Nile Virus and other diseases. In July, the Virginia Department of Health's David Gaines stated that all Virginia Piedmont counties should be on the lookout for birds and mosquitoes carrying West Nile. Arlington and Alexandria provided examples of local mosquito-disease efforts. In May, those localities began a five-part West Nile Virus prevention program: 1) applying insecticide to kill mosquito larvae in storm drains; 2) spraying a film over pools of water to smother larvae and pupae; 3) employing two kinds of traps to sample mosquito populations; 4) testing selected dead birds

for the virus; and 5) (in Arlington only) giving routine blood tests to nine “sentinel” chickens to detect antibodies that the chickens would produce if infected with the virus. (*Charlottesville Daily Progress*, 6/23/03; and *Washington Post*, 6/23, 7/3, and 7/10/03) (For more on mosquitoes and mosquito-borne disease, please see the March 2003 *Water Central*, p. 13)

•We turn now to a **complicated regional water-supply story**. It’s happening in North Carolina, but it provides an interesting case study for anyone contemplating regional water supply issues in Virginia. Moreover, the situation involves the short section of the Dan River that dips from Virginia into North Carolina. In addition, the Virginia city of Danville has several concerns.

In March, Yanceyville, N.C. (in Caswell County), Roxboro, N.C. (in Person County), and Person County signed a 40-year agreement on a regional water system that would take up to 30 million gallons per day (MGD) from the Dan River near Milton, N.C. (in Caswell County). The agreement assigns different responsibilities to the three localities for acquiring property, construction of the intake and pump station near Milton, and construction of lines to the localities. Different segments would be built over time as the need arose and money was available. The N.C. Environmental Management Commission, which must approve all water-withdrawal permits, took up the agreement in June.

On June 23 Caswell County, which opposes the project, sued the three localities. The county claims that, under North Carolina law, a county’s board of commissioners must consent before county property can be acquired by a unit of local government from a *different* county. Under the agreement, Yanceyville, in Caswell County, would acquire the Caswell County property for the intake and pump station, but Roxboro and Person County would share the title.

In Danville, the city’s director of water and wastewater treatment identified in June four concerns with the agreement: 1) no documented need for 30 MGD; 2) need for a drought-management plan for the project; 3) a relatively short distance (about 10 miles) between Danville’s wastewater discharge and the proposed N.C. intake; and 4) potential obstacles to Danville increasing its use of Dan River water from its current 8 MGD to 18 MGD (its current intake *capacity*).

Most recently, in August the three N.C. localities reduced their proposal from 30 MGD to 10 MGD. The 30 MGD figure had been based in part upon a plan to provide 8 MGD for a proposed Dominion Energy power plant in Roxboro. The plant proposal was the original impetus for the regional water plan, but Dominion cancelled its proposal in February 2003. (*Danville Register and Bee*, 3/25, 6/23, 6/26, and 8/20/03)

•On June 24, the Virginia Marine Resources Commission denied the **city of Newport News’ request a formal hearing** to reconsider the Commission’s May 14 vote, in which it denied the city a permit for an intake pipe to supply the proposed **King William reservoir**. Prior to this request to the Commission, Newport News had already filed a notice of appeal in circuit court, which the city now plans to pursue. The city’s appeal requests that the court order a formal Commission hearing and overturn the Commission’s May 14 permit denial. (*Richmond Times-Dispatch*, 6/25/03) (Please see the June 2003 *Water Central*, p. 17, for a previous item.)

•On July 3, American Electric Power (AEP) made public its draft **shoreline management plan for Smith Mountain Lake**, a large hydroelectric-generating impoundment in Bedford, Franklin, and Pittsylvania counties. The plan, begun by AEP in 2001, is part of AEP’s efforts to renew its hydroelectric license—which expires in 2010—with the Federal Energy Regulatory Commission (FERC). As part of the license, FERC requires AEP to maintain the environmental, recreational, and scenic value of the shoreline, to which end the draft plan is directed. The proposed plan, which AEP intends to enforce even while FERC reviews it, establishes six land-use categories that regulate construction, vegetation, and shoreline materials below the lake’s 800-foot contour. A copy of the plan and more information about the lake are available online at www.smithmtn.com. (*Roanoke Times*, 7/3 and 8/4/03)

•On July 8 the Bi-state [Virginia and Maryland] **Blue Crab Advisory Committee held its final formal meeting**. The panel included legislators, fishery managers, and crabbers from the two states and provided information and recommendations on Chesapeake Bay crabs and their management. Formed in 1999, the panel was discontinued when Virginia failed for two years to provide its share of funding. The Chesapeake Bay Commission, a panel of state legislators, may continue some of the Committee’s crab-industry monitoring functions. (*Richmond Times-Dispatch*, 7/4/03)

It’s also **bad news recently for the crabs themselves**, as well as crabbers. The crab population seems to be near its lowest recorded level, according to the annual assessment by the Chesapeake Bay

Stock Assessment Committee. With poor catches for several recent years, crabbers in Virginia and Maryland became eligible in Spring 2003 for federal disaster relief (about \$500 per person in Maryland, and \$300 to \$950 in Virginia). (*Bay Journal*, Jul.-Aug. 2003)

Water-quality signs were also bad this summer. Scientists reported the largest area—250 square miles—of **low dissolved oxygen** levels ever recorded during the summer in deep waters of the Bay. They attribute the large oxygen-poor region to the impact of an unusually large nutrient runoff this year, a consequence of three years of drought (allowing nutrient build-up on land) followed by excessive rainfall in 2003. Crabbers reported seeing crabs crawling onto buoys or land, presumably in search of oxygen. (*Baltimore Sun*, 8/7/03, and Va. Inst. of Marine Science Website, www.vims.edu, 8/7/03)

- On August 14 the **National Research Council** released its study of the **potential impacts of introducing the Asian, or Suminoe, oyster to the Chesapeake Bay**. The report recommended continued “carefully regulated” aquaculture of sterile non-native oysters, but said further research is needed on the possible effects of putting *reproducing* populations in the Bay. Issues needing investigation include the potential for new diseases, competition with native oysters, spread of non-natives beyond the Bay, and market demand for non-natives. Copies of the report, *Study on Non-Native Oysters in the Chesapeake Bay*, will be available this fall online at www.nap.edu or by calling (800) 624-6242. (National Academies Press Release, 8/14/03)

- On August 21, four of the **world’s “largest and fastest” container cranes** arrived at Norfolk International Terminals. The cranes—produced in Shanghai, China, and costing \$5.6 million each—are able to unload ships carrying 26 twenty-foot containers side-by-side. While the largest ships now carry only up to 17 containers across, larger ships are a coming trend, Virginia Port Authority officials believe. The Port Authority will receive four more giant cranes in August 2004. (Associated Press, as reported in *The Roanoke Times*, 8/23/03)

...and Outside of Virginia

- While most of the eastern United States enjoyed a wet spring and summer this year, **drought persisted from the Mississippi River to Pacific Northwest**. The U.S. Drought Monitor map for August 19 (available online at www.drought.unl.edu/dm/monitor.html) showed at least “abnormally dry” conditions in all or part of every state west of the Mississippi except for Louisiana; in sections of Maine, Illinois, and Michigan; and in a large part of Wisconsin. “Severe” to “exceptional” drought covered large parts of the Great Plains and Rocky Mountains.

- In May the U.S. Army Corps of Engineers began following **new guidelines** on use of its **emergency fund for flood, drought, and coastal storm preparation and response**. The guidelines also identify state and local responsibilities to be eligible for such funds. The guidelines were published in the April 21, 2003, *Federal Register* (pp. 19357—19371), which is available at federal repository libraries or online at www.gpoaccess.gov/fr/index.html. (*Natural Hazards Observer*, July 2003)

- On June 22, a hailstorm over Aurora, Nebraska, produced the **largest hailstone on record**: 7 inches diameter and 18.75 inches circumference. The previous record stone, found in Kansas in September 1970, was 5.7 inches diameter and 17.5 inches circumference. (*Associated Press*, as reported in *The Roanoke Times*, 8/3/03)

- In July the U.S. General Accounting Office released **Freshwater Supply: States’ View of How Federal Agencies Could Help Them Meet the Challenges of Expected Shortages** (GAO-03-514). The report compiles assessments by water managers in 47 states of the likelihood of future water shortages and their consequences, and how the federal government can help states meet future demand. Even under normal rainfall conditions, 36 states expect local, regional, or statewide water shortages sometime within the next 10 years (Virginia expects local shortages). The report is available at www.gao.gov/new.items/d03514.pdf, or by phone at (202) 512-6000. (*GAO Highlights*, July 2003)

- Speaking of federal responses to water-supply issues: On May 2, U.S. Interior Secretary Gale Norton unveiled a new initiative, **“Water 2025: Preventing Crisis and Conflict in the West.”** The effort seeks to focus federal attention and resources on specific western watersheds that face chronic water-supply shortages, including areas of Arizona, California, Nevada, New Mexico, Texas, and Utah. The Website for

the initiative is www.doi.gov/water2025; it includes a map identifying areas of potential water conflict. (*Colorado Water*, June 2003)

•In August, the U.S. Fish and Wildlife Service (USFWS) approved a plan for **eight eastern states to kill about 3,000 Mute Swans (*Cygnus olor*) per year** over the next 10 years, an effort to reduce what officials believe are the non-native birds' impact on native aquatic vegetation and birds. Mute Swans were brought to the United States from Europe. Maryland will seek to reduce its Mute Swan population from over 3,200 birds to about 500. Opponents of the plan may file a second federal lawsuit to stop the plan; a lawsuit in April temporarily stopped Maryland from killing the birds and required a USFWS environmental assessment (which the *Federal Register* published on August 7). (*Baltimore Sun*, 8/8/03)

Meanwhile, Maryland and Louisiana are to receive federal assistance for **eradication and control** of the rodent **Nutria (*Myocaster corpus*)**, a native of South America that has damaged marshes in the two states. The Nutria Eradication and Control Act of 2003 (now Public Law 108-16), signed into law in April, authorizes financial assistance through 2008. (*National Wetlands Newsletter*, May-Jun. 2003; and www.encyclopedia.com, 8/26/03)

•**Non-native aquatic species** and their impacts are **not just a U.S. issue**. A recent report on non-native species in Africa, for example, indicates that African wetlands, lakes, and rivers have suffered millions of dollars of damage from invasive species such as Brazilian Water Hyacinth and the Louisiana Crawfish. The report is *Alien Invasive Species in Africa's Wetlands: Some Threats and Solutions*, released in February 2003 by the IUCN-World Conservation Union. (*National Wetlands Newsletter*, Mar.-Apr. 2003)

•Here's something positive about **wetlands and Iraq**. "Eden Again" is a new project sponsored by the Iraq Foundation to restore the Mesopotamian Marshlands—about 7,600 square miles of lakes and wetlands within Iraq and Iran. The Iraqi government destroyed about 90 percent of the marshlands in a 1991 campaign against the area's indigenous population. Eden Again is funded in part by the U.S. State Department. According to its Website, the Iraq Foundation is a non-profit organization "working for democracy and human rights in Iraq." (*National Wetlands Newsletter*, May-Jun. 2003; and www.iraqfoundation.org, 8/27/03)

•This summer, researchers with the National Oceanic and Atmospheric Administration tested in Colorado and Kansas a **tornado-detection system that monitors "infrasound"**—ultra-low sound frequencies produced by tornado-generating thunderstorms but not by other thunderstorms. Similar sound frequencies, which the human ear cannot detect, are used by whales and elephants to communicate. (*Colorado Water*, June 2003)

•On August 10, marine experts and volunteers released **five rehabilitated Pilot Whales** that had become stranded in the Florida Keys on April 18. The five had been in a group of 28 stranded whales, of which nine swam away but 14 either died or required euthanasia. About 1,000 volunteers provided round-the-clock care for the whales during their recovery in a lagoon. (Associated Press, as reported in *The Roanoke Times*, 8/11/03)

•**Finally**, in July, Unity College in Maine hosted a **Fishing for Scholarships contest**. At nearby Lake Winnecook, 106 students tried to catch 100 fish tagged for prizes, including one award of four-years' tuition. But only two tagged fish were caught, bringing the angler a sea-kayaking tour and a \$50 tuition credit. (*Roanoke Times*, 7/29/03)

—By Alan Raflo

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 and For the Record sections. The SOLs listed below are from Virginia's 2003 Science SOLs and 2001 Social Studies SOLs. Abbreviations: CE= civics and economics; ES=earth science; GOVT = Va. and U.S. government; LS=life science; VS = Va. studies; WG = world geography.

Feature Article—Markets and Water Quality

Science: 6.9, LS.12, ES.7, ES.11.

Social Studies: CE.7, CE.9, WG.7, GOVT.14, GOVT.15, GOVT. 16.

For the Record—Water Law Information Sources

Social Studies: VS.10, CE.7, CE.8, GOVT.8, GOVT.9, GOVT.16.

Special Item: Post 9/11 Security Developments at U.S. Water Utilities— Summary of An AWWA Report

On May 1, 2003, the American Water Works Association (AWWA) released a report on security efforts at U.S. water utilities since the September 11 attacks. Reprinted below (with AWWA permission) is an excerpt from the press release about the report. Please note that opinions expressed in the following are not necessarily those of the Water Center or Virginia Tech. *Water Central* thanks the Colorado Water Resources Research Institute for printing this article in its June 2003 newsletter.

According to a new report issued by the **American Water Works Association, (AWWA)** America's water utilities' immense focus on homeland security since the terrorist attacks of 9/11 has resulted in an unprecedented mobilization of effort and resources to protect America's water supply. The new report, *Drinking Water Security in America After 9/11*, identifies the extensive new security measures water utilities have undertaken since 9/11. It also describes the new culture of security that water utilities now operate under and the challenges they still face in protecting the nation's water supplies from terrorism. For a copy of the full report, go to www.awwa.org. [For more information, readers may also phone the AWWA at (202) 628-8303 (Tom Curtis) or (303) 913-0063 (Andrew Hudson).]

Established in 1881, AWWA is the oldest and largest nonprofit scientific and educational organization dedicated to safe drinking water in North America. AWWA has over 56,000 members worldwide and its more than 4,600 utility members serve 80 percent of America's population.

Working together with the U.S. Environmental Protection Agency (EPA), water utilities have ramped up security efforts at water supply systems throughout the nation. Background checks on new employees have become common, as have intensive employee training, security audits, assessments and emergency response and communications plans. A nationwide information-sharing system has been developed for water utilities. Utilities are identifying their most vulnerable traits and are working with local emergency first responders to coordinate planning.

Taken together, this mobilization of effort and resources is virtually unprecedented. It has resulted in the development of:

- The EPA's "Baseline Threat Report," describing likely modes of terrorist attack and outlining the parameters for vulnerability assessments by community water systems. This is sensitive information provided only to water utilities;
- Risk assessment tools for utilities to identify and evaluate their own security risks. Such analyses, called vulnerability assessments, are required by the Bioterrorism Act;
- Training programs on vulnerability assessments, used by several thousand water systems, to help utilities prepare accurate and detailed assessments;
- Security protocols to assure that vulnerability assessments are safeguarded after they are sent to EPA, as required by the Bioterrorism Act;
- Guidance and technical assistance for utilities to use in revising emergency response plans as required by the Bioterrorism Act;
- Development of information on "best practices" and technical assistance on matters such as security hardware technologies;
- An inventory of past security threats to community water systems and the lessons learned from them;
- Analysis of the lessons learned by community water systems through the vulnerability assessment process;
- Guidelines that water utilities may use to guard against terrorists and security threats, correlated with the Department of Homeland Security's color-coded advisory system; and
- The Water Information Sharing and Analysis Center (WaterISAC), which provides a secure portal for the communication of sensitive security information among utilities, law enforcement, and intelligence agencies.

The drinking water community, in partnership with EPA and others, actually began to prepare for terrorist threats before September 11, 2001. In 1998 President Clinton signed Presidential Decision Directive 63 and thereby identified water as part of America's critical infrastructure. Under that Directive, EPA was assigned lead responsibility for the water sector and, in turn, designated the Association of Metropolitan Water Agencies (AMWA) as the lead for this sector. At the same time, the American Water Works Association (AWWA) began to prepare technical materials and publications for water utilities

relating to water system security. These efforts went into high gear immediately after the terrorist attacks on New York and Washington.

Title IV of the Bioterrorism Act, which was signed into law in June 2002, amended the Safe Drinking Water Act (SDWA) and required specific actions to improve water security, with specific deadlines and requirements for both water utilities and the EPA.

The Bioterrorism Act mandated significant new security requirements for all community water systems serving more than 3,300 people. Collectively these approximately 8,000 utilities serve over 240 million people, or about 90 percent of the nation's population served by community water systems.

The Bioterrorism Act requires community water systems serving more than 3,300 people to do the following:

- Conduct a vulnerability assessment;
- Certify to EPA that the vulnerability assessment was completed by a date specified in the law;
- Submit a paper copy of the assessment to EPA;
- Prepare or revise their emergency response plan based on the results of the vulnerability assessment; and
- Certify to EPA that the emergency response plan has been developed or revised by a date certain.

Deadlines for submission of vulnerability assessments to EPA depend on the size of the water system: systems serving 100,000 or more people, by March 31, 2003; systems serving between 50,000 and 99,999 people, by December 31, 2003; and systems serving between 3,300 and 49,999 people, by June 30, 2004.

Six months after submission of the vulnerability assessment, utilities are required to certify to EPA that they have developed or revised an emergency response plan based upon the results of the vulnerability assessment.

Under the Bioterrorism Act, both vulnerability assessments and emergency response plans have to focus on terrorist attack or other *intentional* acts intended to disrupt the ability to deliver a safe and reliable supply of drinking water or otherwise present a significant health concern. That stands them apart from the assessments and plans that most utilities have had for years for dealing with natural disasters, vandalism, etc. While the assessments and plans that existed before September 11 may serve as a very good starting point, the focus of the Bioterrorism Act is purposeful destruction or contamination, and water utilities must alter their emergency response plans to meet these new threats.

EPA has its own set of deadlines in the Bioterrorism Act. Congress required that by August 1, 2002, EPA complete a baseline threat report with information on likely threats for utilities to consider in the development of a vulnerability assessment. EPA completed the *Baseline Threat Information for Vulnerability Assessments for Community Water Systems* and provided this sensitive report to water utilities in the fall of 2002.

The law also required EPA to develop a protocol for protection of the submitted vulnerability assessments by November 30, 2002. In response, the Agency has completed a robust protocol with multiple levels of protection to safeguard vulnerability assessments within a controlled-access facility at EPA headquarters.

EPA is also required to conduct research on prevention, detection, and response to contamination and supply disruption, and a research plan is under development. Finally, the law requires EPA to develop guidance for small systems serving less than 3,300 people. While these systems are not required to conduct a vulnerability assessment and revise an emergency response plan under the Bioterrorism Act, many are implementing plans to protect their customers.

Virtually all of the largest utilities—those with the earliest deadline of March 31, 2003—submitted their vulnerability assessments to EPA on or before the deadline. They are now revising their emergency response plans to reflect what they learned in the vulnerability assessment. In addition, utilities are conducting prevention and response training to anticipate and prepare for issues surrounding a potential terrorist attack that impacts the water supply. Medium and smaller sized utilities across the nation are in the process of developing their vulnerability assessments, and they too will develop or revise effective emergency response plans.

Since the terrorist attacks of September 11, 2001, water utilities have been assessing their systems. AWWA has estimated \$1.6 billion is needed for the first steps towards greater physical protection, to include better fences, locks, lights, and alarms at critical utility assets. The cost of other necessary utility security upgrades is highly dependent on local factors such as the level of water security upgrades needed. Such costs have not been estimated at this time, but will be substantial. Barring additional local, state, or federal funding, these costs will be passed on to the customer.

N O T I C E S

State Meetings and Hearings

The Virginia Department of Environmental Quality (DEQ) posts notices of regulatory action, public hearings and meetings, and other events on-line at www.deq.state.va.us/info/ (click on "Public Calendar" or "Public Notices"). The DEQ Coastal Program posts events and other notices on-line at www.deq.state.va.us/coastal/calendar.html. Following are some water-related public meetings in August through October 2003; we include past events in case readers wish to enquire about what occurred at a given meeting. To reach the listed contact people by e-mail, go to the Public Calendar Website, find the event, and click on the name; by phone, call the DEQ's Central Office in Richmond at (800) 592-5482.

- 8/6, Richmond:** Advisory committee on proposed VPDES general permit regulation for *construction* discharge of storm water. For more information: Burt Tuxford.
- 8/11, Richmond:** Public meeting on federal evaluation of Virginia Coastal Resources Management Program. For more information: Laura McKay.
- 8/18, 9/11, 9/29, and 10/15, Richmond:** Water policy technical advisory committee. For more information: Scott Kudlas.
- 8/20, Richmond:** Advisory committee on proposed VPDES general permit regulation for *industrial* discharge of storm water. For more information: Burt Tuxford.
- 8/26, Luray:** Public meeting on proposed total maximum daily load (TMDL) for bacteria impairment of Hawksbill Creek in Page County. For more information: Robert Brent.
- 8/27, New Market:** Public meeting on proposed TMDL for bacteria/general impairment of Smith Creek in Rockingham and Shenandoah counties. For more information: Robert Brent.
- 8/27, Skyland Resort:** State Water Control Board. For more information: Cindy Berndt.
- 9/8, Virginia Beach:** Public hearing on proposed VPDES permit for town of Onancock (Accomack County). For more information: Raleigh Smith.
- 9/9, Charlottesville:** Advisory committee on proposed general permit regulations for confined animal feeding operations. For more information: Scott Haley.
- 9/10, Richmond:** Public hearing on proposed VPDES permit for Phillip Morris USA in Richmond. For more information: Oula Shehab.
- 9/11, Bluefield:** Public meeting on proposed TMDL for benthic and bacteria impairment of Bluestone River in Tazewell County. For more information: Nancy Norton.
- 9/11, Radford:** New River PCB Source Study Citizens Committee. For more information contact, Jay Roberts.
- 9/16, Richmond:** Ground Water Protection Steering Committee. For more information: Mary Ann Massie.
- 9/22, Bastian:** Public meeting on proposed TMDL for Hunting Camp Creek in Bland County. For more information: Nancy Norton.
- 9/23, Glade Spring:** Public meeting on proposed TMDL for aquatic life for Hutton, Hall/Byers, and Cedar creeks in Washington County. For more information: Nancy Norton.
- 9/30, Richmond:** State Water Commission. For more information: Marty Farber, (804) 786-3591 (please note that this is *not* a DEQ contact).

International Coastal Cleanup

Volunteers are needed across Virginia to pick up trash along waterways and record information about amounts and types of debris found. The main clean-up day is September 20, but volunteers may choose any date in September or October. The clean-up is sponsored in Virginia by Clean Virginia Waterways and worldwide by The Ocean Conservancy. For more information, phone (800) 262-2322, e-mail cleanva@longwood.edu, or visit www.longwood.edu/cleanva.

World Water Monitoring Day

From September 18–October 18 citizens are requested to monitor local water quality and enter the information in an international database. Information on participation in Virginia is available on line at va.water.usgs.gov/watermonitoringday.htm, or phone the Virginia Save Our Streams program at (540) 461-0044. For information about the worldwide event, visit www.worldwatermonitoringday.org, or phone the Clean Water Foundation at (202) 898-0908.

Conferences and Other Gatherings

- 2003 Wetlands Workshop.** Oct. 27—30, 2003, Atlantic City, N.J.; sponsored by the Wetlands Work Group. For more information: Ralph Spagnolo at (215) 814-2718; Web-site: www.wetlandsworkgroup.org.
- Protecting Our Lakes' Legacy: 23rd International Symposium.** Nov. 4—8, 2003, Mashantucket, Conn.; sponsored by the North American Lake Management Society. For more information: Amy Smagula at (603) 271-2248 or asmagula@des.state.nh.us; or Neil Kamman at (802) 241-3795 or neilk@dec.anr.state.vt.us.
- Reuse It or Lose It!—Exploring Technologies, Programs, and Public Health Issues for Water Reuse.** Nov. 13, 2003, Richmond, Va.; sponsored by the Virginia Water Environment Association. For more information: Tom Broderick at (703) 771-1095, or Teresa Moore at (804) 330-2917; Website: www.vwea.org.

Also Out There...

From the many water-related publications that arrive in the Water Center's mail, here are brief descriptions of some recent, detailed articles on various subjects.

- “The Data Quality Act: A Revolution in the Role of Science in policy Making or a Can or Worms?”—Explains the potential impact of Section 515 of the Treasury and General Government Appropriations Act of 2001, which required the federal Office of Management and Budget to issue guidelines for the “quality, objectivity, utility, and integrity of information...disseminated by Federal agencies.” *WRI News*, May/Jun. 2003; North Carolina Water Resources Research Institute, Raleigh, N.C.; (919) 515-2815; available online at www.2ncsu.edu/ncsu/CIL/WRI.
- “The Great American Weather War.”—An interesting introduction to a 50-year-old debate over the role of the government vs. that of private interests in providing weather information and services. *Natural Hazards Observer*, Jul. 2003; Natural Hazards Center, Univ. of Colorado, Boulder, Colo.; (303) 492-6818, hazctr@colorado.edu; available online at www.colorado.edu/hazards/.
- The Nov.-Dec. 2002 issue of the *Journal of Soil and Water Conservation* included 21 papers on nutrient management that were presented at the August 2001 joint conference of the Soil and Water Conservation Society and the Soil Science Society of America. For more information, contact the Soil and Water Conservation Society in Ankeny, Iowa, at (515) 289-2331.

At the Water Center

To reach the Water Center, phone (540) 231-5624; e-mail: water@vt.edu; or visit www.vwrrc.vt.edu.

- Desalination Study Grant.** The Water Center received \$24,980 from the Virginia Department of Health for a General Assembly-mandated study on desalination technologies to supplement drinking-water supplies in Virginia. For more information, contact Tamim Younos.
- 2003 Competitive Award Recipients.**
Competitive Grants

Gregory S. Hancock, William and Mary, “Hydrologic Impacts of Urbanization on Small Watersheds and the Effectiveness of BMPs, Williamsburg/James City County, Virginia.”

Kurt Stephenson, Virginia Tech, “Water Demand Reduction Effectiveness of Drought Curtailment Policies in Virginia.”

Peter Vikesland, Virginia Tech, “Effects of Dissimilatory Iron Reducing Bacteria on the Longevity of Iron Permeable Reactive Barriers.”

James N. Galloway, Univ. of Virginia, “Identification of Native Brook Trout Streams that are Impaired by Acidification.”

Seed Grants

James A. Smith, Univ. of Virginia, “Monitored Natural Remediation of Contaminated Ground Water by Diffusion and Barometric Pumping.”

Vinod Lohani, Virginia Tech, “Initiation of Activities to Establish an Institute for Drought Management Studies.”

William R. Walker Graduate Fellow Award: Ms. Forest P. Walker, Doctoral Student, Geological Sciences, Virginia Tech.

Undergraduate Summer Research Fellowship Award : Mr. Paul M. Thomas, Chemistry Department, George Mason Univ.

•**Universities Council on Water Resources (UCOWR) Award.** In July, Tamim Younos received the “Friend of UCOWR” award for national leadership in water resources research, education, and outreach. The award was presented at UCOWR’s 2003 national conference in Washington, D.C.

•**Moving Day at the Water Center!**

The Water Center moved August 11. Phone numbers and e-mail addresses are the same. The mailing address now is 23 Agnew Hall (0444), Blacksburg, VA 24061.

—By Heidi Clark and Alan Raflo

Virginia Water Research Symposium 2003: Water Resource Management for the Commonwealth

About the Symposium

The Virginia Water Research Symposium 2003 will assemble research scientists, educators, regulators, and environmental interest experts in a forum to discuss water resource management issues facing the Commonwealth of Virginia. **If you have questions or need more information than printed here, please contact Jane Walker, (540) 231-4159, janewalk@vt.edu, or visit the Water Center's Website at www.vwrrc.vt.edu/symposium.**

Featured Speakers

Timothy Miller, Chief, Office of Water Quality for the **U.S. Geological Survey** has oversight and management responsibility for USGS water-quality activities across the United States. He has worked for the USGS for more than 30 years and since 1995 has served as chief of the National Water-Quality Assessment (NAWQA) Program.

Shannon Cunniff, Director of Research and Development for the **Bureau of Reclamation**, has led the agency's efforts to invest in science and technology to address water and related resource management challenges since September 2000. Ms. Cunniff emphasizes the integration and use of research products through development, demonstration and deployment of research; partnerships; and increased stakeholder participation in research priority setting.

The Honorable Tayloe Murphy, (invited) **Virginia Secretary of Natural Resources**, served in the Virginia House of Delegates from 1982 to 2000 and served as chair of the Joint Legislative Audit and Review Commission, the Chesapeake Bay Commission, and co-chair of the House Labor and Commerce Committee. Secretary Murphy is committed to environmental conservation and stewardship and the protection of Virginia's natural resources and was instrumental in the General Assembly's passage of both the Chesapeake Bay Preservation Act and the Virginia Water Quality Improvement Act.

Workshops

Three workshops will be offered (subject to sufficient enrollment) on **Tuesday, October 7**. Participation in these workshops will be limited to first come, first-served. Pre-registration is required. **Please register by September 26**. There will be no on-site registration for workshops.

1.) Finding Funding and Writing Successful Grant Proposals. Instructor: Bob Porter, Program Development Manager, Office of the Associate Provost of Research. Virginia Tech, Blacksburg, VA. This "hands on" workshop will focus on the use of Internet searching tools to find funding and suggest practical strategies for proposal writing. The workshop will cover the basic principles of good proposal writing: developing a research theme, identifying funding sources, using online databases including the *Community of Science* and *The Foundation Center*, and constructing proposals. Participants will practice their newly acquired skills during the workshop. Ways to avoid common pitfalls that lead to early proposal rejection will be discussed.

2.) Sediment Data-Collection Techniques. Instructors: John R. Gray and G. Douglas Glysson, Sediment Specialists and Hydrologists. U.S. Geological Survey, Reston, VA. This workshop will cover the goals of collecting sediment data and review basic fluvial sediment concepts and properties. The design and function of various samplers, including those for suspended-sediment, bottom-material, bedload, and water-quality will be discussed. A description of manual and automatic collection of suspended-sediment data and manual collection of bed-material and bedload data will be provided.

3.) ABC's of TMDLs. Instructors: Brian Benham, Water Quality Extension Specialist; Kevin Brannan, Research Associate; Theo Dillaha, Professor; and Gene Yagow, Research Scientist. Biological Systems Engineering Department, Virginia Tech, Blacksburg, VA. This workshop will cover 1) The TMDL program history and requirements, 2) How TMDLs are developed, 3) Challenges associated with TMDL development, and 4) Recent regulatory changes to the TMDL program and how these changes may affect TMDL developers and stakeholders. The workshop will cover the data needs for TMDL development and the basic tools used in TMDL development, including HSPF, SWAT, and GWLF. Information about other TMDL development tools, including flow duration, adaptive implementation, and pilot watersheds will be presented, along with several TMDL case studies.

Special Programs

1.) Water Supply Roundtable: Assessment of Current Status and Future Prospects. The roundtable forum will provide an opportunity to discuss the current state of Virginia's water supply and identify critical issues that will shape the adequacy of future water supply. A panel discussion led by water supply experts will provide insight from diverse perspectives on water supply, including water utility managers, individual water supply interests, regulatory and natural resource management agencies, and environmental protection interests. Technical issues relating to the provision of water supply and policies that provide overall guidance and direction will be discussed. At the conclusion,

panelists and roundtable participants will create a prioritized ranking of water supply issues necessary to ensure sustainable water supplies for the future. Participation fee in the roundtable is included in the full symposium and Friday registration fees.

2) Virginia Tech Laboratory Tours. Tour Virginia Tech’s water-related laboratories on Friday afternoon (subject to sufficient enrollment). Lab personnel will explain current research projects and demonstrate lab techniques. Tour fees are included in the full symposium and Friday registration fees. **Please register by September 26.**

Registration Information

Registration includes symposium proceedings, continental breakfasts, refreshment breaks, reception, and lunch on Wednesday and Thursday. Student registration also includes participation in a workshop, however advance registration is required. To register, complete the registration form or register online at www.vwrrc.vt.edu/symposium. Requests for refunds will be honored if received seven calendar days prior to the symposium. However, there will be a \$25 cancellation fee. Substitutions will be accepted at any time. If the program is cancelled or postponed, the University will refund the registration fees, but cannot be held responsible for any other costs, charges, or expenses, including cancellation/change charges assessed by airlines or travel agencies. **There will be an additional \$25 fee for on-site registration for the symposium. No on-site registration for workshops.**

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If you are a person with a disability and require any auxiliary aids, services, or other accommodations, please discuss your accommodation needs with Wanda McAlexander at (540) 231-5242 or TDD (800) 828-1120 at least two weeks prior to the program.

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Registration Form

Complete a separate form for each participant, or register online at www.vwrrc.vt.edu/symposium. Registration will be processed when payment is received. Return completed form with payment (no staples, tape or paper clips, please) by **September 26, 2003** to: Conference Registrar, Division of Continuing Education, 810 University City Boulevard, Suite D (0272), Blacksburg, VA 24061; phone (540) 231-5182. Credit card registrations only: FAX (540) 231-3306.

Name _____ SSN _____
 Employer _____
 FID* _____
 (FID is necessary to process a refund payable to any company, agency, or government)
 Title _____
 Address _____
 City _____
 State _____ Zip _____
 Day Phone _____ Fax _____ Email _____

Registration: PLEASE INDICATE YOUR PARTICIPATION IN:

- Reception (Included in Full Symposium Registration Fee)
- Water Supply Management Roundtable (Included in Full Symposium and Friday Registration Fees)
- Lab Tours (Included in Full and Friday Registration Fees)
- Full Symposium (\$150)
- Full Symposium Student Fee (\$80)
- Wednesday Only (\$80)
- Thursday Only (\$80)
- Friday Only (\$80)

PRE-CONFERENCE WORKSHOPS (No On-Site Registration) (Choose one workshop)

- 1. Finding Funding; Writing Proposals (\$25)
- 2. Sediment Collection (\$25)
- 3. TMDL (\$25)

Total Amount Due: _____

Make check payable to: **Treasurer, Virginia Tech**

Credit card: MasterCard VISA AmEx

Card # _____ Expiration Date _____ Name of Cardholder _____

Virginia Water Research Symposium 2003 Schedule

(Subject to Change)

TUESDAY, OCTOBER 7

1:00 – 5:30 p.m. Workshops

1. Finding Funding; Writing Successful Proposals
2. Sediment Data-Collection Techniques
3. ABC's of TMDLs

WEDNESDAY, OCTOBER 8

7:30 – 8:30 a.m. **Registration**

8:00 – 8:30 a.m. Continental Breakfast

8:30 – 9:00 a.m. Welcome

9:00 – 9:30 a.m. **Featured Speaker:**

Timothy Miller, Chief, Office of Water Quality, USGS

10:00 – 11:30 a.m. Concurrent Sessions

(For titles of individual papers within the concurrent sessions, please see the conference brochure online at www.vwrrc.vt.edu/symposium.)

Session A: Science-based TMDLs and Watershed Management

Session B: Drinking Water: From Source to Consumer

11:45 – 1:15 p.m. **Luncheon**

- Walker Fellowship Award Presentation

1:30 – 3:00 p.m. Concurrent Sessions

Session A: Turbidity and Sediment Measurements

Session B: Drinking Water: From Source to Consumer

3:15 – 5:00 p.m. Concurrent Sessions

Session A: Turbidity and Sediment Measurements

Session B: Fate and Transport of Contaminants

5:00 – 6:30 p.m. **RECEPTION**

THURSDAY, OCTOBER 9

7:30 – 8:30 a.m. **Registration**

8:00 – 8:30 a.m. Continental Breakfast

8:30 – 9:00 a.m. **Featured Speaker:**

Shannon Cunniff, Director of Research and Development, U.S. Bureau of Reclamation

9:00 – 10:30 a.m. Concurrent Sessions

Session A: Nutrient Movement in the Environment

Session B: Water Supply Planning and Conservation

10:45 a.m. – 12:15 p.m. Concurrent Sessions

Session A: Hydraulic Measurement and Modeling Tools

Session B: Groundwater Resource Management

12:30 – 1:45 p.m. **Featured Luncheon Speaker:**

The Honorable Tayloe Murphy, Secretary of Natural Resources (invited)

2:00 – 3:45 p.m. Concurrent Sessions

Session A: Source Identification and Quantification of Fecal Bacteria

Session B: Land Use Management Techniques to Protect Watersheds

4:00 – 5:00 p.m. Concurrent Sessions

Session A: Virginia Fish and Wildlife Information Service

Session B: Waterborne Diseases

Session C: Community Outreach Tools for Water Researchers

FRIDAY, OCTOBER 107:30 – 8:30 a.m. **Registration**

8:00 – 8:30 a.m. Continental Breakfast

8:30 a.m.– Noon **Water Supply Roundtable**

•Student Presentation Awards

Noon **Adjourn Symposium**1:30 – 4:00 p.m. **Virginia Tech Lab Tours****Location and Lodging**

The symposium will be held on the campus of Virginia Tech, one of the Commonwealth's land-grant universities. A limited block of rooms has been reserved at Virginia Tech's Donaldson Brown Hotel & Conference Center (DBH & CC) for \$76/night (Until Sept. 21). Call (540) 231- 5156 or (877) 200-3360 to make reservations. Ask for the "Virginia Water Research Symposium" rate. Early reservations are encouraged because of Virginia Tech's Homecoming.

Directions

Take **I-81**, Exit 118B onto **Route 460 West** (bypass) and continue (approximately 8 miles) until the stoplight. At stoplight, turn *right* onto **Southgate Drive**. Take next *left* onto **Duck Pond Drive**. Take next *right* onto **Washington Street**. Go straight at 4-way stop. Take next *left* onto **Otey Street**. DBH & CC is on the left.



FOR THE RECORD

Sources for Selected Water Resources Topics

Water Law and Water Rights

This topic was covered in the December 1999 *Water Central*, p.15. Except as noted below, the information in that issue was still correct as of July 2003. For sources on water *regulations* specifically, please see the April 2000 issue (state) and the June/Aug. 2000 issue (federal).

Updated Information

Virginia Association of Counties (VACO). A possible source for information on local water ordinances, their Website is located at www.vaco.org.

Virginia Municipal League (VML). Another potential source for information on local water ordinances, their Website is located at www.vml.org.

Congressional Quarterly. Congressional Quarterly, Inc., publishes various journals and books on the federal legislative process. Its products are available online at www.cq.com, but for subscribers only. The company's phone number is now (202) 419-8500.

Environmental Law Reporter, a monthly publication written by and for lawyers, is published by Environmental Law Institute (ELI). The e-mail address for ELI (not previously given) is law@eli.org.

Virginia Code. The multi-volume *Code* includes all the laws passed by the Virginia General Assembly. The online address for the electronically searchable version is now leg1.state.va.us/000/src.htm.

U.S. Code. The statutes passed by Congress, arranged in a series of 50 subject areas called *titles*. Water-related laws are located in various titles (such as Title 16, Conservation, or Title 43, Public Lands). The online address for the electronically searchable version is now www.gpoaccess.gov/uscode/index.html.

New Sources

Inland Recreational Fishing Rights in Virginia: Implications of the Virginia Supreme Court Case Kraft V. Burr. This Water Center Special Report, published in 1999, discusses landowner issues in conjunction with Virginia fishing rights. The report is available online at www.vwrrc.vt.edu/pdf/sr13-1999.pdf. Printed copies may be requested from the Water Center at 23 Agnew Hall, (0444), Blacksburg, VA 24061; (540) 231-5624; e-mail: water@vt.edu.

On Tap. The National Drinking Water Clearinghouse, located at West Virginia University, publishes this magazine quarterly. The Fall 2001 issue included an article on water rights entitled "Water Wars." The article includes an introduction to water rights, a glossary, and discussion of how rights differ in various states. This issue (and others) are available online at www.nesc.wvu.edu/ndwc/articles/OT/WI03/WI03Index.htm. Free subscriptions are available by calling (800) 624-8301 or (304) 293-4191, or e-mailing: ndwc_orders@mail.nesc.wvu.edu.

Water Resources Impact, bimonthly magazine by the American Water Resources Association. Two articles in the March 2003 issue involving water law are "East Meets West: The Tale of Two Water Doctrines" and "Native American Water Rights." Past issues of the magazine are available online at www.awra.org/impact/. For print copies, contact American Water Resources Association at (540) 687-8390, or e-mail: info@awra.org.

New Mexico Water Rights. For more on water rights in the *western* United States, this report provides an informative introduction (along with history of New Mexico and its water resources). It is available for

purchase from the New Mexico Water Resources Research Institute, (505) 646-4337; email: nmwrri@wrri.nmsu.edu; Website: wrri.nmsu.edu.

The Regulated Riparian Model Water Code, by the American Society of Civil Engineers (ASCE), 1997. A result of the Model Water Code project, this book contains a proposed model for eastern U.S. water codes. It is available for purchase from ASCE Publications, (800) 548-2723; Website: www.asce.org.

“Thomas—Legislative Information on the Internet” is the Library of Congress’ Website for following the U.S. Congress. The site provides access to the *Congressional Record*; the text of legislation back to 1989; and text, summaries, and status of current bills. The site is located at thomas.loc.gov.

Environmental Law Handbook, 17th Ed., Government Institutes, 897pp. This handbook, covering legislation, case law, and regulation, is written for resource professionals. It is available for purchase from Government Institutes, (301) 921-0264; Website: www.govinst.com.

Legal Control of Water Resources: Cases and Materials, by Joseph L. Sax, John D. Leshy, 3rd Ed., Robert H. Abrams, and Barton H. Thompson, Jr., 2000. This 956-page book provides lawyers with a survey of water law. It is available for purchase from Thomson & West, (202) 842-7570; Website: west.thomson.com.

The **International Water Law Project** Website contains copies of international agreements and daily water news from around the world. The Website, maintained by the Pacific Institute, is located www.internationalwaterlaw.org.

Historical Background on Water Law in Virginia

Several Virginia Water Center research bulletins and special reports provide a historical perspective on water law and policy in Virginia. While much time has passed since the reports’ publication dates and much has changed in the law or policy areas they discuss, they are nevertheless valuable in clarifying the foundations of Virginia’s current water law and policy.

Photocopies of the following publications may be requested (for cost of copying) from the Water Center at 23 Agnew Hall (0444), Blacksburg, VA 24061; phone (540) 231-5624, e-mail: water@vt.edu. You may also find the publications at Virginia state depository libraries; for a list of those libraries, visit the Library of Virginia Web-site, www.lva.lib.va.us, or phone (804) 692-3754. Two publications, indicated by **(WEB)**, are available online at www.vwrrc.vt.edu.

Bulletin No. 107—*Water Resources Administration in Virginia: Analysis and valuation*, by William R. Walker and William E. Cox, 1976, 258pp. This bulletin reviewed the water-related responsibilities of Virginia’s administrative agencies.

(WEB) Special Report No. 1—*Recommendations for Improving Water Resources Management in Virginia*, by William R. Walker and William E. Cox, 1976, 12 pp. This report explored Virginia’s water-management institutions in order to identify issues and constraints to effective management.

(WEB) Special Report No. 7—*Virginia Water Law: A Functional Analysis With Respect to Quantity Management*, by William E. Cox and William R. Walker, 1979, 16 pp. This report analyzed the various components of Virginia’s legal framework for water use within the context of specific management issues, such as withdrawals, instream uses, and emergency use.

Bulletin No. 138—*Institutional Issues Affecting Water Supply Development: Illustrations from Southeastern Virginia*, by William E. Cox and Leonard A. Shabman, 1983, 157pp. This study questioned the adequacy of the institutional resources that support Virginia water supply decision-making.

Bulletin No. 142—*Institutional Framework for Rural Water Supply in North Carolina, South Carolina, and Virginia*, by William E. Cox and Kurt S. Patrizi, 1984, 146 pp. This study examined whether existing institutions adequately addressed the unique problems of rural water systems.

Bulletin No. 147—*A Water Code for Virginia*, by William R. Walker and Phyllis G. Bridgeman, 1985, 183pp. This study discussed water scarcity and proposed preventive legislation.

—By Heidi Clark and Alan Raflø

Water Central thanks Bill Cox, Virginia Tech Department of Civil and Environmental Engineering, and Jesse Richardson, Virginia Tech Department of Urban Affairs and Planning, for their assistance with this section.

Upcoming “For the Record” Schedule

Dec. 2003: State Water Regulations
Feb. 2004: Federal Water Regulations
Apr. 2004: Aquatic Life Information
Aug. 2004: Water Maps
Oct. 2004: Coastal/Marine Information

Schedule subject to change

Virginia Water Central

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YOU GET THE LAST WORD

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

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

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