



Running on EMPTY?

While the Fifth District's water supply outlook isn't as dry as you might think, the region could benefit from water policy reform.

BY BETTY JOYCE NASH

The Hollow Creek Golf Club has been working with the town of Middletown, Md., on a plan to use water from the town's wastewater treatment plant to irrigate the drought-stricken golf course.

When rainfall swells streams, water supply worries wash away. But when the rain stops, questions over ownership, supply, use, allocation, and price bubble to the surface, creating turbulence among users.

Water knows no boundaries. Whether it flows through the deep aquifers beneath the earth or in the powerful rivers on the planet's surface, water quenches the thirst of industry, households, agriculture, and recreation, keeping daily life processes and commerce flowing.

Like much of the East, the Fifth District has historically been awash in water. And still is, says Leonard Shabman, a resident scholar in environmental policy with Resources for the Future (RFF), a Washington, D.C., think tank.

"I don't want to underplay the drought," he says, adding that the economic and ecological system has adapted to the amount of water that's there, whether it rains every day or once a year. "And then the question becomes, given that resource, to what uses will you put it?"

In other words, water, like any other commodity, can become scarce. The trick is to determine how to best manage its allocation, given competing social needs.

The 2002 drought is prompting states to manage water differently, says Terry Wagner, director of water resources management for the Virginia Department of Environmental Quality. Virginia's latest drought, one of the worst in a century, highlighted supply issues and exacerbated conflicts.

"Whether the drought continues or not ... we will see increases in potential for competition for water resources," Wagner says.

Free Water

There's nothing like scarcity to bring about change.

"When there are no droughts, there are no choices — people don't think about it," Shabman notes. But the legacy of recent droughts coupled with exploding populations in the District's urban areas has put water allocation, along with pricing and conservation measures, in the spotlight.



Water conservation signs were prominent all over the University of Virginia campus as students and faculty worked together in an effort to conserve water at the University and the surrounding Charlottesville, Va., area during the 2002 drought.

Traditionally, people pay for water based on provision of plants, pipes, and treatment services. Pricing the water itself is an idea economists sometimes advocate but is politically unpalatable, says Jim Boyd, an economist at RFF. People perceive water, like air, as a birthright. Water comes from God, the joke goes, but he forgot to put the pipes in the ground.

"The fact is, people waste water," says Boyd. "It's free."

Echoing Boyd's observations is Stephen Ragone, science and technology director of the National Groundwater Association.

Complicating the consumption issue is the required value now attached to leaving water in place, Ragone says. There's an inherent tension between private uses of water and its public-good attributes, those that benefit everyone.

Ragone notes water's commodity and common-good values, each serving the other. For example, low river levels have docked industrial barges, preventing commerce as well as fostering pollution. Water protects endangered species and dilutes potentially toxic pollutants, a public service. "If you don't have surface water, you don't have ecosystems," Ragone says. And the same goes for groundwater. In many parts of the country, he says, excessive groundwater withdrawals have caused the earth to sink in spots. "When you pump out the water, you remove the pressure that water conveys on the clays and sands and then it collapses.

"When you create imbalance by

only pricing water for its commodity use, we're building in future problems. ... A lot of people are saying, we have to get back to more natural use patterns. Use it where you live and return it to where you live."

Water experts throughout the District are reaching similar conclusions.

"We used to be in the Garden of Eden: there was so much water we didn't need to worry about it. You could just pluck fruit from the tree. Now there are more of us and we use more water," says John Morris, director of the North Carolina Division of Water Resources. His state's water supply is being stretched by a 21 percent increase in population between 1990 and 2000 — much of that in urban and coastal areas. "There's still enough to meet our social needs, but we have to plan ahead and manage it better, make our users manage it efficiently."

Price Tag

Though the East may be years away from pricing raw water, the cost of service can help regulate water flow. Water rates are undoubtedly headed up as stringent federal drinking water laws and aging water infrastructure drive up costs. The General Accounting Office estimates future investments in drinking water systems could range from a low of \$12 billion annually to a high of \$20 billion. Experts seem to agree that higher prices are on the way and that could help spur conservation.

Water appears to be a "natural monopoly;" that is, it requires substantial

conveyance infrastructure so it is efficient for one enterprise to invest rather than many. Most water treatment plants that serve municipalities are publicly operated as self-funding entities. But private corporations are increasingly buying water systems and competing for management contracts (see sidebar on p. 14).

Historically, the Southeast has used declining rate structures to price water, partly as an incentive to lure industry. The more water used, the less it costs. Such thinking was particularly beneficial to heavy water users, such as textile producers. But as the South's industrial base has changed and as water becomes more precious, the philosophy behind water rates is changing too, according to Lex Warmath. He is vice president of Raftelis Environmental Consulting Group Inc. of Charlotte, N.C.

It's the average homeowner who uses the most water in urban areas, Warmath says. "In communities like Charlotte and Cary, N.C., residential usage is 75 percent to 90 percent of total usage.

"[There have been] some technological innovations that allow industries to use less water. But [with] residential

growth, neighborhoods continue to expand ... with a lot of green areas," he says. And along with the suburbanization of the Southeast comes the big house with the big yard, expected to be green 12 months a year. It's not uncommon to find new homes with five bathrooms instead of the two bathrooms common decades ago, he notes.

"People continue to build houses with large lawns and that creates a huge, seasonal water demand," Warmath says.

Warmath consults with public utilities to set rates that recover costs as well as other objectives, which vary by community. "[One] objective that is coming to the forefront is what can we do with our rates that encourages people to use water more wisely? You can be aggressive in your rates or just send a little reminder," Warmath says, depending on the political climate and level of affluence in the community.

One community he's worked with is Cary, N.C., just outside Raleigh and home to such mega-employers as IBM and SAS Institute. Cary sought water solutions as its population jumped from about 3,300 people in 1960 to 105,000

today, says Kim Fisher, director of public utilities. The town put in place a water conservation program in 1996, including a plan to sell reclaimed water, or treated wastewater, to customers with underground irrigation systems.

"We estimated on a peak day we could divert a million gallons a day if we had a reclaimed water system," Fisher says. "... this past June, when it was so stinking hot and dry, our peak day was 1.2 million gallons." In the summer, he explains, between 40 percent to 50 percent of water demand can be for irrigation.

Cary aims also to change water use patterns through behavior. Advertising, increased water rates, and water use restrictions send the message that the water supply is finite.

"Over the last three to four years, our total water sales revenues have been pretty level," Fisher notes. The rate structure is now an increasing block rate, meaning that if customers use less water, they'll get a discount. As they use more, they'll pay for that luxury.

Cary may be atypical because of its affluent and educated populace, but many communities are being forced to review prices, Warmath says. Historically, the federal government provided money to build water treatment plants, but that money dried up in the 1980s, as responsibility for infrastructure was pushed down to state and local levels.

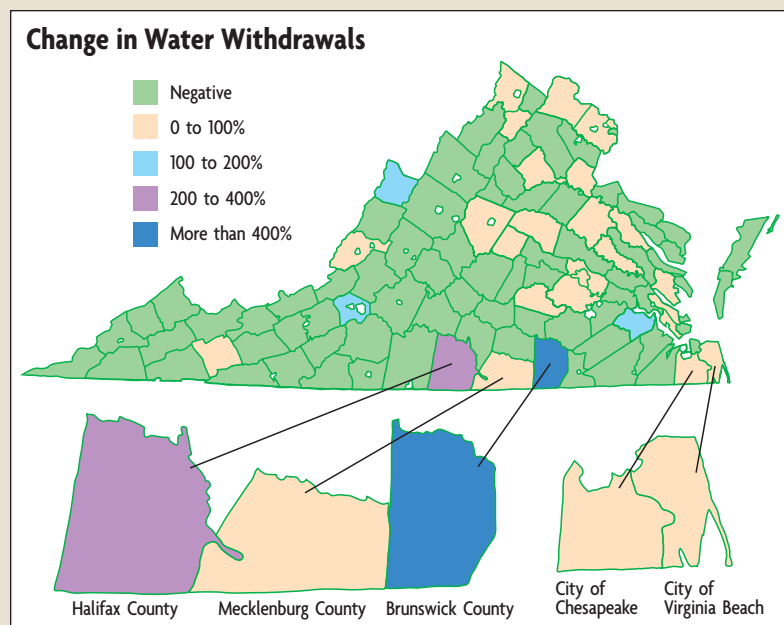
Raising the price of water may conserve supply, but the price elasticity for water suggests that a 10 percent increase would decrease demand by only about 2 percent. Only a dramatic price hike would get people's attention, Warmath says. "You'd be amazed at how much you have to raise the price to make people stop using water. Realistically, people's water bills still tend to be about half what their cable bills are."

Doubling the price of water does get results, Warmath says. Still, price isn't everything. "The price does matter, but it's not a solution in getting people to significantly change their habits in the short term."

Even with aggressive water reduction targets, there's bound to be a supply problem if the population keeps growing. Say a community cuts water use by 20 percent in 10 years but is

Water Goes Where the Demand Is

Daily water withdrawals increased 721 percent in Brunswick County from 1990 to 2000, even though population growth in that county was only 15 percent during the same period. Part of that increase is due to withdrawals from Lake Gaston, where up to 60 million gallons of water are transported daily to the city of Virginia Beach.



SOURCE: National Water-Use Information Program, U.S. Geological Survey

Desalination Opens a New Spigot for Water Utilities

Coastal communities in the Fifth District have supported a growing number of thirsty residents and businesses for decades. As they continue to deplete their freshwater sources, however, supply constraints loom. Many have resorted to desalination to develop saltwater sources.

Distillation, the most common method of removing salt from water, has been around for centuries. Saltwater is heated until it evaporates, then the vapor is condensed into freshwater. Two other desalination methods were developed during the latter half of the 20th century, electro dialysis and reverse osmosis. Both filter salt using membranes, thin barriers that permit only particles of a certain size or type to pass through.

All three methods consume a lot of energy, accounting for up to half of a desalination plant's operating costs. They also require specialty materials that can withstand corrosion. As a result, desalination is relatively expensive compared to traditional water treatment techniques. "For the typical city with freshwater sources that are not environmentally sensitive, a utility would not look at desalination because of the cost," notes Ben Movahed, a Beltsville, Md.-based engineer and president of the American Membrane Technology Association.

However, desalination is becoming more cost competitive. One reason is the rising fiscal and ecological toll of building reservoirs, pipelines, wells, and other infrastructure to meet water demand. "There are more cities, especially coastal cities, that are running out of freshwater. . . or cannot withdraw it without an environmental impact," explains Movahed. "Those are the cities that are looking at desalination."

At the same time, the cost of desalination has fallen. "In the last five to seven years, the membranes have dropped 50 percent in price," says Neil Callahan, who heads the Tampa office of R. W. Beck Inc., a consulting and engineering firm.

This has helped broaden the market for desalination. In addition to unlocking new water supplies, membranes are used to remove heavy metals, bacteria, and other contaminants from water.

Still, water utilities can't afford to produce potable water from the blue seas surrounding coastal communities. Seawater, as well as groundwater near the surface, is very salty, requiring more energy for the desalination process. In addition, the water must be pre-filtered.



Parts of coastal North Carolina depend on desalted groundwater to supplement their water supply. Dare County, N.C., has built three desalination plants over the last 14 years to support their burgeoning residential development and tourist trade.

Instead, utilities typically desalt water far below the surface in deep aquifers, which are relatively abundant along the Atlantic Coast. This water isn't as salty because it has seeped through layers of clay and sand before collecting in the aquifers.

On the Virginia Peninsula, Newport News Waterworks operates a desalination plant that taps into aquifers as deep as 1,000 feet. The water produced from the plant is "two to three times more expensive" than water from the utility's four reservoirs, according to Ronald Harris, chief of water resources. Nevertheless, he believes the cost to the utility's customers in Hampton, Newport News, Poquoson, York County, and James City County is justified.

Harris says the desalination plant is needed to augment the Peninsula's water supply until the King William Reservoir is built. During the last drought, surface water supplied about 55 million gallons a day to Waterworks' customers, but daily demand almost reached that level. Without the four-year-old desalination plant, Harris says there would have been a risk of a shortage.

Other Peninsula communities have turned to desalination to supplement their water supplies because the new reservoir could take at least 10 years to complete. James City County is one of them.

"Based on our projected demand, we knew that we didn't have adequate water to meet our needs in four years," says Larry Foster, general manager of the James City Service Authority. Even now, the county has a tough time in the summer, when outdoor water use increases demand by 60 percent to 80 percent compared to the winter season.

While these communities supplement their

water supply with desalted groundwater, parts of coastal North Carolina depend on it.

For example, Dare County has built three desalination plants over the last 14 years, pushing up wholesale water rates for beachfront towns like Nags Head from 75 cents per thousand gallons in the 1980s to as high as \$1.35, according to utilities director Robert Oreskovich. The towns had to pay the higher cost of desalted water to support their burgeoning residential development and tourist trade. "Groundwater desalination was the least expensive alternative," he says.

In Southern California, water utilities built desalination plants to avoid the expense of new aqueducts, notes engineer Neil Callahan. Florida also has a significant number of plants because the state has lots of coastline and certain areas are hot and dry, he explains, limiting freshwater supplies.

Tampa Bay officials hope to achieve seawater desalination on a large scale where Key West and Santa Barbara, Calif., failed to do so economically. Their strategy is to operate a 25-million-gallon desalination plant within a power generation facility. This enables the plant to utilize some of the seawater drawn from Tampa Bay to cool the power facility's generators. Also, the plant's briny waste product is mixed into the water that the power facility already discharges into the bay. Consequently, Callahan says the plant needed fewer permits since its environmental impact is minimized, and it requires less pumping and discharge equipment.

If the Tampa Bay project succeeds, Movahed and others believe the approach of co-locating desalting and power generation facilities could serve as a model for future desalination projects.

—CHARLES GERENA

growing at 5 percent a year. “Your water use will still go up, and if you’ve got a supply problem, your situation is going to get worse.”

In Concord, N.C., a bedroom community for Charlotte, town officials knew their water and sewer rates didn’t reflect the true cost of operations. The town recently implemented rate structures for residential and industrial users aimed at conserving their limited water supply.

In Eastern North Carolina, the town of Kinston relies on deep groundwater in the Black Creek Aquifer. Historically, industries such as textiles and tobacco processing, along with domestic and agricultural water use, have sucked too much from the aquifer for it to properly recharge. The state is requiring Kinston to reduce withdrawals. That means that, by 2016, it will need to cut its dependence on the aquifer by 75 percent, according to Ralph Clark, Kinston’s city manager.

He explains that the deep water was cheap and good. Maybe too cheap and too good. “What’s happening is we’re taking out more than is being recharged,” he says. “Now is the time to address the problem rather than waiting until you’re 100 feet down.” The water needed virtually no treatment, he says, admitting the city was spoiled. “We had been used to getting this high-quality water at virtually no cost.”

But all that’s changing, as Kinston recently formed a water and sewer authority to build a surface water treatment plant to take the burden off the slow-to-recharge aquifer. It won’t be cheap. Estimates have come in at \$110 million.

Clark says that selling that change to consumers will be a tough job. “The consumers are going to be re-educated one way or the other, through pricing or conservation. It’s going to be a real challenge.”

Hot Water

During the dry spell in the summer of 2002, the pressure on water supplies intensified debates among water users sharing a single source. Such conflicts are common, but they are often about issues other than water, notes economist Shabman. He consulted on the Lake Gaston project, an effort that pipes water from the Roanoke River Basin 125 miles to Virginia Beach, Va., approved after years of court wrangling. “In that case it was about, ‘This [was] our water and you can’t have it,’” he says. Virginia Beach succeeded in its efforts largely because the opposition could not make the case they would be harmed by the withdrawal, Shabman says.

Like all flowing waters, the Yadkin-Pee Dee River system respects no man-made boundaries. It runs from the foothills of the Appalachian Mountains to the Atlantic Ocean near Myrtle Beach, S.C. In North Carolina, six

The Privatization Wave

Most Americans get their water from public utilities, including some whose aging pipes and treatment plants are reaching the end of their useful life. A growing number of local governments are turning to privatization to address these infrastructure needs, as well as to reduce operating costs and to meet stricter water quality and safety standards.

In some cases, a private firm will acquire a region’s water facilities outright. But more commonly, it will simply manage the facilities of a public water system. When this occurs, the locality continues to own the system and set water rates, while the firm agrees to perform a variety of tasks, from billing and meter reading to operating and maintaining facilities. The reasoning is that private contractors can run a water system more efficiently.

“If [a public utility] can’t get rid of incompetent people, privatization can be a way of getting around that restraint,” notes Gary Wolff, principal economist and engineer at the Pacific Institute for Studies in Development, Environment, and Security in Oakland, Calif. Also, utilities may be unable to keep up with the latest regulations and cost-saving technologies, especially those in smaller communities that can’t afford to train workers and attract the best talent. “A private company that

services... different utilities can have a [knowledge] base that is top notch and can be shared with every community,” says Wolff. In general, such economies of scale are possible when a company manages enough utilities such that adding an additional client has a small impact on total costs.

But private companies aren’t always more efficient, says Michael Arceneaux, deputy director of the Association of Metropolitan Water Agencies in Washington, D.C. “There are plenty of public water utilities that can do things just as efficiently or better.” Many have sought ways to trim the fat from their operations and improve their asset management, Arceneaux claims.

In the final analysis, smaller water utilities appear to have the greatest chance of benefiting from partnering with private industry. “The most fertile ground for privatization is in small and medium-sized communities that are, in most cases, strapped for cash,” explains Jeffrey Jacobs of the National Research Council’s Water Science and Technology Board, which recently published an assessment of the effectiveness of privatizing water utilities. “These communities have a small number of users [and] often don’t have a healthy tax base to generate the resources for its utility.”

This was the case with Reidsville, N.C. The city of 14,500 residents awarded a five-year contract to Hydro Management Services Inc. to operate and maintain its small water system. Steve Routh, public works director, says Hydro’s managers have broader expertise than the city’s longtime staff because they work at more than a dozen water utilities other than Reidsville’s. “We use the expertise of the management staff, and the company keeps us informed of when we will need upgrades,” says Routh.

Still, the contract doesn’t relieve Reidsville of the financial burden of making major repairs and improvements — Hydro pays only for repairs under \$300 — and Routh admits that significant labor savings weren’t achieved.

Other private-public agreements have been more problematic. United Water managed Atlanta’s water system since 1999, but was repeatedly accused of responding too slowly to customer complaints and service calls. The 20-year contract was dissolved in January.

The lesson is that privatization can be a useful option, but management contracts between municipalities and private water companies must be written “in a way that benefits both sides, and maintains the public interest,” notes Arceneaux.

—CHARLES GERENA

Major Rivers and Lakes

About 95 percent of water withdrawals in the Fifth District come from surface sources, according to 1995 estimates from the U.S. Geological Survey. The rivers with the largest withdrawals in each state are highlighted below, as well as a few other sources of drinking water.

Rivers

Maryland:

Potomac, Severn, Patapsco, Patuxent

North Carolina:

Catawba, Cape Fear, Dan, Yadkin, Neuse

South Carolina:

Seneca, Broad, Cooper, Savannah, Saluda

Virginia:

James, Pawmunkie, Potomac, York, New

West Virginia:

Potomac, Ohio, Kanawha, Monongahela, Cheat

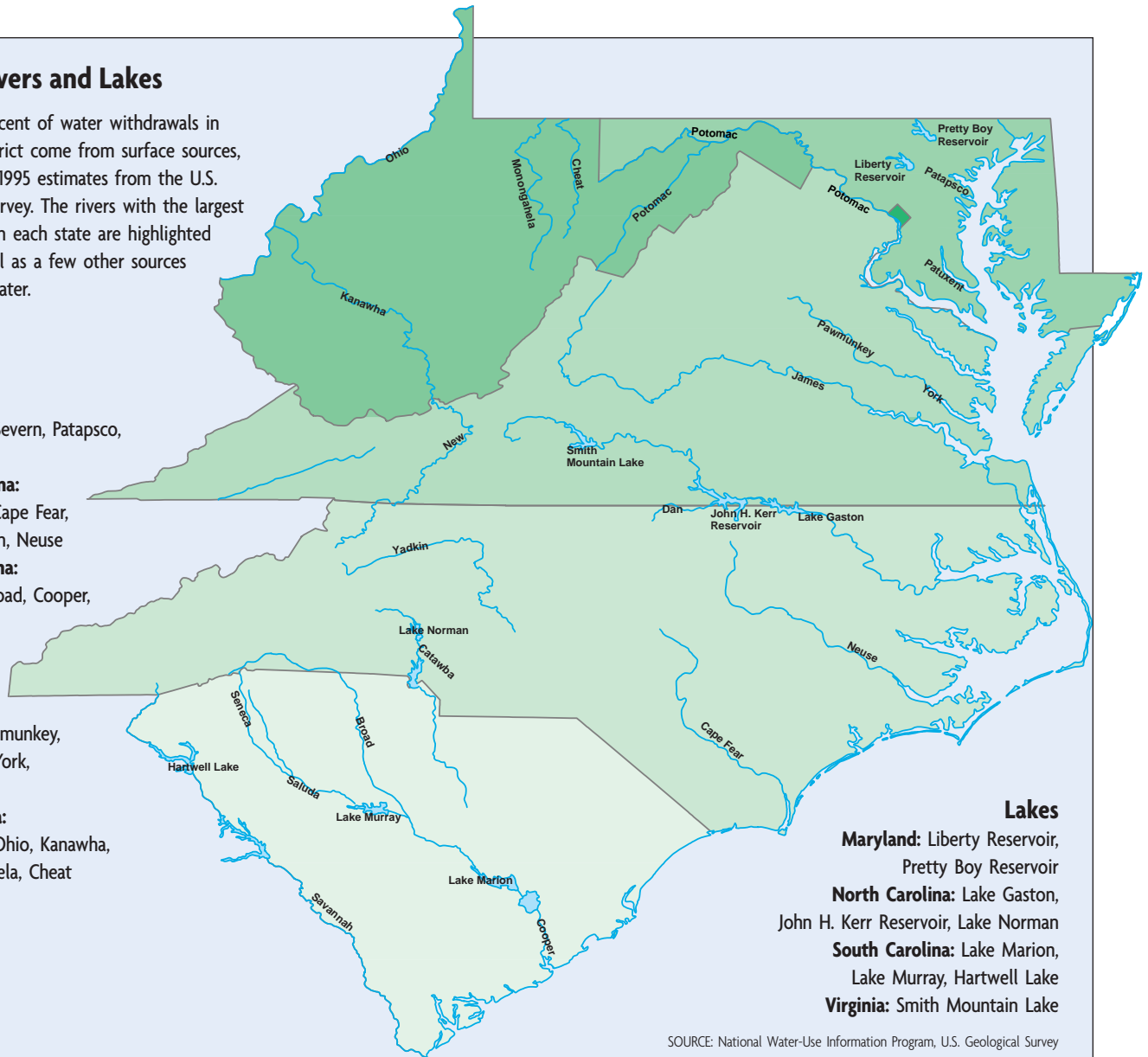
Lakes

Maryland: Liberty Reservoir, Pretty Boy Reservoir

North Carolina: Lake Gaston, John H. Kerr Reservoir, Lake Norman

South Carolina: Lake Marion, Lake Murray, Hartwell Lake

Virginia: Smith Mountain Lake



SOURCE: National Water-Use Information Program, U.S. Geological Survey

hydroelectric dams on the Yadkin River store water in lakes, which supply power, recreation, habitat, and drinking water. The Yadkin River dams, which must be relicensed by 2008 by the Federal Energy Regulatory Commission (FERC), are required to release water to keep the river flowing to users downstream in South Carolina. There, the waters dilute wastewater discharges of industry and keep saltwater from intruding inland into the river, which Myrtle Beach and the Grand Strand tourist area taps for drinking water.

But during the drought, the FERC-mandated release of 1,400 cubic feet per second dropped lake levels dramatically. Negotiations ensued.

“We were able to negotiate with the

state of South Carolina, FERC, and the utility companies to come up with a different plan,” says Morris of North Carolina’s Division of Water Resources. “Basically, we said to South Carolina, ‘You’re happy you’re getting this water now, but if we keep doing this, we’re going to run out of water.’ That would have been a real disaster for them. What we worked out was an agreement that South Carolina would accept a lower flow ... 900 cubic feet per second. That slowed down the process of emptying the lakes.”

Happily, by September, it rained and the lakes filled.

“But it shows us when new licenses are issued, we need a flexible, thought-out plan that would go into the licenses that would minimize damage

and have a fair sharing of the burdens should we have to go into emergency operations again.”

The Yadkin River water issues are likely to play a central role in public comment during the relicensing process.

The drought got everybody’s attention in a big way, says Monty Crump, who is the city manager of Rockingham, N.C., and also works with the Yadkin-Pee Dee Licensing Coalition.

“For years, we were all fat, happy, and sassy and thought there was an unlimited resource,” he says. “You got this drought and boom ... all of a sudden you have all these folks coming to the table.”

While water supplies may not be in a state of constant crisis, North Carolina has nevertheless required jurisdictions to

Water Systems on Guard

The Sept. 11 terrorist attacks have prompted a major reallocation of resources throughout the economy. More money is going towards securing the nation's critical infrastructure, from airports to seaports to utilities.

However, the nation's water systems are inherently difficult to protect in the view of Stephen Schmitt, vice president of security programs at American Water Works Company Inc., headquartered in Voorhees, N.J. He says that plants and pipes weren't built to be secure against terrorist attack. Schmitt and others in the water industry believe that much work lies ahead to identify potential threats, assess the vulnerability of water utilities to those threats, and install monitoring and communications systems to warn against an attack.

Terrorists don't have a shortage of recipes for disaster. A cyber attack could cripple a water facility's automated equipment. Or a bomb could destroy a facility's pumps and reduce water pressure for firefighters and other critical users. While few scenarios would likely affect a large number of people, attacking key elements of a water system would cause "significant economic cost, inconvenience, and a loss of confidence," says Dr. Nabil Adam, director of Rutgers' Center for Information Management Integration and Connectivity (CIMIC). Adam led CIMIC's effort to form a Laboratory for Water Security.

Since the anthrax scare in 2001, many people worry about terrorists poisoning an entire water system. In fact, water experts say that many toxins would probably become too diluted to be effective if they were dumped into a river or reservoir, or they would be neutralized during the

treatment process. A few chemical and biological agents are resistant to chlorine, but it would take large quantities of these substances — or anything else — to have a systemwide effect.

Given the difficulties of attacking the water supply at its source, a more effective option would be to introduce toxins at a water treatment facility. Or terrorists could target certain neighborhoods or buildings by contaminating their pipes. In general, distribution systems are harder to protect than water sources. Pipes and valves form vast networks under major cities, and all of them can't be locked up or placed under 24-hour surveillance.

The scope of these security challenges will force municipal and private water utilities to make hard choices about how much they can do. European countries installed early warning systems at major rivers, despite the expense of installing and maintaining these systems. Government officials didn't want to be caught off guard again after a warehouse fire in 1986 dumped 30 tons of toxic chemicals into the Rhine River.

Back in America, drinking water is closely scrutinized. Real-time monitoring systems at plants detect minute changes in temperature, mineral content, and other factors that affect water quality, but they can't detect biological and chemical agents. And they only know when something is wrong — further tests must be done in order to determine the problem.

Before water utilities can effectively guard against terrorism, water monitoring systems must become more advanced. But the market may take a while to develop.

Some utilities may not want to increase

their capital and maintenance costs to improve water monitoring.

In the Washington, D.C., metropolitan area, utilities are already under pressure to rehabilitate their infrastructure and adhere to new regulatory standards, says James Shell Jr., principal water resources planner for the 18-member Metropolitan Washington Council of Governments. "They have to prioritize and determine what is more critical to do. A lot of them . . . think the Potomac River would be a difficult target to contaminate because of its size and the volume of water that is coming through."

Also, utilities are interested in systems that "have multiple uses, and won't just be fire alarms," says Christopher Owen, president and COO of Apprise Technologies Inc. in Duluth, Minn. But companies like Apprise are reluctant to begin the research and development process until they know what federal standards for water security might need to be met.

Until new monitoring technology is commercially available, water utilities are relying on existing equipment. Some use sensors to "extrapolate" or estimate the presence of toxic substances in water, describes Glenn Patterson at the U.S. Geological Survey's Office of Water Quality. Others employ Mother Nature. They expose sentinel species such as bacteria, algae, clams, and fish to the water supply and observe their behavior. If they react to a foreign substance, the water is tested to see what the substance is.

In the end, water utilities alone may not be able to secure the nation's water supply. Regional partnerships between utilities, state regulators, and federal agencies could prove essential.

—CHARLES GERENA

provide water supply plans since the early 1990s. The state also regulates inter-basin transfers of water. In gathering this data, the state can plug the leaks in wasteful use and theoretically avoid serious water troubles in the future.

"These [supply plans] have been fabulous data sources to any kind of inquiry," Morris says. "You can use it to see whether there are conflicts among the different plans. The next frontier is to do plans by river basins. We try to look 50 years ahead and determine if those water needs can be borne by that basin and, if not, what adjustments might be needed."

Virginia Gov. Mark Warner is proposing water policy reform to encourage local governments to develop water supply plans. Such reforms have previously failed, but the recent drought may still be fresh in legislators' minds.

The Commonwealth has had its share of water fights, with the states allowing conflicts to be resolved in the courts, such as the Lake Gaston issue. Virginia is currently sparring with Maryland over Fairfax County's application to build a new intake pipe in the Potomac River for its 1.2 million customers. Maryland claims ownership of the river bottom by right of a colonial

grant, but Virginia is entitled to certain rights under a 1785 pact. Agreements are under way among stakeholders along the James River as a water treatment plant is under construction just upstream from Richmond. The list goes on.

Foresight Keeps Water Flowing

While disputes have garnered headlines, there are cases where jurisdictions have cooperated to keep water supplies flowing.

In the Washington, D.C., metropolitan area, for example, three major water utilities operate independently.



AP PHOTO/THE CHARLOTTE OBSERVER, ROBERT LANIER

Workers connect the first section of water line at the Kings Mountain City reservoir at Moss Lake near Shelby, N.C. The city of Shelby is paying for 8,000 feet of water line to connect Shelby's water system to the reservoir.

But 20 years ago, the utilities agreed to share the \$100 million cost of storing water for use during dry spells in the Jennings Randolph Reservoir on the Potomac River. Officials at the Interstate Commission decide when and how much water should be released.

"Without cooperation, these guys could end up in court battling each other," says Curtis Dalpra, communications manager for the commission. "They have given up a little power to create a very healthy situation."

As competition for water supplies grows, states' roles could expand as well.

"The state has not been forced to take a position up to this point on what is the appropriate role in the management of the resources," says Terry Wagner of Virginia's Department of Environmental Quality. "Until you have physical conflicts, you'll never develop the political will necessary [to change]. We're just starting to see the physical conflicts."

"We're moving to a point where we have to consider the effects of water resource withdrawals on other users. That's a major shift. Until you really have problems, it's tough to get over that entropy of the last 200 years."

Marketing Water

A murky question surrounding water use in the East is that of ownership. Exactly who owns water anyway? Under Eastern water law, anyone can take water from a stream as long as so doing won't harm others, says RFF's Shabman. "You don't own the water rights in the sense that you own your car and can sell it to somebody else." In some places in the West, people who use a certain amount of flow in streams establish a right to that water. Under those circumstances, they can sell or rent those rights.

In California, for example, a controversial proposal still in negotiation includes diversion of water from the Imperial Valley Irrigation District for Southern California. That district has held rights to 70 percent of California's water from the Colorado River for 100 years under the first-come, first-served doctrine.

Water transfers and trading would require some definition of rights in the East, says Clay Landry, an economist located in Wyoming who values and prices water for jurisdictions interested in creating markets for water. Landry has begun consulting with some clients in the East, he says, as droughts deepen thoughts on creative solutions.

The first step in establishing workable markets, Landry says, would be to establish a property right that could be transferred and traded. Florida, he says, has begun looking into the idea.

Creating a market for buyers and sellers, he says, reallocates a scarce resource using money. In times of scarcity, water can be allocated by regulation or through markets. Voluntary agreements have a niche in the marketplace, he says, but negotiations tend to drag and sometimes culminate in court actions.

"The fundamental difference? With a trading program, there's money involved," he says. "When you put cash on the table, things just move a little quicker."

In some Western states, he says, irrigation districts have hammered out agreements that compensate them when water is transferred to cities during a drought. Conversely, a district

will buy extra water to irrigate during critical watering periods for agricultural products. For example, a water market emerged in 2001 in Yakima, Wash. Apple growers needed water to protect future yields of orchards. The market was established and monitored by a partnership between the state and the federal Bureau of Reclamation, according to Landry.

"Basically, there were uses in the basin that had lower values placed on the water, and they were able to sell some of that water to orchards who were willing to pay quite a bit of money to save their orchards," he says. "Essentially, [the market] allowed the water to move to its higher valued use for that time. Federal and state agencies also purchased some water for flow augmentation for salmon recovery," he says. In that particular instance, it was a one-time deal, but the state is now working to establish rules that would allow the market to occur in any year.

Whether the East's water woes bring about changes to the East's property rights regime, or increased state oversight, improved cooperation, or all three, water will flow to people, Shabman says.

"We're not going to relocate people to the Great Lakes from Atlanta," he jokes. "It's just a matter of cost and decisionmaking, and if in the next 50 years, 50 percent of our population chooses to move to Southern California, we'll get water to them." **RF**

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