

**B. Water Resources Management
in Virginia
and the Role of Localities**





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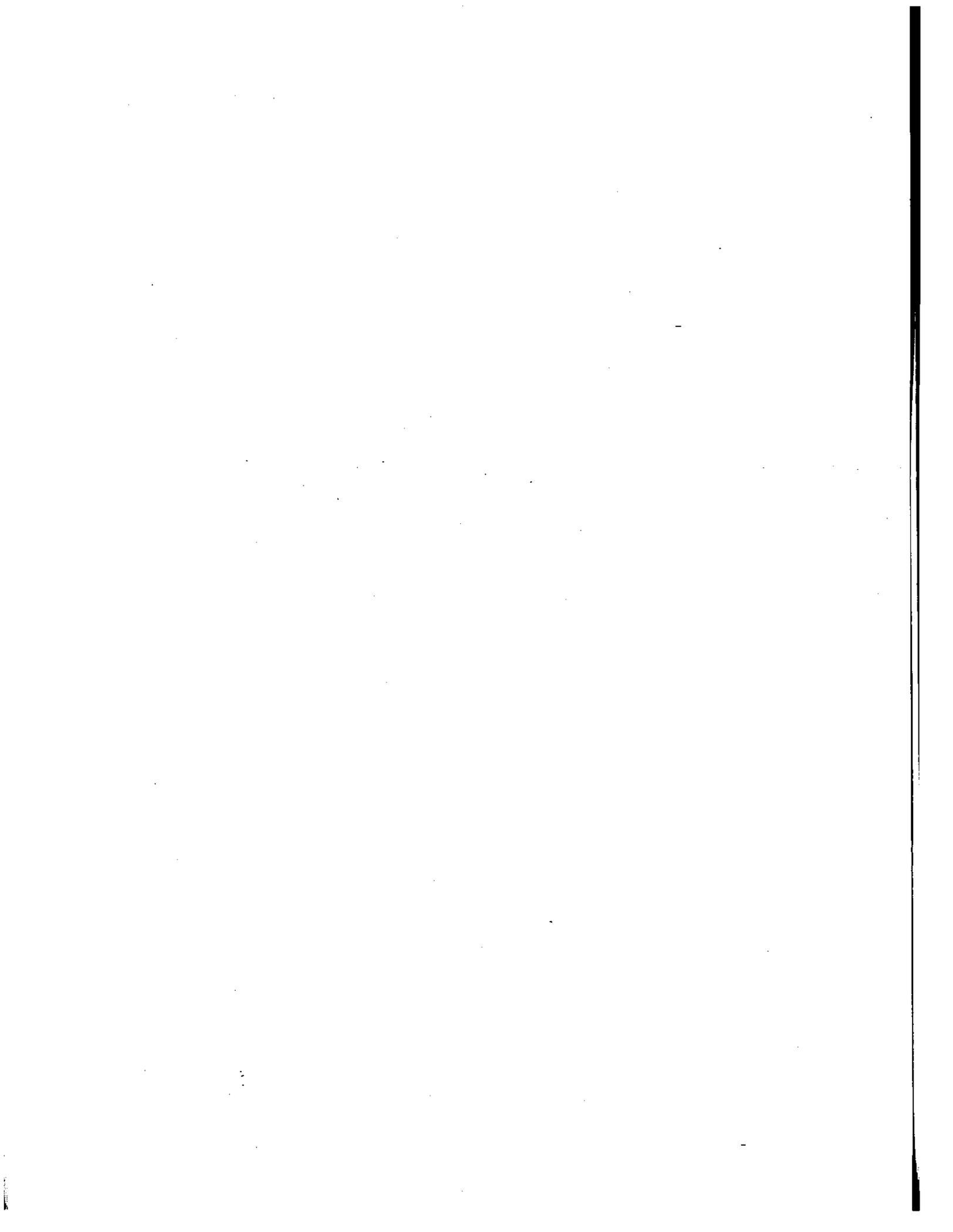
John Randolph

Sourcebook for Local Water Resources Management

**A Public Service Research Project of the
College of Architecture and Urban Studies
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061**

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and the Virginia Water Resources Research Center**

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PREFACE

This report is one of ten volumes that make up the *Sourcebook for Local Water Resources Management*, which provides a wide range of information to assist localities in Virginia. The compendium was produced by a team from the College of Architecture and Urban Studies at Virginia Tech with a grant from the Virginia Environmental Endowment (VEE). The objective of the project is to help localities develop the means to respond to local water-related problems and to incorporate water resources information into land use and comprehensive planning.

The need for this work stems from the realization that, as providers of water and sewer service and controllers of land use, local governments are in a strategic position to manage water resources, including water supplies, flooding and stormwater, nonpoint source pollution, groundwater contamination, and shorelines and wetlands. Therefore, attempts to manage water resources that do not engage localities will fundamentally fail. State and federal programs have recognized this potential role of localities and increasingly have called on them for their program implementation, often without sufficient technical or financial support. However, most Virginia localities lack experience and capacity, and they need assistance in implementing these programs and in realizing the potential role they can play in managing water and related land resources.

The project began in December 1989 with a one-year grant from VEE under the title *Managing Water Resources by Virginia Localities*. The first year of the project was spent gathering information on the framework, rules, methods, and experience in local water management in Virginia. This was done by reviewing literature, agency programs, and the Virginia Code; conducting case studies; and performing a survey of planning district commissions on local water problems, needs, and experience. From this information, we produced four reports which were printed and distributed to all Virginia local governments and planning districts, as well as other interested parties.

In November 1990, VEE provided a second-year grant for the project, enabling us to demonstrate water management concepts in five Virginia localities which volunteered to be part of the study. Supplemental funding was obtained from the Virginia Center for Innovative Technology. The demonstrations gave us an opportunity to experience local water resources management first hand, offering assistance to the localities involved and learning from the experiences. In addition, two first-year draft reports were reviewed and revised, and four more second-year reports were completed. The ten reports that make up the *Sourcebook* are listed below.

The Sourcebook for Local Water Resources Management

- A. *Summary and Guide to the Sourcebook for Local Water Resources Management*, J. Randolph
- B. *Water Resources Management in Virginia and the Role of Localities*, J. Randolph
- C. *The Can-Do Book of Local Water Resources Management: The Demonstrations*, D. Hirschman, J. Randolph, J. Flynn
- D. *Case Studies of Local Water Resources Management in Virginia*, D. Hirschman and R. Roth
- E. *Managing Water Resources at the Local Level: Regulatory and Non-Regulatory Programs*, W. Owens and D. Hirschman
- F. *Multijurisdictional Approaches to Managing Water Resources: Options for Virginia Localities*, W. Owens
- G. *Primer for Developing Local Water Resources Plans and Programs*, L. Williams and J. Randolph
- H. *Analytical Methods for Local Water Resources Management*, W. Shepherd
- I. *Data Resources for Local Water Resources Management*, W. Shepherd and V. Birch
- J. *Where to Turn, Who to Call: Institutional Resource Guide for Local Water Resources Management*, D. Drummond, J. Randolph, D. Hirschman

Many people have contributed to this project. The project team included:

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In addition, three graduate students contributed to the project through their masters thesis work in urban and regional planning. They included: Patrick Burton, Rajat Sarkar, and Shaoli Huang.

Managing Water Resources by Virginia Localities 1990-1991 Advisory Committee

A project Advisory Committee provided valuable assistance to the project team in formulating the direction of the work and reviewing draft reports. Five meetings of the Committee were held from January 1990 to January 1992. The Committee was made up of the following members:

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Introduction

The management of water in Virginia is as complex as the resource itself. Perhaps because of the variety of water bodies, the wide range of beneficial uses, the numerous sources of degradation, and water's critical influence on nature and society, there exists a maze of institutions, laws, and programs designed to develop, utilize, and protect the Commonwealth's water resources. This maze has become increasingly complex with the explosion of new laws, regulations, and programs affecting water management in Virginia in the past three years.

This report aims to define, within that maze, the current and prospective role of localities¹ in water resources management in Virginia. This requires, first, describing Virginia's water management framework including existing issues and problems and the state and federal laws, agencies and programs that address them; second, identifying what roles localities can play in these state and federal programs; and third, determining what additional water management roles Virginia localities play or should play beyond these programs. It is expected this document will be used as a reference by local governments and groups wishing to understand the need and opportunity for local water programs and the context into which these programs fit.

The report is divided into two main sections. The first describes specific water concerns and reviews the state, federal, and local programs addressing each concern. The second section describes the implications of those programs for local water management, and focuses on what roles localities must, can, cannot, and should play in Virginia's water management. A companion report, "Local Water Management Activities, Problems, and Needs," describes the state of local water resources management in Virginia as determined from the literature, interviews with state and local officials, and surveys of localities, including a survey of the Planning Districts Commissions (PDCs) conducted for this project. Appendix A introduces the primary actors in Virginia water management, including state and federal agencies, state and national environmental organizations, local and regional agencies, and community-based groups.

Virginia's Water-Related Concerns and Management Framework

Whether they choose to or not, localities play a critical role in water resources management in Virginia. Local governments are important players in state and federal water-related programs, as (a) the permittee or regulated body under these programs (e.g., as owner of landfill), (b) the primary implementer of the programs (e.g., erosion and sediment control), or (c) the recipient of financial or technical assistance for water-related programs or projects (e.g., local sponsor of a federal flood control project). Local governments are the principal providers of water and sewer service. They plan for and control land development. Localities are the prime monitors or "first line of defense" in water management as water problems generally come first to the attention of local citizens and governments. And they are the "managers of last resort" for water-related concerns not adequately addressed by state and federal programs. Many of these concerns are related to land use and its effects on water resources.

This section is organized by water issue. For each issue, the principal concerns are briefly described, relevant state and federal programs are noted, and the implications for local water management are discussed. Because programs and policies are constantly changing, a

¹ While the term "localities" focuses on local governments (i.e., cities, counties, towns), it is also meant to include Planning District Commissions, other multi-jurisdictional organizations (i.e. authorities), and local citizens groups.

review such as this becomes quickly dated. This report gives the status of programs at the end of 1990. The nine water issues presented are:

1. Domestic Water Supply
2. Domestic Wastewater
3. Groundwater Quality
4. Groundwater Quantity
5. Surface Water Quality
6. Surface Water Quantity
7. Protection of Wetlands and Shorelines
8. Water-Related Recreation

By necessity there is some overlap in categories (e.g., interaction of surface and groundwater; recreation and in-stream flows) and in program emphasis (e.g., nonpoint source controls that affect both surface and groundwater quality). As a result, some cross-referencing is done to avoid redundancy.

1. DOMESTIC WATER SUPPLY

Perhaps the most fundamental and critical human use of water is domestic drinking water supply. Principal concerns about domestic water supply in Virginia include: public water system improvements and expansion; protection of public water supply sources; protection of individual drinking water systems; and provision of safe and reliable drinking water to inadequately served populations.

1.1 Public Water System Improvements and Expansion

The 1980 census showed that nearly three-quarters of Virginia's households were served by public water systems, and that proportion has been growing as the population has become more urbanized. There are extensive needs for system improvements as a result of aging and deterioration of treatment plants, storage facilities, and distribution lines. More stringent federal Safe Drinking Water Act (SDWA) regulations are requiring treatment upgrades at many facilities. In addition, many systems are being pressured for expansion and extension of service by land development in urban and urbanizing areas and by the growing need to serve households having inadequate individual systems (see section 1.4 below).

Thus, many localities face the need to acquire additional water sources. Although semi-humid Virginia has always been thought to be water-rich, recent controversies hinging on issues of interbasin transfer (e.g., Virginia Beach/Lake Gaston pipeline) and in-stream flow (Roanoke County's Spring Hollow reservoir plan), as well as groundwater quality concerns, have demonstrated that developing new water sources is no longer a simple engineering exercise. Existing supply sources are increasingly perceived as precious resources requiring protection from contamination and overuse. Difficulties in developing new supplies have prompted calls for improved efficiency in the use of water through water conservation practices (e.g. Virginia Beach, Newport News, Roanoke County).

These concerns translate into substantial capital needs. A 1985 Virginia Department of Health (VDH) survey estimated public water supply needs at \$1.9 billion by the year 2000. While urban areas are generally in a favorable financial position to generate needed capital, this is not the case for many rural and urbanizing communities which face a considerable tax or water-rate burden to meet their water supply needs.

State and federal programs affect public water supply in three ways: regulation, financial assistance, and planning. First, VDH regulates public water systems under the Virginia code and its primacy program for the federal SDWA. In addition to about 500 publicly owned systems, VDH regulates private systems that serve more than 25 people (because certain res-

taurants with individual systems so qualify, the number of these systems is about 5,000). All permitted systems are self-monitored for water quality to insure meeting federal Environmental Protection Agency (EPA) drinking water standards; large public systems must monitor more frequently for a larger number of water quality parameters. Where systems have difficulty meeting the standards, VDH may order treatment upgrades, such as activated carbon filtration, which can add to the financial burden of the water utility. The VDH estimates that \$51-143 million will be needed to upgrade treatment systems to comply with SDWA. (*Water News* 1990a).

Second, there are state and federal programs to assist local public water systems in financing the costs of improvement and expansion. The Virginia Resources Authority (VRA) was formed in 1984 to offer reduced-interest loans to local water and sewer projects using a \$300 million state bond fund. The Virginia Water Supply Revolving Fund of \$10 million was established in 1988 for water system loans; the fund is managed by VRA, but loans are allocated by VDH. Federal financing assistance is also available through grants and loans from Housing and Urban Development (HUD) and Farmers Home Administration (FmHA).

However, these federal resources are limited. In fact, although the state and federal programs can assist localities in generating the needed capital, in almost all cases, the funds must be repaid through increased rates or taxes. Thus, the financial responsibility for developing new supplies, extending service, and responding to more stringent federal and state standards is falling increasingly on localities. Whereas larger systems enjoyed the benefits of federal and state grants and laws, smaller systems having limited revenues now face needed upgrades and expansion at a time when these funding sources have diminished. In response, it was proposed to the 1990 General Assembly that a state small-utilities fund be established for helping such systems; the fund would be built from a 10 cent per 1000 gallon charge on all state water suppliers. The proposal was carried over to the 1991 General Assembly session and referred to the State Water Commission for study.²

Finally, the Virginia Water Control Board (VWCB) has developed a series of water supply plans for the state's major river basins, including detailed analyses for sub-basins and specific water demand centers.³ The objectives of the plans are to identify water supply problems and alternative solutions and to evaluate the adequacy of water resources to meet off-stream needs through the year 2030. Still, the ultimate responsibility for planning individual water supply systems rests with the local government authority, or utility that owns and operates the system. Little planning is actually performed by local staffs; typically localities contract with consultant engineering firms to formulate local water development plans. But local government officials (and often local voters through bond referenda) must ultimately approve such plans and necessary financing.

1.2 Public Water Source Protection

Three hundred public water systems serve 4 million people in Virginia; 87 percent of this population are served by 54 major urban systems. The 300 systems obtain 83 percent of their water from surface sources and 17 percent from groundwater.⁴ Surface sources include both rivers and reservoirs (Randolph 1987). The Virginia Groundwater Protection Steering Committee anticipates that new state in-stream flow protection requirements and federal wetland regulations may make surface sources more difficult to develop and groundwater

² In August 1990, a task force to the State Water Commission recommended, instead of the Fund, a \$5.2 million state appropriation to fund SDWA upgrades. (*Water News* 1990a).

³ VWCB authorization for the planning comes from section 62.1-44.38 of the Virginia Code as amended in 1989 (HB 1607). Plans were completed in 1987 for each of the ten major basins in the state.

⁴ Of the state's total population, 59 percent is served by community surface sources, 3 percent by community groundwater, and 28 percent by rural groundwater (i.e. individual wells and springs).

an increasingly important option (GWPC 1990). (See section 6.2 on in-stream flow and 7.1 on wetlands protection.)

River sources are generally poorer in quality and more variable in both quality and quantity than reservoirs and groundwater. As a result, they require far more extensive and costly water treatment. The river sources are categorized as "public water supply" in the VWCB stream water quality standards which specify maximum concentrations for a list of constituents. The standards are tied to the VWCB Virginia Pollutant Discharge Elimination System (VPDES) permit program, so that pollutant dischargers are regulated to prevent violations of the specified receiving water's quality standards (see section 5, surface water quality). The quality of river water is also affected by nonpoint sources of pollution which are not regulated and over which localities have some influence in their control of land use. However, river water quality is affected by the cumulative effect of nonpoint sources upstream. Therefore, an individual community generally has little control over the quality of its river water source and must respond to variation and uncertainty in quality with elaborate treatment.

However, the situation is often reversed for water supply reservoirs and groundwater sources. Generally, these sources are higher in quality, require less treatment, and are under less direct state or federal management. Protecting the quality of these sources will avoid future costs for needed treatment upgrades or source replacement necessitated by degradation or contamination. Protection requires watershed management in the reservoir basin and management of aquifer recharge areas. *Watershed and recharge area protection can be provided by land use controls available to local governments* (see sections on watershed protection under nonpoint source controls (5.2) and groundwater quality (3)).

Thus, while there is limited local control over river water source protection, reservoir and groundwater source protection remains a major local responsibility.

1.3 Protection of Private Water Supply: Wells and Springs

The 1980 Census showed that more than 350,000 (18%) of Virginia's 2 million households relied on individual drilled wells, more than 100,000 (5%) relied on shallow dug wells, and 75,000 (4%) had other sources, including springs. In 11 of Virginia's 95 counties, more than 90 percent of households rely on these sources (U.S. Census 1983). Water from these systems is generally consumed raw, without treatment, and is unmonitored except by voluntary testing and the user's observation of odor, taste, and color. Almost all of these well and spring systems occur in rural areas where groundwater is subject to potential contamination from a variety of sources: inadequate septic systems, agricultural use of fertilizer and pesticides, polluted runoff on karst terrain, and illegal waste dumping (see groundwater quality, section 3 below).

Control of individual water supply systems is limited. VDH, through local health department field offices, regulates new well construction through specific guidelines. There are 20,000 new permit applications per year (GWPC 1988a). In 1990, VDH developed new private water well regulations which, in addition to construction and location standards, require before-and-after-construction visits by sanitarians and a safe water bacterial test before occupancy.⁵ However, VDH has no authority to monitor existing wells or new ones after this initial test, but local field offices will assist in water testing on request. The GWPC has suggested that some type of periodic retesting is needed and that a requirement for retesting private wells at the time of property resale should be investigated (GWPC 1990).

⁵ The Groundwater Protection Steering Committee has recommended that these new private well water tests be expanded to include toxics, heavy metals, and other chemicals regulated by the Safe Drinking Water Act (GWPC 1990).

With respect to local government authority, under Virginia law a municipality may regulate well construction activities provided local regulations are at least as stringent as state standards. Also, as a result of legislation in the 1990 General Assembly, ten counties and two cities now have authority to require demonstration of adequate, potable water before granting a building permit. However, in the final analysis, because of the lack of treatment and overall monitoring, Virginia users of private wells and springs are subject to greater risk of consuming contaminating water than public system users. Current protection of private systems therefore depends on area-wide protection of groundwater quality. As discussed in the section on groundwater quality (section 3), localities can play an important role in that effort.

1.4 Provision of Safe and Reliable Drinking Water to All Virginians

As mentioned previously, the 1980 census indicated that more than one-quarter of Virginia households relied on individual water systems. The private, nonprofit Virginia Water Project estimates that nearly half of the drilled wells and two-thirds of the dug wells are inadequately constructed (VWP 1988). Many systems that are adequately constructed tap aquifers that are naturally poor in quality or quantity yield, while others are contaminated by pollution.

In 1984, the Governor's Commission on Virginia's Future discussed the goal that all Virginians have a safe and secure drinking water system. The Virginia Water Project has used state appropriations to work toward this goal. Between 1978 and 1988, the Project provided \$2.7 million to enable small communities and individuals to gain access to improved water and wastewater services through the extension of public water systems, construction of community wells, and emergency repair of individual systems (VWP 1988).

Recognizing that 50,000 Virginia households had no indoor plumbing, the 1989 General Assembly established the Indoor Plumbing Program (IPP) to provide assistance to low income residents who still lack adequate plumbing, water supply or wastewater disposal. Administered by the Department of Housing and Community Development, the \$5 million fund is provided in grants to local community agencies which conduct individual projects.

Local government can play an important role in providing improved water supply to inadequately served populations. In particular, county public service authorities (PSAs) are in a strategic position to establish and manage small, independent community water systems.

Table 1 summarizes the local role in domestic water supply.

Table 1 Local Role in Domestic Water Supply

Public Water Systems: Owner/Operator

- Permittee of VDH: water treatment monitoring, compliance with SDWA standards
- Plans for expansion, extension of system (consider effects on subsequent land use and environment), development of new water sources
- Financier of system: revenue, G.O. bonds; federal or state grant or loan recipient

Private Water Systems

- Local well construction standards may exceed VDH regulations
- Demonstration of adequate water before building permit (authority to 12 localities)
- Protection of ground water quality (see below).

Protection of Water Supply Sources

- Surface water sources (see section 5 on surface water quality): watershed protection through land use controls, nonpoint source controls, land acquisition
- Groundwater sources (see section 3 on groundwater quality): protection of wellhead areas, aquifer recharge areas

2. DOMESTIC WASTEWATER

Domestic wastewater problems facing Virginia localities are similar to those of water supply. The principal concerns result from growing service needs, increasing regulation, and decreasing funding. The specific problems include: providing public sewage treatment upgrades and sewer extension; reducing impacts of on-site wastewater disposal; and providing adequate sewage disposal for all Virginians.

2.1 Public Sewer: Treatment Upgrades and Service Extensions

The 1980 census showed that two-thirds of Virginia's households were served by community sewer systems; like water systems, that proportion has been growing in the past ten years as a result of urbanization.

Public sewer and sewage treatment requirements are affected by federal and state regulation of treatment and effluent discharges and by needs for service extension. Like any discharger or disposer of wastewater, public sewage treatment plants are regulated by the VWCBS permit program required under the federal Clean Water Act (CWA). Facilities that discharge effluent into water bodies must get a VPDES permit requiring a specific treatment technology or effluent limitation. Sewage treatment facilities that do not discharge effluent (e.g. pits, ponds or lagoons) must have a Virginia Pollution Abatement (VPA) permit; such facilities must meet certain design guidelines and may require groundwater monitoring (see section 5.2).

Compliance with the regulatory programs has required large capital expenditures for sewage treatment facilities. However, the financial burden on localities has been eased by the availability of federal EPA construction grants for sewage treatment facilities and interceptors. As of 1989, more than \$1.2 billion in construction grants had been expended in Virginia, the majority since 1975. Since 1971, the state has complemented the federal funds with \$56 million in state support of local projects. The VWCBS has managed the construction grants program, passing federal and state grant dollars to local construction projects based on a priority system. Having greater discharges and pollution impacts, larger cities were generally served first. Despite the large expenditures, the state's sewage treatment needs have not been fully met. As of 1986, about one-sixth of Virginia's 250 treatment plants had serious capacity constraints⁶ and almost half did not meet the level of treatment required by the effluent discharge permits issued under the VWCBS's VPDES program⁷ (Randolph 1987). Under the 1987 CWA, the federal sewage treatment grants to states will terminate in FY 1994. Since FY 1988, the majority of the grant funds went into a state revolving loan fund administered by VWCBS rather than direct grants to localities. In 1989, for example, loans totalled \$63 million, while grants were only \$10 million (VWCBS 1990a). The state VRA and federal HUD and FmHA also provide financial assistance for wastewater systems as they do for water systems.

In 1987, Virginia's capital needs for sewage treatment by the year 2000 were estimated at \$2.1 billion. This does not include financial requirements for sewer line extension; collection systems other than interceptors have not been eligible for federal and state construction grants and loans. Communities are being pressed to extend sewer collection, not only by land development pressures but also by the need to serve residents with inadequate and failing septic systems. Like public water supply, provision of public sewage and sewage treatment is principally an issue of money, and local ratepayers and tax payers will increasingly have to bear the costs.

⁶ The so-called "95% Policy" applied: facilities are being operated at more than 95% of design capacity and thus need expansion.

⁷ The so-called "Municipal Policy" applied: facilities have inadequate treatment to meet prescribed 1988 permit requirements and therefore treatment upgrades are needed.

2.2 Reducing Impacts of On-site Wastewater Disposal

Septic Systems

For those not fortunate to be connected to public sewage treatment systems the alternative is on-site wastewater disposal. In 1980, 30 percent of Virginia's 2 million households were served by septic systems (U.S. Census, 1983). These systems are used by nearly three-quarters of rural households most of whom are dependent upon individual, untreated and unmonitored groundwater sources (Randolph 1987). As of 1985, more than three-fourths of households in 57 of Virginia's 95 counties used on-site disposal systems (VA Gen. Assembly 1989).

Inadequate septic systems can affect the quality of groundwater through inadequate filtration of septage effluent and of surface waters through surface seepage. The Virginia Water Project estimates that 45,000 households are served by inadequate or failing on-site systems (VWP 1988). The issue became the subject of a General Assembly Joint Subcommittee study "Pollution from Untreated Sewage and Failing Septic Tanks" that described the situation as a "ticking time bomb which will not wait much longer to explode" (VA Gen. Assembly 1989). Septic systems are now believed to be the top source of groundwater contamination in the state (GWPSC 1990).

Septic systems are regulated by 139 local health department offices, which are local arms of the VDH. Local sanitarians are state not local employees. Following the VDH Sewage Handling and Disposal Regulations (SH&DR), the offices process 30,000 permit applications per year. Local sanitarians design each system and inspect the construction. They must work closely with local governments, especially building permit officials, to ensure effective control of new septic systems.

The 1990 General Assembly granted VDH authority to consider groundwater quality protection (in addition to traditional "public health and welfare" protection) in septic tank regulations. In December 1989, in response to a recommendation by the Chesapeake Bay Local Assistance Board, the VDH had already proposed modifying the SH&DR in the Tidewater area (known for high water tables) because of potential impacts on groundwater and the Chesapeake Bay.⁸

Although the VDH and its local offices have primary responsibility for new septic system regulation, local governments can also play a role through zoning and other land use ordinances. These ordinances can restrict use of septic systems in areas of especially poor percolating soils or require design features more stringent than state SH&DR. For example, some northern Virginia counties as well as local governments in the Chesapeake Bay Preservation areas require that new systems have a reserve drainfield on new building lots (see Chesapeake Bay Preservation section 5.4).

While the construction of new septic systems appears to be adequately regulated, there is no state requirement for monitoring systems once constructed. Local sanitarians inspect existing systems only on request or in response to a complaint. These local health department offices do not have the staffing to conduct sanitary surveys to assess the adequacy of systems or cumulative impacts on an area-wide basis (GWPSC 1988a).

This lack of control of the operation and maintenance of Virginia's more than half million septic systems is a major deficiency in the state's water quality management. Recognizing

⁸ Current regulations permit drain lines to be placed between 2 and 21 inches of the water table (depending on the soil), and the VDA proposal recommended 36 inches (which could be narrowed to 18 inches by using advanced septic systems). However, because of the potential impact of the proposed regulations on development and the environment, they are to undergo further study by a newly established Secretaries' of Health and Human Services, Natural Resources, and Economic Development Task Force on Septic Separation (GWPSC 1990).

this problem, some have suggested localities play a stronger role in both monitoring systems and requiring maintenance. For example, Chesapeake Bay localities must require septic tank pump out at least every five years for new systems. Chesterfield County recently enacted an ordinance requiring homeowners to pay the County to maintain their septic systems. Most rural localities do not have the staff or resources to support such a program; homeowner fees would have to cover full program costs.

Local governments and planning districts can play a role in septic surveys to assess area-wide or cumulative impacts. For example, Northern Virginia Planning District Commission conducted a comprehensive septic survey in 1989.

Package Treatment Systems

In addition to regulating new systems, VDH researches alternatives to septic systems, and some alternatives are allowed under the regulations. But lacking experience with such new systems, local sanitarians are often reluctant to permit them. However, one increasingly popular alternative to septic systems is on-site package treatment plants which provide biological treatment and/or sand filtration and discharge effluent to surface waters. As such, these systems are permitted and regulated by the VWCB VPDES program (see managing discharges, section 5.2).

Because these systems do not require percolating soils, they have become extremely popular in areas not suitable for septic systems such as the Shenandoah Valley and Tidewater. "Single family home treatment plants are allowing localities to encourage residential development in areas where it was not practical prior to the use of these plants" (VA Gen. Assembly 1990). The first single family package plant was built in 1978; by the end of 1989 there were 850, growing in number by 200 per year.

Due to the increased use of these systems and concerns about their long-term effects and maintenance, the 1989 General Assembly passed a resolution to have the VWCB and VDH study the systems and offer recommendations (VA Gen. Assembly 1990). Based on this study, the 1990 General Assembly passed legislation allowing the VWCB to place single family plants under a general VPDES permit, but requiring owners to obtain a permit from the VDH. VDH issued its policy for such systems having flows ≤ 1000 gallons per day.⁹

Local governments must provide certifications that such package systems comply with local ordinances. Localities can create a district or authority to control the systems and can provide special regulations. Some local governments have already assumed responsibility by requiring extended maintenance contracts or even prohibiting these systems (VA General Assembly 1990).

2.3 Provision of Adequate Sewage Disposal to All Virginians

While most Virginians are served by public sewers or adequate septic systems, as discussed earlier, many septic systems are failing, and in 1980, 4 1/2 percent of Virginia households (90,000) used "other means of sewage disposal", mostly outhouses and privies (U.S. Census 1983). Seepage from such systems and direct discharge from households with nothing more than a drainage pipe to a nearby stream are a major cause of bacterial pollution in Southwest Virginia surface waters (VWCB 1990a).

⁹ Such systems are allowed only after all other onsite wastewater disposal options (including septic system with pump, low pressure distribution, elevated sand mounds) have been explored and found unsatisfactory, certain technical criteria concerning point of discharge, and development density are met, and monitoring and maintenance contracts are in place. In cases where the system is to replace a failing septic system, some of these requirements can be waived if the package systems results in reduced health risk or environmental impact (VDH 1990).

Adequate sewage disposal, complemented by indoor plumbing where necessary, is both a social and an environmental objective. As with adequate water supply, provision of adequate sewage disposal requires substantial investment often beyond the means of many prospective users. As discussed under section 1.4, the Virginia Water Project has worked to extend community systems to serve the rural poor, and the VDHCD Indoor Plumbing Program targets those still dependent on outhouses and privies. As with water supply, county PSAs can play an important role in providing service to unserved communities by developing small independent systems; however long distances and limited density constrain the cost effectiveness of many extensions.

Table 2 summarizes the local role in domestic wastewater.

Table 2 Local Role in Domestic Wastewater

<p>Public Sewage Systems: Owner/Operator</p> <ul style="list-style-type: none"> • Permittee of VWCB: wastewater treatment monitoring, compliance with permitted effluent limitations • Plans for expansion, extension of system (consider subsequent effects on land use and environment) • Financier of system: local revenue or G.O. bonds; federal or state grant or loan recipient. <p>On-Site Wastewater Systems</p> <ul style="list-style-type: none"> • Septic systems <ul style="list-style-type: none"> ▪ Local building permit officials work closely with local health department sanitarians ▪ Local ordinances for septic system design may exceed VDH standards ▪ Land use controls restricting use of septic systems in certain areas ▪ Local monitoring or maintenance of systems • Package treatment plants <ul style="list-style-type: none"> ▪ Local certification of VDH/VWCB permits ▪ Local ordinances restricting use or requiring extended maintenance

3. GROUNDWATER QUALITY

Groundwater quality has become a critical environmental issue as citizens and local governments have realized both the importance and vulnerability of the groundwater resource. In the past decade, more than one-quarter of the state's households relied on untreated groundwater from wells and springs. Groundwater also supplies 17 percent of the water for the state's 300 community water systems. Natural groundwater quality varies greatly within and among the state's physiographic regions, and affects the suitability and costs of using specific aquifers for domestic supply. Variation in natural groundwater quality (e.g. hardness, iron, sulfur) typically poses a nuisance, rather than a human health threat. Changes in natural quality due to contamination by petroleum products, pesticides, or nitrates, however, can threaten human health and, in extreme cases, cause the loss of the aquifer for domestic use, imposing substantial costs to develop new sources.

An indicator of groundwater contamination problems is the number of complaints registered with VWCB's Pollution Remediation Program (PReP). As shown in Table 3, these have increased dramatically in recent years. Three-quarters of the complaints have been related to petroleum-product spills or leaks.

Several state agencies are involved in a variety of groundwater quality protection programs. As a result, the Groundwater Protection Steering Committee¹⁰ (GWPSC) was established in 1986 to develop a coordinated state strategy for groundwater protection. The main objectives of the State's strategy became (1) an anti-degradation policy, (2) anticipation and prevention of contamination, (3) agency coordination, and (4) federal/state/local cooperation (GWPSC 1987). In this latter objective, GWPSC recognizes the importance of local government involvement because of its major "authority over land use and development which significantly impact groundwater" (GWPSC, 1990; p.2).

Table 3 Groundwater Contamination Complaints Reported to VWCB

Time Period	#/Year	Total	Petroleum -Related	Percent Petro. Related
1978-87	88	797	596	75%
1987-89	280	559	442	79%

Sources: DSWC, 1988/1989. VWCB, 1990.

3.1 Implementing Virginia's Anti-degradation Policy

The policy of the Commonwealth is to protect the natural quality of its waters, including groundwater. This is the anti-degradation policy, defined in the Virginia Code (Section 62.1-44.2) and applied to groundwater in the VWCB's Water Quality Standards for Groundwater.¹¹ According to the GWPSC (1987), the statute and the standards together declare the following:

- A. There is no right to degrade the groundwater of Virginia from its natural quality.
- B. No groundwater source is pre-classified to allow degradation by human activity.
- C. Those responsible for groundwater pollution can be required to restore the water to its natural condition.
- D. Groundwater protection activities must take social and economic consequences into account.

While the basic narrative policy defines natural quality as the standard for anti-degradation, variances due to economic or social needs are allowable. The VWCB standards, moreover, allow mixing zones -- where contaminants may mix with groundwater -- on a case-by-case basis. Therefore, some degradation under carefully controlled conditions is allowed but is limited by numerical standards or maximum contamination levels for particular substances.

3.2 Controlling Sources of Groundwater Contamination

Because treating contaminated groundwater is usually impractical, the only way to implement the anti-degradation policy and to protect groundwater quality effectively is to control sources of contamination. The main potential contaminants of groundwater are pathogenic bacteria, nitrates, salts, and a large number of organic compounds (e.g., pesticides, petroleum products), which come from a variety of sources. The Groundwater Protection Strategy (GWPSC, 1987) lists 32 potential sources of groundwater contamination. The Committee focused on 16 of these threats, and identified the seriousness, geographic scope, and per-

¹⁰ The committee is comprised of representatives of eleven state agencies (VDH, VWCB, DACS, DCR, DMME, VCES, VCoE, CBLAD, APCD, DHCD, and DWM) with consultation from EPA, Region 3, and staff support from the Institute for Environmental Negotiation at the University of Virginia.

¹¹ Virginia Water Quality Standards, VR-680-21, section 1.09.

ceived adequacy of the state control programs. From this analysis, five primary statewide threats were identified:

- Underground storage tanks: 60,000 statewide greater than 5000 gallons; innumerable smaller unregulated tanks
- Landfills: 229 permitted statewide; innumerable unpermitted, illegal dump sites
- Waste lagoons: 1,350 for animal wastes, 461 for industry, statewide
- Septic tanks & drainfields: 650,000 households
- Pesticides/herbicides: applied to 1 million acres per year statewide; and
Fertilizers: 75,000 tons per year statewide

Regionally, there are problems with salt water intrusion (Tidewater), oil and gas wells (coalfields), mining wastes (coalfields), and animal waste lagoons. Other regional problems are related to the geologic vulnerability to groundwater pollution. Within the Valley and Ridge Physiographic Province, for example, karst terrain features, such as sinkholes, increase the contamination potential (see Figure 1 showing physiographic provinces). In 1980, more than half of the households in 24 of 32 counties in this region depended on water supply from private unregulated wells and springs. In the Coastal Plain, on the other hand, shallow water table depths and highly permeable soils make aquifers susceptible to contamination. In 22 of 29 counties in this Tidewater region, more than half of the population depended on private wells, many simply dug to these shallow aquifers.

Federal Agency Programs: SDWA and Superfund

Federal responses to groundwater quality protection are seen in the 1986 amendments to the Safe Drinking Water Act (SDWA) and to the Superfund Act. The SDWA amendments called for wellhead protection area designations (see section 4.2) and programs to be implemented within the states. The EPA provides technical assistance and limited funds for this process, and reviews states' Wellhead Protection Plans (if any). The EPA also administers the Sole-Source Aquifer Designation program. Aquifers so designated are protected from damage by federal projects, and the designation is potentially an important legal basis of local protection measures. Virginia has no designated well-head protection areas and Clarke County's aquifer supplying its Prospects Hills spring is the state's only designated sole-source aquifer.

EPA also administers the federal Superfund program to clean up old hazardous waste sites that potentially impact human health and environmental quality, often via groundwater contamination. EPA's program under the 1986 Superfund Amendments and Reauthorization Act (SARA) starts with site discovery and inclusion on a national list for further investigation (there are about 30,000 sites on this list nationwide, 515 in Virginia). These sites are ranked for degree of hazard, and if serious, are placed on the National Priority List (NPL) (there were 1,218 on the NPL in 1990, 21 of which were in Virginia). The Superfund remediation process for these sites involves identifying responsible parties, developing a remediation plan, conducting the clean-up, and monitoring and maintaining the site after clean-up. As of 1990, one Virginia NPL site had advanced to the monitoring state, two were undergoing remedial action, and nine were in remediation planning (VDWM 1990).

The Virginia Department of Waste Management (VDWM) supports EPA through the Virginia Superfund Program, established in 1987. In addition to NPL sites, the VDWM investigates sites not ranked high enough for NPL for inclusion in the State Cleanup Program. Forty such sites are under investigation for possible cleanup. As part of its program, VDWM also implements a community relations program to involve the community from site discovery through clean up and monitoring.

SARA Title III established special provisions for local emergency planning and response and "community right-to-know" reporting on hazardous and toxic chemicals. The Act thus establishes the basic emergency response mechanism for chemical spills that may result in

Figure 1: Physiographic Provinces of Virginia

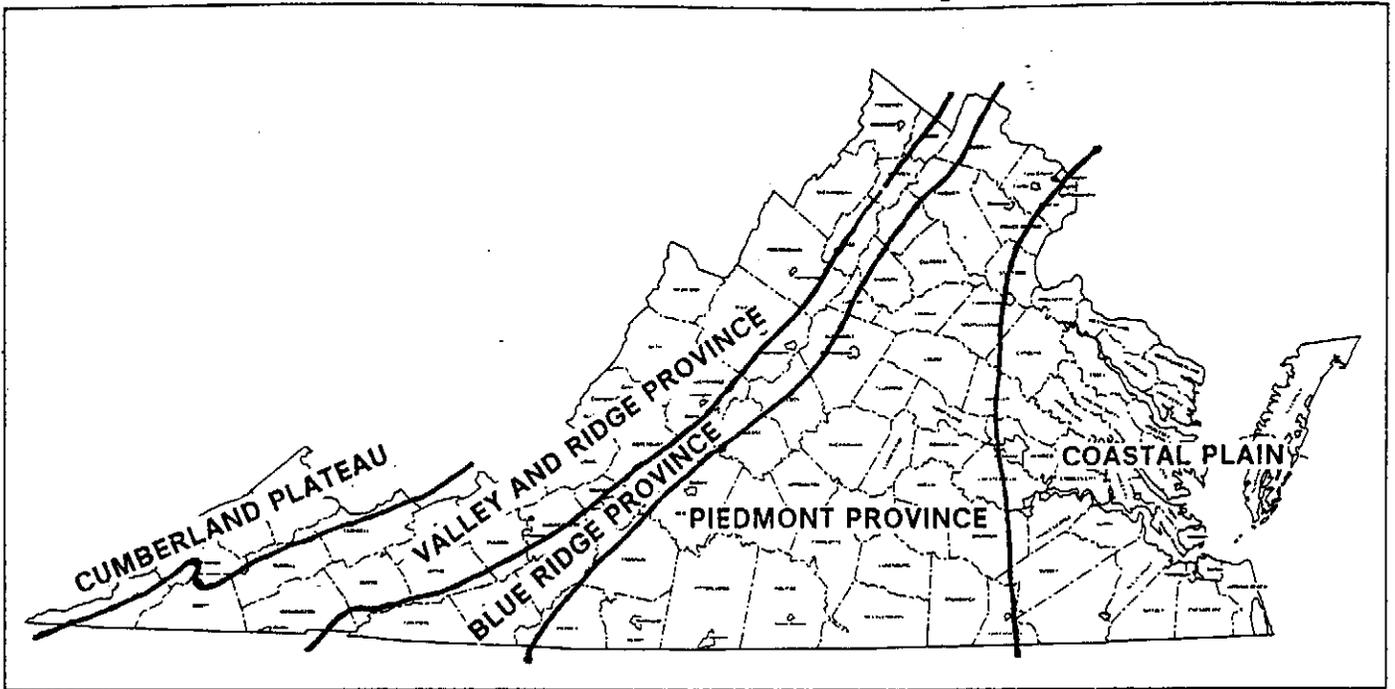
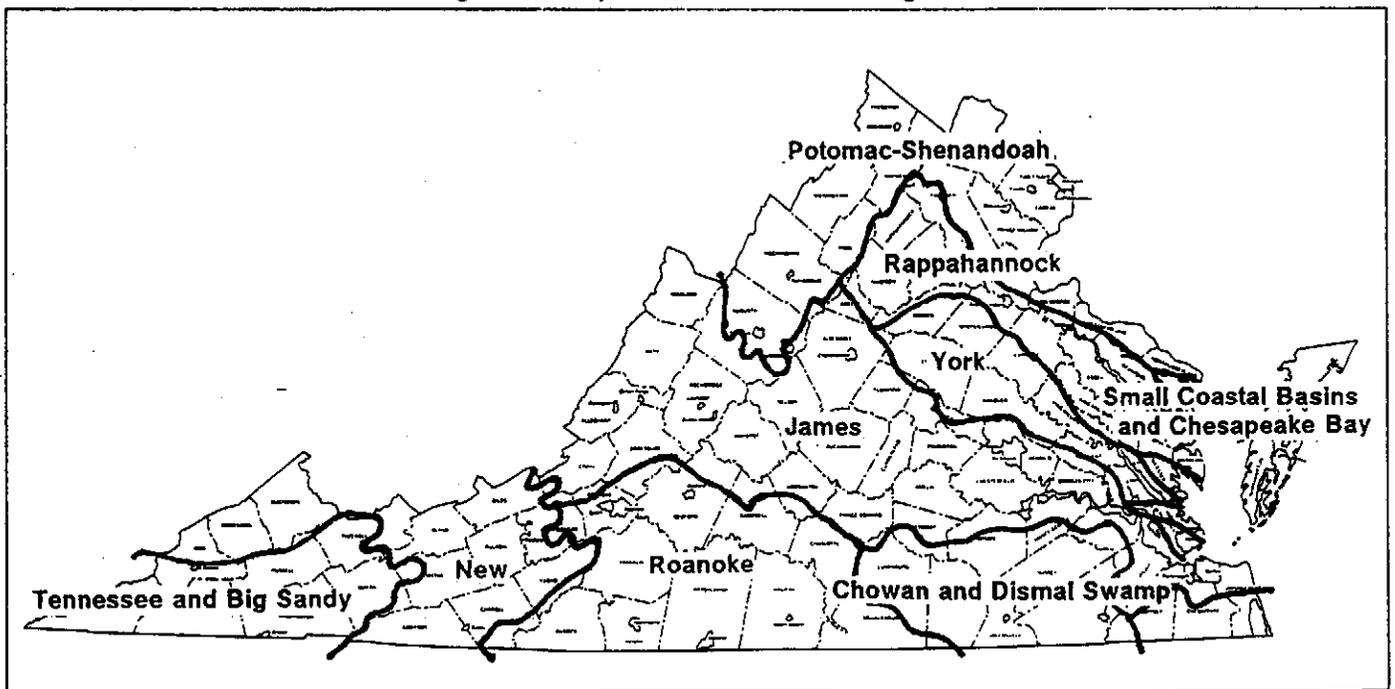


Figure 2: Major River Basins of Virginia



groundwater contamination, as well as surface water spills and other hazardous material accidents threatening human health and environment quality. In response to SARA's requirements, Local Emergency Planning Committees (LEPC) have been established through the Commonwealth. Each committee has developed a plan for responding to hazardous material emergencies and designated local and regional response teams, usually specially trained members of local fire departments (Conn and Owens 1989). Title III also requires public notification of emergencies and local and state reporting of hazardous material inventories by facilities having such materials. While all localities must have LEPC and response teams, there is substantial variation in quality of these programs around the state.

State Agency Programs

There are eleven primary state agencies involved in groundwater protection. The roles of these agencies have been described in the Virginia Groundwater Management Handbook (GWPSC 1988) and the Groundwater Protection Strategy, 1990 Supplement (GWPSC 1990). Table 4 summarizes the regulatory and non-regulatory programs that aim to control sources of groundwater contamination. The recent legislative and administrative directives affecting the programs shown in the table indicate the high level of activity in developing and refining the state's coordinated groundwater management strategy. Most of these programs are described in other sections. (See sections 2.2 (on-site wastewater), 5.3 (VPDES, VPA permitting), 1.1 and 1.3 (permitting of public and private wells), 5.2 (nonpoint source control program), 4.1 (groundwater management areas), and the discussion above on Superfund Programs.)

Of state programs listed in Table 4 not discussed elsewhere in this report, several are worthy of mention here. The VWCB regulates commercial underground storage tanks under regulations established in 1989 that detail technical standards, and corrective action and financial responsibility in case of leakage. Local governments do not have the authority to impose different requirements on these tanks. However, localities play a role in implementing the state program as local building officials inspect new tank installations for compliance with the regulations. While the state program covers tanks greater than 5,000 gallons capacity, there are innumerable smaller commercial and residential underground tanks that are not regulated.

The VDWM regulates hazardous materials facilities and municipal waste landfills. Most of the latter are owned and operated by local governments and authorities which must meet VDWM landfill regulations established in 1988; existing landfills must comply with the standards by 1992. In addition, 1989 regulations on recycling require a 25% reduction of the waste stream to landfills.

Important to all programs related to groundwater protection is good data monitoring. Monitored groundwater quality data are available from a number of sources including the VWCB monitoring network, EPA records, and VDH data on public water supply sources, among others. The GWPSC's Groundwater Data Management Task Force developed an action plan for developing a statewide groundwater data management system. During the next several years, the system will include data on well construction, groundwater quality, water levels and use, geologic information, and inventories of potential sources of contamination.

Local Activities

While the state agencies listed in Table 4 provide the lead in controlling groundwater contamination, local governments can enhance certain regulatory programs and play a role in groundwater monitoring. Table 5 highlights the local role in groundwater protection. Under Virginia law, local governments can regulate water-well construction and on-site wastewater system installation, so long as local regulations are at least as stringent as state standards. Albermarle and Clarke Counties, for example, have adopted water-well ordinances pre-

**Table 4 State Programs to Control Groundwater Contamination
(with recent legislative and administrative directives)**

<p>A. State Regulatory Programs to Control Potential Sources of Groundwater Contamination</p> <ul style="list-style-type: none"> • VDH standards, permitting and inspection of on-site wastewater disposal construction (1990 activity to consider ground water quality in regulations) • VWCB standards and permitting of underground storage tanks (1989 regulations for UST technical standards, corrective action, financial responsibility) • VWCB standards and permitting of wastewater pits and lagoons (1988 Virginia Pollution Abatement (VPA) permit regulations) • DWM standards, permitting and monitoring hazardous waste facilities • DWM standards, permitting and monitoring municipal waste landfills (1988 landfill standards (1992 compliance for existing); 1989 solid waste recycling regulations (25% by 1995)) <p>B. State Regulatory Programs to Protect Groundwater Sources of Drinking Water</p> <ul style="list-style-type: none"> • VDH permitting and monitoring of public water supply wells • VDH permitting of private well construction (1990 regulations for well construction and abandonment) <p>C. State Regulatory Programs to Control Discharges that May Ultimately Affect Groundwater</p> <ul style="list-style-type: none"> • VWCB permitting and monitoring of discharges by VPDES permittees <p>D. State Programs to Control Non-Point Sources That May Ultimately Affect Groundwater</p> <ul style="list-style-type: none"> • DSWC Non-point Source Pollution Management Program (1989 "319" Plan; 1990 Erosion & Sediment Control Regulations) • DACS Pesticide Control Program (Pesticide Control Board) (1989 Pesticide Control Act) • DSWC Nutrient Management Program (1989 voluntary program to help farmers schedule fertilizers) • Chesapeake Bay Preservation Program (1988 Chesapeake Bay Preservation Act; 1989 CBLAD Land Use Regulations) <p>E. State Response to Groundwater Contamination</p> <ul style="list-style-type: none"> • VDWM Virginia Superfund Program and Cleanup Fund • VWCB Leaking Underground Storage Tank Cleanup Program (1989 Virginia LUST Remediation Trust Fund) • VWCB Pollution Remediation Program • VDES Hazardous Spill Response Program <p>F. State Groundwater Monitoring</p> <ul style="list-style-type: none"> • VWCB monitoring of network of 100 wells and development a statewide ambient ground water monitoring framework • VWCS saltwater intrusion monitoring in Eastern Shore and Coastal Plain Areas • VDH well construction data (monitoring data to be available in 1991) <p>G. State Control of Groundwater Withdrawals that May Affect Quality</p> <ul style="list-style-type: none"> • VWCB permitting of major withdrawals in Groundwater Management Areas. (1990 expansion of Eastern Virginia GMA)

Sources: GWPSC, 1987; 1988b; 1990.

scribing their own criteria in addition to VDH standards for new well construction. Through zoning and conditional-use permitting, localities can control the locations of certain new potential sources of contamination. However, the authority of local governments is limited. For example, they do not have the authority to establish standards for, or regulate the operation of, underground storage tanks, waste lagoons, waste landfills, and other potential sources of groundwater contamination.

Localities have long been dependent on the state for groundwater information. For example, localities still use the county groundwater investigations conducted by VWCB in the late 1970s. The new statewide groundwater data management system will be of great use to localities. However, a local government may still decide to contract for more detailed information (as Clarke County did in contracting with the USGS for a 2 1/2 year Clarke County Groundwater Resources Study) or to provide for additional monitoring through local groundwater study committees or other groups.¹²

Table 5 Local Role in Groundwater Protection

<p>Involvement in State Program Implementation:</p> <ul style="list-style-type: none">• Local Emergency Planning Committee, Local Emergency Response Teams: "first line of defense"• Inspection of new underground storage tank installation• Landfill operation and maintenance• Lead agencies in Urban and Construction Nonpoint Source Control Program <p>Local Ordinances to Enhance State Regulations:</p> <ul style="list-style-type: none">• Well construction standards• Septic system, package treatment plant standards <p>Land Use Planning and Controls</p> <ul style="list-style-type: none">• Zoning regulation restricting location of septic systems, package treatment• DRASTIC studies and use in comprehensive planning• Overlay districts, performance standards (e.g. sink-hole ordinances, impervious surface restrictions) to protect aquifer recharge and groundwater quality.

3.3 Land Use Effects on Groundwater Quality

Nearly all contamination of groundwater comes from so-called nonpoint sources, many of which can be traced to improperly operating sources regulated by state agencies (i.e. septic systems, underground storage tanks, landfills, and waste lagoons). However, contamination also results from land use practices and runoff that are not controlled by state programs. This is particularly true in areas that are susceptible to contamination such as karst areas or shallow aquifers. Land use can affect not only groundwater quality, but also quantity, as impervious surfaces from land development can inhibit infiltration in aquifer recharge areas (and at the same time create runoff problems, as described in section 7).

Because local governments have major authority for land use control, they are in a strategic position to manage these land use effects on groundwater. Given sufficient information on aquifer recharge areas and susceptibility to groundwater contamination, localities can employ controls to protect groundwater. These controls may include overlay districts that utilize performance standards such as sinkhole ordinances, septic system standards, or impervious surface restrictions.

To provide information on susceptibility to groundwater contamination, DRASTIC studies have been completed in eleven Virginia counties. These studies map areas of relative vul-

¹² For example, "Warren County Household Water Quality," Virginia Cooperative Extension Service, 1989.

nerability based on seven soil and geologic criteria. The resulting maps and other information can be used for public education and/or provide a basis for land use controls. While DRASTIC studies have limitations (e.g., maps are accurate only to 100-acres and thus cannot be used for site-specific decisions), they are a useful first step for localities concerned about groundwater (Burton 1990). (See DRASTIC Case Study in accompanying *Case Studies* report).

Clarke County's Groundwater Protection Plan (Lord Fairfax PDC 1986) is often viewed as a Virginia model for local government action. Through the plan, the County has adopted a sinkhole ordinance, waterwell standards, and an on-site wastewater system management program. In addition, the plan has prompted a community groundwater education program and incorporation of groundwater information in the County's geographic information system (GIS). (See Clarke County Case Study in accompanying *Case Studies* report).

4. GROUNDWATER QUANTITY

In addition to water quality problems, there are also groundwater quantity concerns in Virginia, including overdraft, land use impacts on recharge, and impacts of land-disturbing activities.

4.1 Controlling Overdraft: Groundwater Management Areas

In the early 1970s, major depressions of the water table in eastern Virginia aquifers caused by industrial groundwater pumping prompted passage of the 1973 Groundwater Act to control major withdrawals. Under the Act and 1986 amendments, the VWCB requires permits for industrial or municipal withdrawals greater than 300,000 gallons per month (gpm) in designated Groundwater Management Areas (GMA). There are two such designated areas: Eastern Virginia GMA and Eastern Shore GMA. In 1989, the Eastern Virginia GMA added seven counties and four cities east of I-95 and bounded by the York and James Rivers.

In 1986, the threshold withdrawal for a permit was lowered from 50,000 gallons per day to 300,000 gpm, and municipal withdrawals were no longer exempt from the permitting program. Agricultural withdrawals continue to be exempt from permitting, but the VWCB may require agricultural users to report their withdrawals if greater than the threshold level.

In areas outside of designated GMAs, neither the state nor localities have the authority to regulate groundwater withdrawal. The GWPSC has questioned the ability of the program to prevent overdrafting given the withdrawal threshold, the agricultural exemption, and the grandfathering of existing users at their highest daily yield during the two years prior to the law's passage. The Committee suggests that management areas could be established in other regions of the state vulnerable to saltwater intrusion (e.g., the Middle Peninsula and Tidewater areas) or surface-source contamination (e.g., karst region in Shenandoah Valley) (GWPSC 1990).

4.2 Land Use Impacts on Aquifer Recharge Areas

As mentioned in section 3, land use can potentially impact recharge of aquifers. While the greatest concern is contamination, large impervious surfaces can also reduce infiltration and recharge of important isolated aquifers. Even though this is not a statewide concern, local problems can develop.

For these aquifers, local governments can identify areas of recharge and control land use and development by establishing a zoning overlay district, impervious surface restrictions, or other regulations. For example, Clarke County's Natural Resources Protection Overlay Zone is designed to provide protection to recharge areas, among other resources, identified as critical recharge areas. Development is allowed in the Zone, but residential use is re-

stricted to two-acre minimum lots and only 20 percent lot cover is allowed. Non-regulatory controls such as conservation easements, can also be employed.

More focused attention on existing water supply sources is provided by controlling land use in well-head protection areas (WHPA). EPA, through the Safe Drinking Water Act, has a WHPA program that provides technical assistance to localities, but Virginia has not participated in the program. The GWPSC has recommended that a committee of relevant state agencies and local government representatives be established to develop options to use local land use authority to protect groundwater, including model ordinances for well head and aquifer recharge protection and other measures. Localities were granted authority for such land use controls by the General Assembly in 1988 and 1990.

4.3 Impacts of Land Disturbing Activity on Individual Wells: Mining, Gas and Oil

Dewatering of individual wells by mining, oil and gas drilling, or other land-disturbing activity has been a localized groundwater quantity concern in the Virginia coalfields. Subsidence caused by underground coal mining has been the focus of legal and political controversy especially due to its potential effects on groundwater in an area where most residents have individual water wells. While there is a regulatory mechanism to protect major aquifer sources of public water supplies and "the hydrologic balance," there is no regulatory mechanism to require mining companies to replace or repair damaged water supplies. (Ironically, there is a regulatory requirement to replace or repair water supplies damaged by surface mining). Those with damaged wells must negotiate with mining companies, which have compensation/replacement policies, or take them to court. The issue has been the subject of legislative inquiry, and now is the focus of a mediation process between residents, the industry, and environmental organizations. Local governments have no authority to regulate or restrict coal mining activities.

5. SURFACE WATER QUALITY

Surface water quality is a major focus of Virginia's water management programs. In response to federal mandates and through an evolving process that dates back to 1946, the state has developed a comprehensive program of surface water standards, monitoring, and discharge permitting. Armed with federal grants, Virginia has made considerable progress in constructing publicly-owned treatment systems to protect surface waters. This construction and permitting of municipal and industrial "point" discharges has done much to reduce conventional pollution from these sources and improve surface water quality. Current attention focuses on toxic discharges and nonpoint sources of pollution. The major issues in the protection of Virginia's surface water quality, including revising and attaining water quality standards, managing wastewater discharges, managing nonpoint sources of pollution, and restoring Chesapeake Bay, are discussed below.

5.1 Virginia's Water Quality Standards and Progress Toward Their Attainment

Water Quality Standards

Virginia's water quality standards establish a definition of acceptable ambient quality. Statewide standards are based on criteria to support recreational use, propagation of aquatic life, and protection of human health. Additional standards apply to designated trout streams, sources of public water supply, and other special waters.

The standards serve as a benchmark for water quality monitoring and for regulation of discharges. All dischargers of wastewater into the state's surface water bodies must receive a permit which requires a certain minimum level of treatment. If the VWCB determines that such a treatment level is insufficient to meet the water quality standards, more stringent treatment is required (see managing wastewater discharges, section 5.2).

As of October 1990, the surface water standards are a combination of (a) narrative statements (concerning general requirements, pollutant mixing zones, anti-degradation of high quality waters, and stream flow); (b) statewide numeric standards for dissolved oxygen, pH, and temperature, (c) numeric standards for bacteria and for several parameters that are applied to surface sources of public water supplies on a site-specific basis; and (d) non-mandatory water quality criteria for additional parameters.

The standards are applied to specific river basins (see Figure 2); subbasins, and stream sections shown in a series of maps and tables which identify stream classifications, stream-section-specific special standards, and outstanding state resource water designations.

Under the CWA, the state must review the water quality standards every three years and revise them as necessary. The VWCB staff has conducted the 1990 review and has developed a draft revision.¹³ The most substantive proposed changes involve the expansion of statewide numeric standards from three (DO, pH, and temperature) to 67 parameters, chosen to protect against acute and chronic effects to aquatic life and human health.¹⁴ Special standards for bacteria are retained. Modified policies are proposed for mixing zones and streamflow criteria for applications of the standards.¹⁵ With their greater emphasis on toxics, the proposed revisions would give the standards a much stronger basis for incorporating chemical pollutant limitations in discharge permits and in the nonpoint source control program.

Water Quality Monitoring

The key to effective implementation of the standards is an effective monitoring program. The VWCB maintains nearly 513 fixed water quality monitoring stations including 51 "core" stations at which fish tissue and sediments are monitored, and more than 150 biological stations. The water quality stations monitor up to 28 different parameters at variable frequencies ranging from monthly to annual. Each year the VWCB collects about 6,000 water samples on which it runs 177,000 analyses.

The fish tissue monitoring program provides biennial sampling of predatory and bottom feeding fish tissue and analysis of detectable concentrations of 14 different toxic metals and pesticides. In the 1987-88 monitoring period, 33 stations were monitored: five estuarine

¹³ "Proposed Amendments to the Water Quality Standards Sections VR-680-21-01 and VR-680-21-03 (Toxic Standards)", VWCB, October 4, 1990. The Board was scheduled to act on the proposal December 3, 1990.

¹⁴ In a separate matter, in May 1990, VWCB approved a new special water quality standard for dioxin, a toxic pollutant discharged by major bleaching pulp mills in Covington, Franklin, and West Point. Monitoring and fish sampling studies on the Jackson and James Rivers in 1988 and 1989 confirmed elevated concentrations of dioxin in bottom feeders and to a lesser extent in sports fish. In response, the VDH issued a health advisory on consuming fish caught from the Jackson-James Rivers from Covington to Snowden (VWCB 1990a).

The state dioxin standard set at 1.2 parts per quadrillion (ppq) has been the subject of some controversy. While VHD and EPA recommendations are far lower (0.056 ppq and 0.013 ppq respectively), these lower levels are not currently detectable except in fish tissue testing. The VWCB approved the higher standard based on current detection technology. In September, the Environmental Defense Fund (EDF) filed notice to sue EPA and the state over the standard once VWCB submits the standard for EPA approval (*Water News* 1990b).

¹⁵ Standards for acute effects on aquatic life apply to flows equal to or greater than (\geq) the 1 day low flow in 10 years (1Q10); standards for chronic effects on aquatic life apply to flows \geq 7Q10; standards for suspected human health effects from non-carcinogens apply to flows \geq the harmonic mean; standards for human health effects from non-carcinogens apply to flows \geq 30Q5.

stations showed arsenic in tissue at levels exceeding Federal FDA Tolerance Levels; two Shenandoah River stations showed PCB levels above the FDA Action Level.¹⁶

Biological monitoring conducted semiannually at about 150 stations studies benthic macro-invertebrate communities as an indicator of water quality. Evaluation of the community is based on species type, diversity, and density and provides a qualitative water quality rating of six categories ranging from "good" to "fair" to "poor" to "no aquatic life." In spring 1989, 141 stations were monitored; 38% of the stations were classified worse than "fair", 31% "fair", and 31% better than "fair."

Water Quality Assessment

Every two years the states must submit to EPA a water quality assessment (so-called 305(b) report mandated by that section of the CWA). This report serves as the best source on water quality conditions in the Commonwealth. Based on the monitoring described above and supplemental evaluation of waters using other information, VWCB reports the degree to which the state's waters support the CWA goal of "fishable and swimmable waters" and Virginia's goal of supporting indigenous species. The basic monitoring parameters for these goals include dissolved oxygen, pH, and temperature for indigenous species and "fishable" uses, and bacteria for recreational or "swimmable" uses. Other parameters are used in the supplemental evaluation.

Table 6 summarizes the state's assessment for the 1987-89 reporting period. For various types of water bodies it gives the totals present in the Commonwealth, the amounts assessed whether through monitoring or evaluation, the proportion of the assessed amounts that fail to fully support the goals, the water quality parameters or pollutants causing the failure, and the sources of those pollutants.

Eighteen percent of assessed stream miles fail to fully support the goals, due primarily (65 percent) to fecal bacteria contamination caused mainly by agricultural runoff statewide and septage and direct sewage discharge from households mostly in Southwest Virginia. Toxic metals and pesticides are also a problem in 22 percent of affected miles.

Ten percent of lake and 15 percent of estuary area fail to fully support uses, in both cases because of nutrients from agricultural and urban runoff in lakes and because of sewage treatment and industrial discharges in estuaries. Toxic metals and pesticides from runoff and industry also affected 40 percent by volume of the lake and estuary acreage.

Major specific water quality problems include five toxics-related problems that have resulted in fish consumption advisories issued by VDH. These include kepone in 113 miles of the lower James River;¹⁷ mercury in 81 miles of the North Fork Holston River (where only catch-and-release fishing is allowed); mercury in 102 miles of the South River and South Fork Shenandoah River; PCB in 45 miles of the Shenandoah River including South and North Forks; and dioxin in 90 miles of the Jackson and Upper James River.

¹⁶ This latter case illustrates the value of this monitoring system as well as its limitations. Prompted by the monitoring results, a special study was conducted in 1989 involving an 11-station fish tissue collection. As a result, the VDH issued a health advisory against consumption of fish caught from the Shenandoah River. The source of the contamination was determined to be the Avtex Fibers Plant in Front Royal. The discharge permit for the plant was revoked in November 1989, and the plant subsequently closed. Unfortunately, the PCB is in the river to stay until it washes to the Bay.

¹⁷ Although the fish advisory remains in effect for the estuary, the fishing ban on the James from Hopewell to the Bay, established in 1975, was lifted in 1988 as kepone levels in fish remained below FDA Action Level.

The remaining surface water quality problems are caused by a combination of wastewater discharges and nonpoint runoff sources of pollutants. As discussed below, the former are primarily the domain of state control, while the latter require considerable local involvement.

Table 6 Virginia Surface Water Quality Assessment 1987-89

Water Body Type	Total in Virginia	Assessed 1987-89	% Not Fully Supporting Uses	Causes*	Sources
Streams	27,000 miles	10,809 miles	18%	Bacteria (65%) Toxics (22%) pH (12%)	AgriRO (48%); Sewage (22%) STP (69%) AgriRO (26%); STP (20%)
Lakes**	161,290 acres	160,640 acres	10%	Nutrients (93%) DO (62%) pH (40%) Toxics (39%)	AgriRO (43%); UrbRO (29%) Silviculture (12%)
Estuaries	2,529 sq. mi.	2,529 sq. mi.	15%	Nutrients (66%) Ammonia (27%) Bacteria (37%) DO (30%) Toxics (41%)	STP (25%); Ind (19%) Ind (44%); STP (13%) STP (40%) Ind (29%); UrbRO (27%)
Coastal	112 miles	112 miles	0%	--	--

*% of miles, acres or square miles, not fully supporting uses, that are impacted by pollutant parameter.
 **More than 1/2 of lakes, accounting for 64% of state's lake area, classified as Eutrophic or Dystrophic.
 Terms: RO = Runoff Pollution; STP = Sewage Treatment Plants; Agri = Agriculture;
 Urb = Urban, Ind = Industrial
 Source: VWCB 305(b) report, 1990.

5.2 Managing Wastewater Discharges

VPDES Permits

All discharges of wastewater into the state's waters must obtain a permit under the VWCB's Virginia Pollution Discharge Elimination System (VPDES). As of 1989, 2,631¹⁸ municipal and 926 industrial permits were in effect. The top 75 municipal and 64 industrial facilities are considered major and account for 85-90 percent of pollutants discharged. The permit system and its accompanying effluent limitations contributed to major reductions in pollutant discharge. Between 1976 and 1986, the quantity of conventional organic discharges (BOD₅) decreased by 45 percent for major municipal facilities (despite a 46 percent increase in flows) and by 78 percent for major industrials.

Permits require specific effluent limitations which reflect, at a minimum, EPA-established technology guidelines (e.g., secondary treatment for municipal sewage). These guidelines apply if they are sufficient to meet the water quantity standards of the receiving water into which the wastewater is discharged; this is the so-called "effluent limiting" case. However, if the technology guidelines are not sufficient to meet the standards (the "water quality limiting" case), permits may require more stringent effluent limitations. Of Virginia's 183 des-

¹⁸ 661 of these permits were for single family dwellings using package treatment systems. As discussed under section 2.2, these systems are now covered by a general VPDES permit, but a special permit is also required for VDH.

ignated stream and river sections, 56 percent are classified "effluent limiting" and 44 percent are classified "water quality limiting" (VWCB 1990a).

Tying permit requirements to water quality standards will become more complex as the list of standards grow, especially to include the wide range of toxic pollutants. Much of the VPDES focus has been on conventional pollutants, but the 1987 Clean Water Act brought greater attention to toxics. As a result, VWCB established a Toxics Management Regulation¹⁹ which became effective November 1988. The program aims to enhance the biological and chemical monitoring by potential municipal and industrial dischargers of toxic pollutants. The quarterly testing will ultimately be required of about 500 facilities²⁰ (VWCB 1990a).

To complement facility self-monitoring for toxics, VWCB provides its own testing of toxic effluents using its Mobile Aquatic Laboratory. Also, its toxics program monitors 22 facilities each year through regional offices.

Pollution Abatement Permits

In addition to VPDES permits, VWCB also issues permits for handlers of wastewater that is not discharged into waters. These facilities range from pits and lagoons to land application of municipal sewage and sludge. Permits require a facilities plan and may require groundwater monitoring.

In 1988, this Virginia Pollution Abatement (VPA) program replaced the No-Discharge (ND) Certification Program. As of early 1990, only 52 VPA permits had been issued, but 1810 ND certificates, 75 percent of which were for animal-feed lots, were still in effect. As VPA permits are phased in to replace ND certificates, it is estimated that half of the certificates will be revoked (VWCB 1990a).

Land application of sewage and sludge is regulated under 25 ND certificates. Nearly 50 percent of all sewage sludge generated in the state is returned to the land for agricultural use on 85,000 acres. This practice is expected to increase (VWCB 1990a).

Pretreatment Program

In April 1989, VWCB assumed responsibility from EPA to oversee control of industrial discharges into publicly-owned treatment systems. The control authority actually rests with the local systems. Twenty-three of these systems control discharges from 36 pretreatment facilities. Pretreatment programs are currently under development for 6 other systems.

Except for pretreatment control, local jurisdictions have no direct authority to regulate wastewater discharges. This authority rests with the VWCB. Localities do have authority, however, to control the development of new sources of wastewater discharge through land use control and special use permitting.

Federal Permits for Urban Storm Water Discharges

The U.S. Environmental Protection Agency (EPA) published its final regulations setting forth National Pollutant Discharge Elimination System (NPDES) permit applications requirements

¹⁹ VR 680-14-03

²⁰ Built into their permits, the monitoring regulation requires that 75 percent of receiving water tests show no acute or chronic toxicity to aquatic life and that receiving water quality standards or criteria are not violated. If these requirements are met, only annual monitoring is subsequently required. If not, the facility must engage in a toxicity reduction evaluation (TRE) to evaluate and implement treatment; 37 of the initial 207 facilities in the program are involved in TRE.

for storm water discharges on November 16, 1990.²¹ The requirements apply to storm water discharges associated with industrial activity and to discharges from municipal separate storm sewer systems (MSSSS). The rule became effective December 17, 1990 and will affect the most popular Virginia cities and counties.

The regulations require municipal owners or operators of separate storm sewer systems serving a population of 100,000 or more to obtain NPDES permits for discharges from these systems. Large MSSSS (serving a population of more than 250,000) must have a permit by February 4, 1991; medium MSSSS (serving a population of over 100,000 and less than 250,000) must have a permit by February 4, 1992. Recognizing the variety in the nature of discharges from municipal systems in different parts of the country, as well as the varying impacts on receiving waters, the regulations are designed (according to EPA) to encourage site-specific comprehensive storm water management programs.

The permit application process has two parts. Part 1 is "intended to provide an adequate basis for identifying sources of pollutants to the MSSSS, to preliminarily identify discharges of storm water that are appropriate for individual [NPDES] permits (such as illicit discharges to storm sewer systems), and to formulate a strategy for characterizing the discharges from MSSSS."²² In Part 2, the municipal sewer system owner or operator proposes a "comprehensive program of structural and nonstructural control measures that will control the discharge of pollutants, to the maximum extent practicable, from municipal storm sewers."²³

One major focus of the permit application requirements is the detection and control of illicit discharges -- that is, non-storm water discharges without an NPDES permit and illegal dumping -- into storm sewer systems. Control of runoff into MSSSS from construction sites in which greater than five acres of land are disturbed is also required by the regulations.

5.3 Managing Nonpoint Sources of Water Pollution

As progress has been made in the control of point sources of wastewater discharge in the past two decades, nonpoint sources (NPS) of pollution have grown in their relative contribution to Virginia's water quality problems. NPS pollution is caused by diffuse sources not regulated as point sources, and includes: runoff from agriculture, silviculture, urban land use, construction, and resource extraction activities; runoff and leachate from land disposal of wastes; impacts of hydraulic channel modification; and other sources, such as atmospheric deposition, leaks, and spills.

The impacts of NPS on Virginia waters have been assessed by the VWCB in their 305(b) assessments. Table 7 summarizes the results of the 1987-89 assessment. The Table is similar to Table 6 but includes only those waters impacted by NPS. It gives the length or area of streams, estuaries, and lakes impacted by NPS, and categorizes the impacted lengths or areas as "threatened" (i.e., they currently support beneficial uses, but may not in the future), "partially supporting uses," and "not supporting uses." More than 60 percent of the state's lake acreage, about 40 percent of assessed stream miles, and about 20 percent of estuary area impacted by NPS pollution. Bacteria and sediment impact the most stream miles, but nutrients are the main cause of NPS impacts on lakes and estuaries.

²¹ *Federal Register* 55(222):47990, November 26, 1990.

²² *Ibid.*, p. 48044.

²³ *Ibid.*, p. 48044.

Table 7 Waters Impacted by Nonpoint Source Pollution in Virginia

Water Body	Amount Impacted by NPS Pollution	Amount Supporting Uses (but may not in future)	Amount Partially Supporting Uses	Amount Not Supporting Uses	Major NPS Pollutants*
Streams	4,294 miles	2,389 miles	1,122 miles	783 miles	Bacteria (87%) Sediment (54%) Nutrients (46%) Metals (35%)
Estuaries	489 sq. mi.	296 sq. mi.	103 sq. mi.	90 sq. mi.	Nutrient (99%) Bacteria (71%) Metals (53%) Pesticides (46%) Sediment (31%)
Lakes	100,376 acres**	76,639 acres*	13,737 acres	0 acres	Nutrients (93%) DO (62%)
<p>*% of miles, acres or square miles, not fully supporting uses, that are impacted by pollutant parameter. **Includes 76,639 acres in Lake Chesdin, Smith Mountain Lake, Kern Reservoir, and Claytor Lake. Source: DSWC 1988/1989a.</p>					

While the federal government has provided a relatively strict program for point source control, NPS controls have been left primarily to the states. In Virginia, prior to 1987, there was limited coordination of a range of programs related to NPS control; these programs included, among others, federal and state agricultural soil and water conservation programs, regulation of mine-land reclamation, erosion and sediment control regulations for land development, areawide water quality plans, and statewide information on best management practices (BMPs) for NPS control.²⁴

Because of the growing importance of NPS pollution, the 1987 CWA amendments included a major provision under section 319, requiring state programs for NPS control. While the Act provided funds for planning and implementation and called on EPA to establish certain guidelines, it left the details of program development up to the states. Virginia's Division of Soil and Water Conservation (DSWC) was given the responsibility for developing the "319" program and coordinating its implementation.

State legislation has also enhanced NPS control in Virginia. In 1988, the General Assembly passed the Chesapeake Bay Preservation Act which stated goals for the Bay drainage area and established a comprehensive program for land use control in Tidewater to reduce water quality impacts. The legislature amended the Erosion and Sediment Control Act which aimed to strengthen local implementations. Although these programs are both part of the 319 program, they are discussed in separate sections below because of their importance to local water management. Also in 1988, the General Assembly passed enabling legislation for local governments to develop and/or amend zoning and subdivision ordinances to protect surface and groundwater. Finally, in 1989, stormwater management legislation was enacted. The implications of these laws are discussed below and in section 6.1 on flooding and stormwater.

²⁴ The areawide water quality plans that addressed NPS and the statewide BMPs were mandated under EPA's section 208 NPS program and administered by the VWCB. The BMPs were developed in a series of 5 volumes addressing different nonpoint sources. The BMP Management document set up lead agencies for the sources and called for voluntary implementation of the BMPs. However, the program was largely ineffective (Thompson 1989; Cox and Herson 1987).

Virginia's 319 NPS Program

Nonpoint source water pollution can be generated by runoff from nearly all human uses of the land, from agriculture and forestry to land development and mining to urban use. Add to these sources others like atmospheric deposition and hazardous spills, and it becomes apparent that a comprehensive control program will be, by necessity, complex. Although Virginia has given the Division of Soil & Water Conservation the responsibility to develop the state's 319 program, the Division has engaged a wide range of agencies and existing programs for its implementation. The 319 program involves the programs of thirteen state agencies and four federal agencies, in addition to planning district commissions, soil and water conservation districts, and local governments. Table 8 lists the agencies and their responsibilities; it also illustrates the institutional complexity of the program.

This approach can be efficient as it takes advantage of existing legislation, resources, and experience to fashion a comprehensive program. However, there are limitations. The approach requires extensive coordination and program monitoring, and unless the lead agency has considerable authority to strong-arm other agencies, the effectiveness of the approach depends on the commitment of participating organizations. This is especially true for Virginia's program, which, despite certain regulatory components, is largely voluntary.

The 319 program focuses on eight different nonpoint sources, which are listed in Table 9 along with a summary of their pollutants and the program's goals. One major goal of the program that appears repeatedly on this list is a 40 percent reduction in nutrient loading to the Chesapeake Bay. This goal is taken from the state's Chesapeake Bay Preservation Act, and is founded on the Chesapeake Bay Agreement. In addition, the state's toxic program has a goal of zero toxics entering the Bay.

Agricultural NPS Plan. Perhaps the most complex of the 319 program's nonpoint source management plans is that for agriculture. It aims to coordinate and enhance a range of existing state and federal programs. There are several basic elements to the *Agriculture Plan*, given below along with implementing agencies:

A. State incentives for using BMPs:

- Virginia Agricultural BMP Cost-Share Program for farmers (\$1.2 million within Chesapeake Bay basin; \$0.5 million outside) (DSWC, SWCDs);
- Virginia Conservation Tillage Income-Tax Credit.

The 319 Plan calls for legislation requiring land enrolled in use-value tax assessment to have approved conservation plan.

B. Federal incentives for using BMPs:²⁵

- Agricultural Conservation Program (ACP) (cost-sharing to farmers, \$3 million per year in Virginia; special water quality projects);
- Conservation Reserve Program (CRP) (cost-share for expenses plus annual payment to farmers to convert highly erodible cropland to permanent grass and trees, \$2-3 million per year in Virginia; requires approved conservation plan by January 1, 1990, full implementation of plan by 1995, or loss of all benefits [37,000 plans expected in Virginia]);
- Rural Clean Water Program (Nansemond-Chuckatuck watershed project [one of 21 RCWP experiments nationwide] involves cost-share contracts with farmers to implement plan developed by SCS).

²⁵ These federal programs were enhanced by the 1990 Farm Bill, CRP eligible lands were expanded to include, in addition to highly erodible land, croplands that contribute to water quality impacts and conservation priority areas (e.g. Chesapeake Bay). The Water Quality Incentives Program will pay farmers to implement SCS-approved plans to reduce water pollution. The Wetlands Reserve Program will provide compensation for retiring wetlands from agricultural use (*Water News* 1991).

Table 8 Virginia Nonpoint Pollution Management Program, Implementing Agencies and Responsibilities

AGENCY	ABBR	AGRI	FOR	CONST	URBAN	RES EX	LND DI	HYD MO	OTHER
Division of Soil and Water Conservation	DSWC	FMPRT	FPRT	EPRT	PRT	P	P	EPT	P
State Water Control Board	SWCB	EMT	M	M	EM	M	EMT	EMT	EMT
Department of Forestry	DOF		EFPT						
Department of Mines, Minerals and Energy	DMME					EFPT			
Virginia Department of Transportation	VDOT			EPT				EPT	EPM
Department of Health	DOH				EPT		ET		
Marine Resources Commission	MRC			ET				ET	
Commission of Game and Inland Fisheries	CGIF			T				T	T
Department of Agriculture and Consumer Services	DACS	EPRT							
Corps of Engineers	COE	P	P	PT	P			P	
Department of Waste Management	DWM						EMPT		
Air Pollution Control Board	APCB								EP
Department of Housing and Community Development	DHCD								EP
Soil Conservation Service	SCS	FPRT	FPRT			FPRT			
Agricultural Stabilization and Conservation Service	ASCS	FPRT	FPRT						
Cooperative Extension Service	CES	PRT	PRT		PRT	PRT	PT		
Tennessee Valley Authority	TVA	FPRT	FPRT			PRT		PRT	
Soil and Water Conservation Districts	SWCD	PT	PT	EPT	PT	P	PT	PT	
Planning District Commission	PDC	PT	PT	PT	PT	PT	PT	PT	PT
Local Government		P	P	EPT	EPT	P	EP	P	EP
Areawide Water Quality Planning Agency		MRPT	MRPT	PT	MRPT	P	P	P	P

E - Enforcement (regulation); F - Funding (of BMPs); M - Monitoring; P - Planning; R - Research;
T - Technical Assistance/Education

Table 9 Summary of Virginia NPS Sources and 319 Program Goals

Source	Pollutant	Goal (Date)
Agriculture	Nutrients to CB Nutrients to other rivers Erosion Fertilizer/An. Wastes Pesticides	40% reduction (2000) Attain water quality standards (2000) Cons. Plans on all "T" Lands (2000) Cons. Plans for highly erodible (1995) Nutrient Management Prog (1990) Pesticide Management Prog. (1990)
Forestry	Sediment/Nutrient to CB Several Several	40% reduction (2000) Monitor & evaluate (1989) Minimum BMPs on all forestry operations Preharvest plant for 90% of cutting (1995)
Construction	Sediment	Effective E&S Control on 75% of construction (1995) on 95% of construction (2000)
Urban	Nutrients to CB Several Several	40% reduction (2000) Promote comp. plans and zoning ord. for NPS control, BMPs Identify urban priority watersheds; promote BMPs in land use regs
Resource Extraction	Sediment	Reduce impacts by BMPs, site planning Reduce erosion on abandoned/orphaned mine land
Land Treatment & Disposal	Organic Wastes Bacteria Nutrients Toxics	Effective regulatory programs to control wastes for public health & water quality
Hydrologic Modification	Sediment	BMPs in all permitted hydro. modifications
Other sources: Air deposition Underground Storage Tanks Highway De-Icing Chemicals Spills - Pollution Remediation	Several	Identify & quantify sources and minimize effects.
Source: DSWC 1988/1989b.		

All three programs are run by ASCS, with SCS technical assistance, and currently involve 5,000 farmers and 100,000 acres. The Virginia 319 Plan calls for focusing the ACP on water quality problems, coordinating cost-sharing with DSWC, and expanding programs (e.g., increases CRP goal of 100,000 acres to 200,000; suggests state funds for federal CRP and possibly state CRP).

C. Federal agricultural conservation planning by SCS:

- traditionally has focused on on-farm benefits, now emphasizes off-farm water quality benefits.

D. Federal watershed protection projects:

- Nomini Creek and Owl Run demonstration watershed projects to be completed in 1995. (SCS, DSWC)
- 9 existing projects funded, 10 new projects recommended under 319 Plan by 2000 in Virginia (total cost \$20 million).

E. State pesticide and fertilizer management:

- Pesticide product registration, complaint investigation, applicant certification, monitoring (VDACS) (predates state Pesticide Control Act)
- Fertilizer product registration, complaint investigation (VDACS)
- A new Nutrient Management Program for fertilizer and animal wastes to reduce NPS pollution (initiated in 1989 by DSWC). Goal of 319 plan: 500 new nutrient management plans per year.

F. **Feedlot regulation:**

- VWCB VPDES or VPA permits.

G. **Enhanced data and information:**

- VirGIS complete for Chesapeake Bay drainage by 1995, statewide by 2000.
- Soil mapping, soil surveys (statewide by 1996), digitized soil surveys. enhanced field guides. (SCS, DSWC, VPI&SU, CES)

H. **Technical assistance, demonstrations, research:** S&WCD, CES, SCS, VPI&SU

Urban and Construction Plans. While the agricultural NPS program does not involve local governments directly, they play a key role in the 319 plans for construction and urban runoff. The Construction Plan relies almost entirely on the Erosion and Sediment Control (E&SC) Law. The DSWC oversees implementation of the erosion and sediment regulations, and other state agencies, such as the Department of Transportation, must apply the regulations in their construction activities. Local governments implement the regulations for private construction within their boundaries. Each local government that implements the E&SC regulations is designated the management agency for the Construction Plan in its jurisdiction. The erosion and sediment control program is discussed in greater detail in the next section.

Local governments are also the management agencies for the Urban Plan. In addition to the erosion and sediment controls, the plan suggests a range of local measures designed to reduce NPS pollution from established urban areas, as well as newly developing areas. These are highlighted in Table 10.

With the exception of erosion and sediment controls, and those communities regulated by Chesapeake Bay Preservation Act (CBPA), the implementation of these measures by local governments is voluntary. Localities are "urged" to sign a "memorandum of understanding" with VDCR to develop and implement an urban NPS control program. The 319 Plan indicates that local NPS controls may require state enabling legislation; however, it appears that enactment of 1988 and 1989 laws enabling local planning and zoning to protect surface and groundwater and establishing stormwater management regulations, may have provided that authority.

The Urban Plan also involves several other agencies, including the planning district commissions (for developing regional studies and plans and assisting district localities); the Chesapeake Bay Local Assistance Department (for CBPA localities); the DSWC (for providing oversight, information, research, demonstration; developing a new Urban BMP handbook; designating urban NPS priority areas by 1992); the VWCB (implementing urban stormwater VPDES permit requirements); the VDH (regulation of boat and marina sanitation and shoreline sanitation in shellfish areas); and others.

Other Plans. The Forestry Plan involves coordination with some of the agricultural programs involving tree-planting BMPs described above, as well as programs of the Virginia Department of Forestry (VDF), the U.S. Forest Service (for National Forest lands), and VPI Cooperative Extension Service (including education and technical assistance). VDF determines eligibility for the federal Forestry Incentives Program (cost-share funds for forestry projects) and administers the state Reforestation of Timberland Program (TP) (cost-share for landowners to reforest unproductive area to pine). The 319 Plan calls for the VDF to develop a new Forestry BMP handbook, incorporate BMPs in its operations and programs, enhance BMP awareness and training, require BMPs for RT payment, and develop a system to monitor and report annual water quality improvements. The Plan establishes sedimentation reduction goals of 10 percent by 1991, 30 percent by 1995, and 40 percent by 2000; if the goals are not met, legislation for mandatory BMPs for silvicultural activities is to be proposed.

Table 10 Suggested Local Government Measures for Urban NPS Control Under 319 Plan

- **For Established Urban Areas**
 - A. Establish local depositories for used oil.
 - B. Implement solid waste plans, including litter control, household hazardous waste collection, recycling.
 - C. Enact tree preservation ordinances.
 - D. Adopt state stormwater management regulations (see Section 6).
 - E. Consider ordinances affecting connection of roof drains to sewers.
 - F. Improve existing sanitary sewer systems.

- **For Developing Areas**
 - A. Development Plan Review
 - 1. Control stormwater runoff access quality and quantity to predevelopment levels.
 - 2. Adopt modelling or worksheet techniques to assess quality or peak flow impacts of proposed developments.
 - B. Planning and Capital Improvements
 - 1. Conduct or contract for watershed inventories or comprehensive watershed management plans in jurisdiction or on regional basis.
 - 2. Incorporate NPS concerns into comprehensive plans and zoning and subdivision ordinances.
 - 3. Inventory areas for high potential NPS or high sensitivity to NPS impacts (e.g., wetlands, streams and lakes, floodplains, aquifer recharge areas--see definition of Chesapeake Bay Preservation Areas in following section).
 - 4. Control development in sensitive areas through conservation easements or use of proffers.
 - 5. Use extensions of water and sewer and other public services to steer development away from sensitive areas and into more suitable areas.
 - C. Zoning
 - 1. Require large lots or otherwise reduce densities in sensitive areas to limit impervious area of new development.
 - 2. Designate "sensitive area overlay districts" with special requirements.
 - 3. Permit clustering and planned unit developments in suitable areas of a site to retain sensitive areas as open space.
 - 4. Specify lot coverage requirements such as maximum percent impervious area to reduce runoff, enhance infiltration.
 - 5. Use performance zoning specifying performance requirements of new development.
 - 6. Add zoning ordinance provision requiring in the site plan, an NPS and stormwater assessment and BMP control. Requires that locality include site plan approval as part of review process.
 - D. Subdivision Regulations
 - 1. Restrict platting sensitive areas.
 - 2. Require a NPS assessment and BMP control plan with preliminary plat.
 - E. Tax Incentives
 - 1. Reduce assessment on lands used to prevent or abate NPS pollution. (Requires enabling legislation.)

Source: DSWC 1988/1989b.

The Resource Extraction Plan cites the Department of Mines, Minerals and Energy's regulation of surface mining, administration of the Abandoned Mine Land reclamation program, and development of water quality information systems, as well as the Powell River Project's research and technical assistance. The plan for hydrologic modifications promotes the incorporation of BMP requirements in VWCB's 401 permit certification (Virginia Water Protection Permit, see section 6.2) for dredge and fill discharges, construction of impoundments, and channel modifications.

Some of the other 319 plans involve local governments. For example, while the plan for land treatment and disposal emphasizes state regulatory programs for septic systems (VDH), landfills (DWM), lagoons (VWCB), and land application of wastes (VWCB), local approval is necessary for land application, and localities can regulate the siting of landfills and lagoons through zoning or special use permitting.

Effectiveness of Virginia 319 Plan. It is too early to assess the actual effectiveness of the 319 plan, but some analysts have been critical of the plan's voluntary nature, limited involvement of VWCB, lack of relationship to water quality standards, and emphasis on a jurisdictional rather than a watershed approach. A detailed review was provided in the Natural Resources Defense Council's book, *Poison Runoff* (Thompson 1989); a summary of the critique is provided in Appendix B.

Erosion and Sediment Control Act

Virginia's Erosion and Sediment Control Law²⁶ (ESCL) provides one of the few regulatory components of the state's NPS control program. Administered by the DSWC, the program provides unusual state government involvement in local private land use. However, the program is implemented by local governments with the assistance of Soil and Water Conservation Districts, and prior to 1988, DSWC had limited authority or ability to effectively oversee local programs.

The program was evaluated by separate studies in 1987 and 1988 which identified several limitations and led to long lists of recommended changes (Cox and Herson 1987; DSWC 1988). Among the limitations cited were the following:

- Considerable variation in local implementation, ranging from "aggressive" to "avoidance," because of varying local staffing and expertise²⁷ and local political climates for land use control.
- Lack of state oversight of local programs because of limited DSWC staffing (2 FTE prior to 1988) and limited DSWC authority to force local action.
- Limited penalties for violators and lack of local judicial support to enforce meaningful fines; enforcement needs larger penalties, ability to issue stop-work order (provided by 1986 amendments), and requirements for performance bonds.
- Exemptions for agriculture, silviculture, and developments less than 10,000 sq. ft. limit the program's effectiveness.

Based on these evaluations, the ESCL was amended in 1988. New Erosion and Sediment Control Regulations²⁸ were adopted, effective September 13, 1990. Local programs must contain regulations consistent with nineteen specific standards but they are also granted authority to adopt more stringent regulations. The standards range from soil stabilization to the use of a sediment basin for drainage areas greater than 3 acres to stormwater runoff control to protect downstream properties and waterways. Those proposing regulated land-disturbing activities must submit for approval a control plan consistent with the standards. Following plan approval and installation of controls, certified local officials must inspect the work immediately following installation, at least once every two weeks, within 48 hours after a storm, and at completion of the project. Localities may charge a fee to developers to cover the costs of services (up to \$1000), and plans must be accompanied by a performance bond. Violations of the plan can be enforced by criminal action subject to a maximum \$1000 fine

²⁶ Virginia Code, sec. 10.1-560, *et seq.* originally passed in 1973, the ESCL was most recently amended in 1986 and 1988.

²⁷ In a 1985 survey of S&WCD, more than 80% of respondents believed that localities within their districts did not have technical expertise to properly administer the ESC program (DSWC 1988).

²⁸ VR 62-02-00

and 30 days in jail, civil action for damages (maximum \$2000), and court injunction. Most exemptions, however, were retained in the 1988 amendments. The 1990 General Assembly gave authority to counties with the executive form of government to apply E&SC to single family residences (HB 861).

The DSWC believes that with the force of specific "regulations" (rather than guidelines), more DSWC staff (20 FTE), improved local enforcement authority, and technical certification of local officials, the state's program will better respond to erosion and sediment control needs. The proof will come in local government implementation.

Local Watershed Protection

An important application of nonpoint source controls is in watersheds of water supply reservoirs. The integrity of the reservoir requires maintaining the quality of contributing surface and subsurface runoff, which in turn requires control of land use and development in the watershed. Without adequate protection, degradation of reservoir water quality from nonpoint sources can result to the extent that the resource can be lost, and costly alternative supplies must be found. The responsibility for this watershed protection falls squarely on the shoulders of localities.

If the watershed is entirely within the jurisdiction of the local government, the locality has the ability to control land use that may impact its resource. The local government must recognize these potential impacts, be able to develop effective land use controls and have the political will to implement them. The controls include the NPS measures listed in Table 10; for small drainage basins public ownership of watershed lands can offer the ultimate control.

However, watersheds are not always completely within the locality's boundaries, and in some cases a community's water supply reservoir may actually be in another jurisdiction. In such cases, multi-jurisdictional agreements must be fashioned if necessary land use controls are to be implemented and enforced.

There are a number of useful examples of local watershed management in Virginia dealing with interjurisdictional conflicts and agreements, land-use control options, and technical experience with BMPs and analytical models. Offering a range of lessons for other localities, they are described in companion reports. For example, overlay zoning districts for water supply reservoir protection are being used by several localities including Fairfax County, James City County, Spotsylvania County, and York County (see report on regulatory options). The comprehensive watershed management programs developed for Dragon run in the Middle Peninsula PDC and is discussed in the report on multijurisdictional agreements. In addition, the Casebook contains a case study on efforts to protect the Occoquan watershed. The unique example of watershed protection in Albermarle County and Charlottesville is discussed in the accompanying box.

5.4 Chesapeake Bay Restoration and Preservation

Watershed management is also needed to protect larger water bodies. The scale and complexity of the necessary management program seems to grow exponentially with the area of the watershed: the number and variety of pollutant sources expands, as does the range of political jurisdictions. A case in point is the Chesapeake Bay. The country's largest and most productive estuary, the Bay drains a substantial portion of the Mid-Atlantic region. As a result, it has been the receiving water for a range of municipal, industrial, and runoff pollutants, especially nutrients which have severely degraded the quality of the Bay and its aquatic life. In the mid-1980s, Virginia joined Pennsylvania, Maryland, and the federal EPA in developing the Chesapeake Bay Agreement, an interstate effort to protect and enhance the quality of Bay waters.

Albemarle County/Charlottesville Watershed Protection

Albemarle County and the City of Charlottesville have a unique program in Virginia for comprehensive watershed protection. The program was initiated in the mid-1970s in response to algal growth, siltation, and taste and odor problems in the area's largest water supply reservoir, the South Fork Rivanna Reservoir. The South Fork Rivanna Watershed, in which the reservoir is located, contains three of the county's five water supply reservoirs and encompasses nearly one-third of Albemarle County's land area (Norris and Yager, 1984). The diversity of sources that potentially contributed to the degradation of the watershed's water quality—including industrial wastes, septic systems, agricultural wastes, and urban stormwater (Norris and Yager, 1984)—suggested a comprehensive approach to planning and watershed management.

A water quality management study of the South Fork Rivanna Reservoir, conducted between 1975 and 1977 by the Rivanna Water and Sewer Authority, recommended a comprehensive watershed management plan to address point source and nonpoint source controls, watershed management, and water quality monitoring. As a first step in bringing about the envisioned watershed management plan, the Albemarle County Board of Supervisors enacted a Runoff Control Ordinance in 1977. This ordinance utilized performance standards for nutrient and sediment control from land development activities. Also in 1977, the county formed a Watershed Management Plan Committee comprised of representatives from a wide range of agencies and interest groups. The Committee suggested several actions that could bring the watershed plan to fruition, including the creation of a Watershed Management Official position, the incorporation of watershed management goals into other county programs, and the enactment and enforcement of erosion and sediment control measures.

The Watershed Management Official's office was created in 1980, funded by water rates collected by the Rivanna Water and Sewer Authority (although the office is administratively part of the county government). The Watershed Management Official is responsible for coordinating erosion and sedimentation and stormwater control ordinances, developing education materials, promoting best management practices for agriculture and development to land owners, coordinating the activities of state, federal, and regional agencies, and studying possibilities for improvements in existing programs and ordinances.

In addition to creating the Watershed Management Official position, Albemarle County also undertook some planning and zoning measures to help protect the watershed, including the rezoning of much of watershed's land to low-density uses and the amendment of the County's Comprehensive Plan that removed all water supply watershed land from growth or urban area designation. A Clean Lakes Project, funded by federal grants, has implemented a host of best management practices for agriculture and highways in the South Fork Rivanna's major subwatershed. The county is also involved in planning for and protecting the land around a new water supply impoundment.

The watershed protection program emerged through a spirit of cooperation between Albemarle County and the City of Charlottesville. Every step of the way, difficult issues of cost allocation had to be, and continue to be, addressed. The program's design also rested firmly upon the foundation provided by several technical studies and the input from many agencies, citizens, and community groups. The integration of the program's activities into one Watershed Management Official's office is unique in Virginia, and more than fifteen years of land use planning, study, and interjurisdictional negotiating were required to bring the program to its present state.

The Agreement resulted in a number of programs including the Virginia Agricultural BMP Cost-Share Program discussed earlier. But the focus of Virginia's efforts to "save the Bay" came in the 1988 enactment of the Chesapeake Bay Preservation Act.

In developing the Act, the General Assembly realized that only through effective and widespread land use controls to reduce NPS pollution could the goals and objectives of the Agreement be achieved, and that local governments must play the leading role in implementing them. To assist local governments in this task, the Act established the Chesapeake Bay Local Assistance Board (CBLAB), with staff support from a new Chesapeake Bay Local Assistance Department (CBLAD). The Board is responsible for formulating, adopting, and updating criteria for (a) local delineation of, and (b) management of land use and development within Chesapeake Bay Preservation Areas (CBPA) to prevent further damage to the quality of the Bay and its tributaries.

The program focuses on the Tidewater area shown in Figure 3, which includes 29 counties, 17 cities and 43 towns in nine planning districts. The Act called for the Board to establish regulations for local governments in the region and to assist the localities in implementing them. After a five-month review process, the regulations were adopted by the Board and became effective on October 1, 1989. Tidewater localities were given a year from that date to adopt the criteria and two years to fully integrate them into their local governments outside of plans and ordinances. Local governments outside of Tidewater may voluntarily adopt the regulations.

Summarized in Table 11, the regulations have three basic elements: (1) specific local requirements and deadlines for adoption, (2) criteria for designating local Chesapeake Bay Preservation Areas (CBPA), and (3) performance criteria for land use and development in CBPA. The CBPA are divided into Resource Protection Areas (RPAs) which have special water quality value (e.g., tidal wetlands, tidal shores) and Resource Management Areas (RMAs), which are less sensitive than RPAs but still may impact water quality. Areas outside of designated RPAs and RMAs are not subject to the regulations.

Areas within RPAs and RMAs that have existing development designated as Intensively Developed Areas (IDAs) may be redeveloped so long as the applicable performance criteria are met. Other non-IDAs that have existing development may also be redeveloped.

To assist localities in implementing the standards, CBLAD had a staff liaison assigned to each of the nine planning districts. It is providing maps and other information and developing a Local Assistance Manual which is being provided to the local governments in installments (CBLAD 1989). Matching grants are also provided to local governments, PDCs, and soil and water conservation districts to assist in program implementation. In July 1990, CBLAB awarded \$1.7 million in such grants (CBLAD 1991).

The Chesapeake Bay Preservation Act program is a major departure from Virginia's traditional approach to land use control. While as a Dillon's rule state, Virginia must grant specific authority for local regulatory powers, it has actually mandated very little of local land use control -- until this Act. Local governments are being required to implement state-directed regulations in their control of land use and development. As might be expected in such a departure from tradition, implementation has not been without complications, legal challenges, and delays. As the first 12 month deadline passed, not all localities had adopted the first year requirements.²⁹

²⁹ As of January 1991, half of the Tidewater counties and cities -- and a third of all jurisdictions when towns are included -- have adopted programs. Localities with adopted programs include the cities of Norfolk, Portsmouth, Hopewell, Colonial Heights, Williamsburg, Petersburg, Newport News, Suffolk, Fairfax, Virginia Beach, Hampton, Falls Church; the counties of James City, York, Westmoreland, Richmond, Northumberland, Lancaster, Northampton, Chesterfield, Hanover, Isle of Wight, Prince William; and the towns of Smithfield, Cape Charles, Warsaw, Ashland, Irvington, Kilmarnock, White Stone, Colonial Beach. Another eight counties and two cities have completed programs which await adoption (CBLAD 1991).

Figure 3: Chesapeake Bay Preservation Act Localities

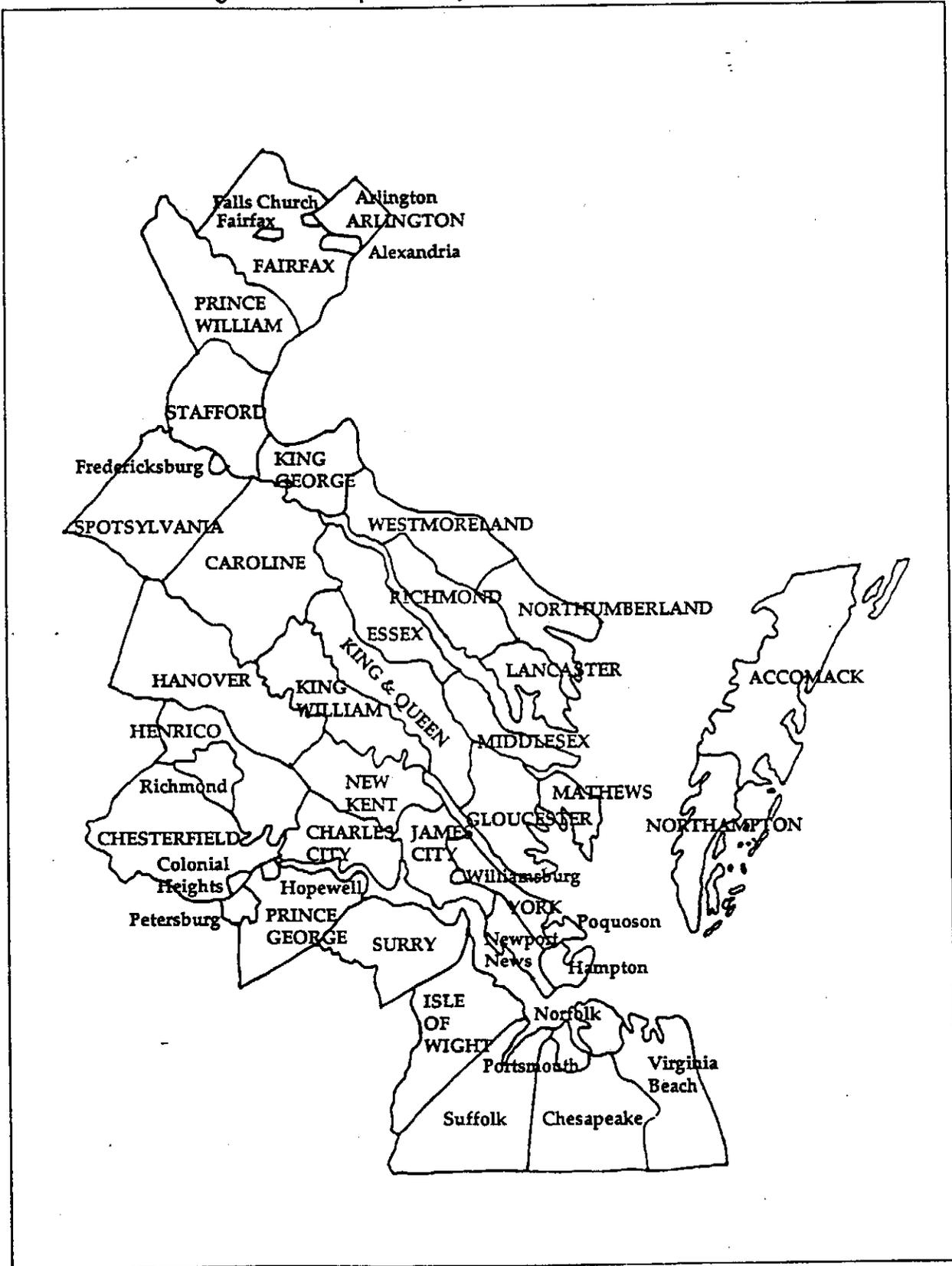


Table 11 CBLAB Regulations for Local Land Use Control

- A. Local Government Program Requirements (with deadline for adoption after October 1, 1989)**
1. Map delineating local Chesapeake Bay Preservation Areas (CBPA) (12 months)
 2. Local performance criteria for CBPA (12 months)
 3. Comprehensive plan or revision that incorporates protection of CBPA (24 months)
 4. Zoning ordinance that (a) incorporates measures to protect water quality in CBPA and (b) requires compliance with performance criteria (24 months)
 5. Subdivision ordinance that respond to 4(a)&(b) (24 months)
 6. Erosion and sediment control ordinance that requires compliance with performance criteria (24 months)
 7. Plan of development process prior to issuance of building permit to assure use and development in CBPA accomplished in manner that protects water quality. (24 months)
- B. Designation Criteria for Chesapeake Bay Preservation Areas**
1. Resource Protection Areas (RPA) (sensitive areas with intrinsic water quality value)
 - a. tidal wetlands
 - b. non-tidal wetlands connected to tidal wetlands
 - c. tidal shores
 - d. other lands with intrinsic water quality value
 - e. buffer area at least 100 feet landward of above areas and on both sides of tributary streams
 2. Resource Management Areas (RMA) (areas outside of RPA with potential water quality impacts)
 - a. floodplains
 - b. highly erodible soils, steep slopes
 - c. highly permeable soils
 - d. non-tidal wetlands not included in RPA
 - e. other lands necessary to protect water quality
 3. Intensively Developed Areas (IDA) (developed areas as an overlay to CBPA available for redevelopment where little natural environment remains)
 - a. existing development has more than 50% impervious cover, or
 - b. public water and sewer currently serves the area, or
 - c. housing density at least 4 dwelling units per acre.
- C. Performance Criteria for Chesapeake Bay Preservation Areas**
1. General Performance Criteria
 - minimize land disturbance, indigenous vegetation removal, impervious cover; ensure BMP maintenance;
 - land disturbance > 2500 sq. ft. requires plan of development review and E&SC compliance;
 - septic system pump out at least every 5 years plus full-size reserve drainfield;
 - post-development NPS runoff load shall not exceed pre-development; redevelopment requires additional 10% reduction if no existing BMPs;
 - agricultural activities require soil and water quality conservation plan by 1995;
 - silvicultural activities are exempt, provided they follow BMP Handbook;
 - evidence of wetlands permits, if required
 2. Additional Criteria for Resource Protection Areas
 - a. only water-dependent development in RPA or redevelopment of existing development allowed.
 - b. Buffer area requirements: 100 feet of vegetation effective in retarding runoff, preventing erosion, filtering NPS pollution; retain if present, establish if not; or at least 50 feet of vegetation plus BMPs for equivalent of 100 feet.
 - i. buffer maintenance required
 - ii. if buffer precludes prior recorded buildable lot, buffer may be reduced if reduction minimized (but no more than 50 feet) and additional buffer provided elsewhere on lot.
 - iii. Redevelopment within IDA may be exempt from buffer requirement, but consideration should be given to establishing buffer over time.
 - iv. On agricultural land, buffer may be reduced to 50 feet if enrolled in BMP program that provides equivalent of 100 foot buffer; or to 25 feet if soil and water conservation plan that provides equivalent of 100 feet. Buffers not required for agric. drainage ditches if adjacent lands have BMPs and conservation plan.

The effectiveness of the program requires a commitment of the localities involved, and that commitment may take some time to develop. Richmond County provides a good example of a jurisdiction that, with assistance from the Chesapeake Bay Foundation, undertook a successful process to develop commitment. (See Richmond County case study.) The fail-

ure of most of the localities to meet deadlines based on perceived needs rather than local capabilities should not be construed as a significant failing of the program. Efforts to weaken certain elements of the program in the 1990 General Assembly did not gain enough support.³⁰ However, similar legislative initiatives backed by agricultural and development interests, may be expected in 1991. Despite this political pressure, Governor Wilder has pledged his continuing support of the program.

Table 12 summarizes the local role in managing surface water quality.

Table 12 Local Role in Surface Water Quality

<p>Nonpoint Source Control</p> <ul style="list-style-type: none">• Participation as lead agencies for urban and construction elements of state non-point source control program• Effective implementation of erosion and sediment control ordinances• Land use controls for watershed protection: BMP requirements, overlay districts, clustering provisions, etc. (see Table 10) <p>Chesapeake Bay Localities</p> <ul style="list-style-type: none">• Effective implementation of Chesapeake Bay Preservation Act regulations <p>Local Monitoring/Cleanup of Surface Water</p> <ul style="list-style-type: none">• Citizen action: Adopt-a-Stream/Save-Our-Streams programs• Stream bank clean-up programs: illegal dumps and litter control

6. SURFACE WATER QUANTITY

6.1 Flood Damage Mitigation

Another water-related problem with a strong connection to land use concerns stormwater flows and flooding. Virginia has experienced several major floods in the past two decades -- most developing from significant rainfall on the heels of tropical storms and hurricanes. While these floods caused considerable damage in low-lying areas across the state, they were especially severe in the mountains where flash floods caused significant loss of life. Communities along the steep hollows of Southwest Virginia, along the Upper Roanoke and James Rivers and their tributaries, and in the Shenandoah Valley are very susceptible to damaging floods.

Considerable investment has been made in major flood control structures, most planned and constructed by the U.S. Corps of Engineers and other federal agencies. While these projects have mitigated the effects of major storms, damages and loss of life have continued to mount with each successive flood.

Increasingly, federal, state and local officials alike have recognized that flooding damages are linked to land use, and that effective mitigation of future damages requires land use control. Land use affects flooding damage in two ways. First, encroachment of development onto flood-prone areas puts more property at risk. And second, land development in the watershed, with its accompanying smooth and impervious surfaces on roads, parking lots and roof tops, increases the volume of stormwater runoff (by reducing infiltration) and, more importantly, the rate of accumulation of that runoff. What results from this urbanization is

³⁰ HB 908 aimed to exclude certain lands from CBPA requirements; SB 145 aimed to use state funds to cover local costs of implementation.

greater peak storm flows, faster accumulation, higher water elevations, and more severe flooding downstream than before urbanization. With more frequent, higher flows comes higher water velocities which increase channel erosion downstream. More frequent flooding and erosion usually increases cries for channelization of waterways, which can destroy natural channels and further increase peak flows downstream.

Therefore, effective management of stormwater and flooding requires control of development in flood plains to prevent encroachment, and control of watershed development to mitigate its effects on peak flows. Virginia local governments have engaged in flood plain management for some time. Comprehensive stormwater management has been implemented in only a few jurisdictions, but recent legislation aims to increase this activity statewide.

Flood Plain Management

One of the few federal programs influencing private land development in localities is the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Administration (FEMA). Because private flood insurance is not available, the federal government established a program offering insurance at subsidized rates to property owners in flood prone areas. Realizing that such a program can encourage counter-productive flood plain development, the program was accompanied by provisions for flood plain management. To enroll in the NFIP, localities must develop and implement flood plain zoning to control development in flood-prone areas. Only by enrolling in the NFIP can a community's residents obtain flood insurance. In addition, if a community does not enroll in the NFIP, no federal support (including grants, loans and even mortgages from federally-insured financial institutions) can be provided for any development in flood-prone areas. Thus, there is a substantial incentive (i.e., flood insurance for residents) for communities to participate in the program and an even greater disincentive (i.e., threatened withdrawal of federal support) if they do not. As a result, nearly all flood-prone communities nationwide and in Virginia participate.

The specific FEMA requirements for flood plain management area summarized in Figure 4. The 100-year flood plain is divided into the floodway and the floodway fringe. New development is prohibited in the floodway but is allowed with raised elevation or flood proofing in the floodway fringe. To assist localities in implementing the regulations, FEMA provides a series of Flood Hazard Maps delineating all floodways and fringes in the community. In addition, Flood Insurance Rate Maps are developed which show the variable rates based on location within the flood-prone areas.

In theory, the regulations are effective in controlling new development to mitigate damage from the 100-year flood, or that having a 1% chance of occurring in any given year. However, the regulations do nothing to protect existing development. In addition, with their single objective of mitigating flood damages, the regulations encourage development and filling in the floodway fringe, which may have certain environmental values (e.g. riparian habitat) or vulnerabilities (e.g. to nonpoint source pollution).

But like most local programs directed from above, the effectiveness of the flood plain management program to achieve its stated objective depends on local implementation -- not only on local governments' adoption of a flood plain zoning ordinance but on how it uses that ordinance in practice. Does it refuse to grant building permits for floodway developments, does it strictly enforce flood proofing in the flood fringe, or does it easily grant variances or exceptions? FEMA does not provide substantive enforcement of the program and depends primarily on state oversight of local programs.

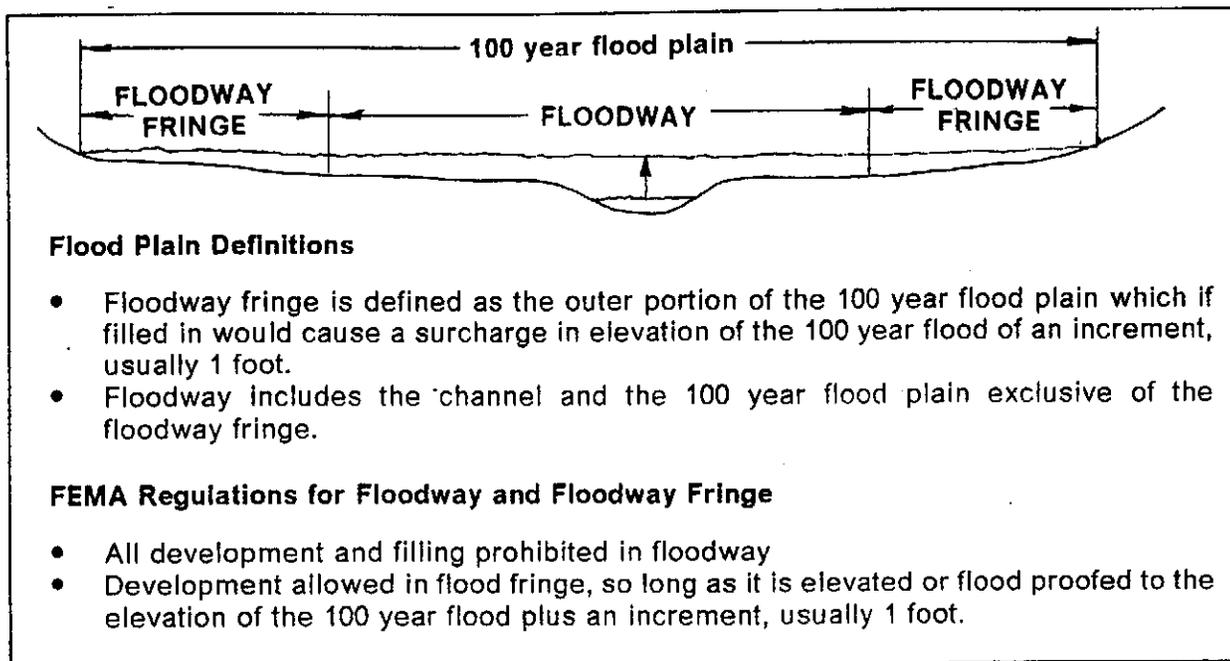


Figure 4 FEMA Requirements for Floodplain Management under the NFIP

In Virginia, until 1989, the VWCB had primary state responsibility for implementing the FEMA program, but the Department of Emergency Services (DES), under a cooperative agreement with VWCB and FEMA, provided the oversight of community programs. In 1989, the General Assembly transferred responsibility to the DSWC which now has a staff of four in its Floodplain Management Section.

The major oversight mechanism is a "community assessment" provided by DSWC (formerly DES) staff of each locality enrolled in FEMA's program (including 254 counties, cities, and towns). At a rate of about 30-40 assessments per year, DSWC inspectors visit a locality, physically inspect its flood-prone areas for potential violations, discuss identified problems with local planners, and prepare a report, which is sent on to FEMA.

If the locality is in violation of the rules and not responsive to DSWC recommendations, FEMA can temporarily suspend the community from the program (in which case each resident in the program must pay an extra \$25 per year premium on flood insurance).

The 1989 Virginia legislation also called on DSWC to develop a state flood protection plan in cooperation with other state and federal agencies. The plan is close to completion with a draft expected by March 1991. DSWC staff indicate that the plan will likely recommend new legislative authority to strengthen and enhance the FEMA-based flood plain management regulations, including increasing flood plain elevation protection and incorporating objectives for preservation of natural areas.³¹

Flood Damage Mitigation Projects and Planning

Structural measures to mitigate storm flows and protect property have long been used to lessen the impacts of flooding. The federal Corps of Engineers, Soil Conservation Service, and Tennessee Valley Authority (in far Southwest Virginia) have been the principal agencies involved in flood control project planning and construction.

³¹ William Kalberer, DSWC, Flood Plain Management Section, personal communication, October 1990.

Federal flood control planning is prompted by a local request, usually through a locality's congressional representative. Project planning requires considerable local involvement -- and considerable time. Any federal project requires local approval, especially to guarantee cost-sharing arrangements, and also approval of the state's governor. Federal projects need to include flood damage mitigation as a primary purpose, but may also include provision for recreation and (in dam and reservoir projects) water supply, hydroelectric power, and other purposes. Federal projects must conform to federal environmental laws, especially the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, and the Historic Preservation Act.

Such federal projects can provide great assistance to localities with severe flooding problems, but the communities have to absorb some of the financial burden. Table 13 gives the current cost sharing requirements. The 1989 General Assembly established the Flood Prevention and Protection Assistance Fund to help localities cover the cost-share requirements. In addition, such projects potentially cause substantial environmental impacts and, while the federal agencies are required to balance environmental and economic effects, localities -- especially community groups -- should play an important role in communicating their needs for flood damage mitigation, recreation, and environmental protection.

Table 13 Non-Federal Cost Sharing and Financial Responsibilities for Non-Navigation Civil Works Projects

Project Purpose	Non-Federal % During Construction	Non-Federal % For OMRRR
Structural Flood Damage Reduction	25% or LERRD ¹ plus 5% cash, whichever is greater, up to 50% ^{2,3}	100%
Nonstructural Flood Damage Reduction	25% ^{2,3}	100%
Recreation	50% of separable costs ²	100%
Hydroelectric Power	100%	100%
Municipal/Industrial Water	100% ²	100%
Agricultural Water	35% ^{2,3}	100%
F&WL Enhancement-National	0	25%
F&WL Enhancement-Other	25%	25%
Hurricane & Storm Protection	35% ²	100%
Streambank Erosion Control	25%	100%
Lake Restoration	25%	100%

¹Lands, easements, and rights-of-way, including dredged material disposal areas and facilities and utility alterations and relocations.
²Share above LERRD reimburseable over period up to 30 years.
³Cost sharing subject to ability to pay.
Source: Corps of Engineers, ER-1165-2-131 (15 April 1989).

The DSWC's Dam Safety Program provides for inspection and certification of all dams in the state. This involves not only flood mitigation reservoirs but also hydropower and water supply impoundments.

6.2 Stormwater Management

As discussed above, some flooding results from stormwater flows that are intensified by land development. Efforts to mitigate future flood damages in the watershed can be undermined by land development lacking effective stormwater management.

In Virginia, until 1989, stormwater management has been the responsibility of local government. In fact, it still is, although the state has provided more substantive guidance in the form of revised Erosion and Sediment Control Regulations and a new stormwater management program. In addition, new EPA regulations for NPDES permits for major urban stormwater discharges placed added responsibility on larger cities (see section 5.2). Several localities are developing their own stormwater management programs (see, for example, Roanoke Valley Case Study).

Stormwater Provisions Under Erosion & Sediment Control

Prior to the new erosion and sediment control regulations, the E&SC criteria contained some provisions for stormwater runoff control. They essentially required that damage channels or pipes from developed sites be capable of carrying peak flows from a 24-hour, 2-year storm. Other provisions such as sediment basins and traps, while designed for sediment control, can also mitigate stormwater flows. The new E&SC regulations more explicitly provide for protection of downstream properties and waterways. Yet the actual regulations do not go much beyond the previous criteria. Developers are required to assure that post-development runoff will not exceed the capacity of a natural channel (for a 24-hour, 2-year storm) or of an existing man-made stormwater conveyance (for a 24-hour, 10-year storm).

Managing New Development: Stormwater Management Regulations

In evaluating the E&SC program in 1988, the DSWC recognized the need for more comprehensive stormwater management and recommended additional legislation and regulation to manage stormwater "to prevent increased localized flooding and nonpoint source pollution" (DSWC 1988).

Among several options presented was one alternative allowing localities the option of adopting a local program at least as stringent as a set of state-promulgated regulations.

The General Assembly acted upon this recommendation and in 1989 enacted a comprehensive statewide Stormwater Management Program. It gave DSWC the responsibility of developing regulations which would serve as minimum requirements for local stormwater management programs. Under the law, localities were given the option of developing such a program, but if they did, the new state regulations, at a minimum, would have to apply.

Final stormwater regulations were published in the *Virginia Register* on November 5, 1990 and became effective December 5, 1990.³² They are summarized in Table 14. Under the regulations, post-development runoff volume must be maintained at pre-development levels or less. A building permit may not be issued for non-exempt development until a stormwater management plan is submitted and approved. Exemptions are similar to the E&SC regulations and include mining, agriculture, forestry, single-family residences, and land development of less than 1 acre. Technical criteria provide specific details of required analyses to verify runoff volumes, velocities, and downstream impacts. Water quality is also a major consideration in sizing detention, retention and infiltration facilities. Non-structural measures, such as cluster development and impervious surface restrictions, are mentioned but not emphasized in the criteria.

³² VR 215-02-00

Table 14 Proposed Virginia Regulations for Stormwater Management

A. Purposes and Applicability

1. Purposes:
 - a. Inhibit deterioration of waters and waterways by maintaining post-development runoff quality and quantity, as nearly as practicable, equal to or better than pre-development
 - b. Control NPS, localized flooding, and stream channel erosion through implementation of technical criteria for new development.
 - c. Provide for administrative procedures, maintenance, integration with related programs, and local program report, review, and evaluation.
2. Applicability:
 - a. Each local government that establishes a stormwater management program; existing local programs have one year to comply; localities may adopt more stringent standards if based on comprehensive watershed management study.
 - b. State agency activities must comply after January 1, 1991.
 - c. Exemptions include: mining, agriculture, forestry, single family residences not in subdivisions, land development less than 1 acre.

B. Technical Criteria

1. General Requirements:
 - a. Post-development peak runoff shall not exceed pre-development runoff for 2- and 10-year storm; runoff rates must be verified by calculation.
 - b. Outflows from facilities must go to adequate channel at non-erosive velocities; where necessary, analysis of downstream impacts must be provided and over-detention may be required to prevent flooding or erosion; facilities should avoid floodplains and comply with NFIP as well as other relevant laws and permits.
2. Water Quality Requirements (WQ volume = [first 0.5 inch rain] x [land development area])
 - a. for detention (dry) basin, WQ volume must be released within 30 hours from time of peak storage.
 - b. For retention (wet) basin, permanent pool > 3 times WQ volume
 - c. For infiltration facility, infiltration within 48 hours; invert must be at least 4 feet above seasonal high water table; case-by-case review to avoid ground water contamination.
3. Non-structural measures (e.g. cluster development, minimizing impervious surfaces and curbing; open space acquisition and conservation easements; floodplain management, etc.) "should be coordinated" with structural requirements.

C. Program Requirements

1. Local program and ordinance must comply with technical criteria, be consistent with other state and federal requirements, and be approved by VDCR.
2. No building permit for development may be granted until a stormwater management plan is submitted and approved.
3. Regional watershed planning is encouraged and should include: modeling analysis of development impacts on 2-, 10-, and 100-year storm runoff; recommendations for regional stormwater facilities; requirements for necessary on-site runoff control; and implementation and financing schedule.
4. Administrative Procedures:
 - a. Localities may require a performance bond from developers and may charge them a reasonable fee for administration.
 - b. Thirty days allowed for preliminary review of plans, sixty additional days for review
 - c. Exceptions may be granted, but not for economic hardship
 - d. Maintenance of facilities remains the responsibility of the land owner, unless assumed by local government.
 - e. Inspections of facilities required by local government at least semi-annually and after major storm; if maintenance neglected, local government may perform work and back-charge owner.

Local governments are not required to adopt a stormwater management program, but if they do these regulations serve as requirements. Existing local stormwater programs must con-

form to these standards. Localities may adopt more stringent criteria, but if so, they must be based on a comprehensive watershed management study. Regional multidisciplinary watershed planning and stormwater management are encouraged and guidelines are provided. Local programs need to be approved by the state and must provide for facility maintenance and inspection. Maintenance is generally the responsibility of the land owner and if it is neglected, local government may perform necessary work and backcharge the owner.

Obviously, it is too early to tell how effective this state program will be. Effectiveness depends on how many communities choose to develop stormwater management programs. However, it is a significant step forward for the state effort to manage stormwater resulting from new development.

Managing Existing Development: The Stormwater Utility

The new state program does little, however, to address stormwater problems from existing development. It does "encourage" regional watershed planning and provides useful guidelines to develop recommendations for regional stormwater facilities. However, the major constraint to developing such facilities is financing the cost of land acquisition, construction, and maintenance.

An innovative option for providing such financing that is used in several communities nationwide is the stormwater utility. Like the more familiar water and sewer authority, the utility bills existing property owners a regular fee based on their property's contribution to stormwater runoff, usually computed by their impervious surface area. The revenues are then used to administer stormwater management programs including planning, construction of local or regional facilities, and maintenance.

The 1988 DSWC evaluation report (DSWC 1988) recommended the use of local stormwater utilities, but the current authority of Virginia local governments to impose such fees has been questioned since a 1982 Attorney General opinion. Specific legislation to provide such authority was introduced in the 1990 General Assembly, only to be carried over to 1991. Only with this authority can urbanized localities implement effective comprehensive stormwater management program.

6.3 Protection of In-Stream Flows³³

Although Virginia is generally perceived as a water-rich state, as population grows and the state develops, demands on its waters increase. In some cases growth which induces increased demand, together with dry weather, have led to local and even regional shortfalls of raw water. In other cases, it is projected future water demand that exceeds current supplies. In either case, increasing supply capacity raises the possibility of taking so much water out of streams and rivers that instream uses and aquatic and riparian ecosystems are harmed.

Streamflows in Virginia's streams and rivers are subject to normal variations in the course of a year that can amount to an order of magnitude or more, simply because of seasonal variations in precipitation, soil moisture, groundwater levels, evaporation, and transpiration (uptake by plants). During the high flow months (late winter and spring), there is, in normal years, more than enough water in most rivers to satisfy all instream and offstream uses. It is during the low flow months (roughly July through September) that water availability is at its lowest. Ironically, this is also the period when both instream and offstream demand is highest.

Of course, streamflows may also vary considerably from year to year, and other activities than simple withdrawal of water for offstream use can affect streamflows to the detriment of

³³ This section was prepared by Richard Roth.

fish and wildlife habitat and instream uses. For example, release schedules for hydropower generation, while maintaining a monthly average flow no different from natural flow, may cause abruptly alternating low and high flows, adversely affecting habitat, causing bank and channel erosion, and precluding recreational use. Land use changes in a basin, such as deforestation or urbanization, can exacerbate both flood peaks and summer low flows. The same is true for channelization. Local governments need to be aware of the consequences of land use decisions on instream flows.

Instream and offstream uses differ according to characteristics of each river and its surrounding geography. In a bill enacted by the 1989 General Assembly, instream "beneficial uses" are defined to include "the protection of fish and wildlife habitat, maintenance of waste assimilation, recreation, navigation, and cultural and aesthetic values" (HB 1837, VC Chapter 24, Sec. 62.1-242.). Offstream beneficial uses, according to the General Assembly, include "domestic (including public water supply), agricultural, electric power generation, commercial, and industrial uses." (HB 1837, VC Chapter 24, Sec. 62.1-242.). These offstream uses, in 1986, added up to 20.4 billion gallons per day (gpd). This total includes both consumptive and nonconsumptive uses. Of this, 19 billion gpd were for electric power generation; 542 million gpd were for public water supply; 462 million gpd were for manufacturing; 28 million gpd went to mining; and irrigation used 21 mgd.

Managing Water Withdrawals

Instream flow issues typically arise when a proposal to withdraw a significant amount of water from a stream is made (for example, when a local government proposes to increase its water supply capacity by drawing on a surface water body) or when a proposal is made to build a hydropower facility, or other facility that changes the flow regime. In general, any ongoing withdrawals of water involve the building of some type of structure -- such as an intake structure or a dam -- in the stream. The federal government, under the Clean Water Act (CWA), has asserted its authority to regulate essentially all construction in the waters of the United States. Any such construction requires a permit from the U.S. Army Corps of Engineers under Section 404 of the CWA (33 U.S.C. Sec. 1344). The Corps also has authority over activities that directly affect streamflows under the Rivers and Harbors Act of 1899 (33 U.S.C. Sec. 401-413), which requires a permit for construction in or alteration of the navigable waters of the U.S. Dams and other structures built for hydroelectric power generation are licensed by the Federal Energy Regulatory Commission (FERC) under the Federal Power Act (16 U.S.C. Sec. 791-823(a) (1982)). Of course, just because a permit is required does not mean that instream flow is an issue. If the withdrawal is very small compared to the quantity of water in the stream, the permitting agency will likely find its effects to be insignificant, and, therefore, no instream flow conditions will be attached to the permit.

The State of Virginia, specifically the VWCB, also has permitting authority over any application for a federal license or permit under the CWA. Section 401 of the CWA requires that the applicant for any federal license or permit to construct or operate "facilities, which may result in any discharge into the navigable waters" of the United States, undergo a state certification process. In Virginia, it is the VWCB that certifies that any such discharge will comply with various other sections of the CWA.³⁴ The state may require the incorporation of specific streamflow maintenance standards for such certification, but the VWCB has been reluctant until recently to use this authority to protect such instream values as recreation.

Although Virginia laws regarding the uses of water have historically been weighted very heavily toward economically valuable offstream uses, this has recently changed somewhat. Perhaps because of the general upsurge in environmental awareness and interest in outdoor recreation, support for protection of instream uses has grown. Certainly several local conflicts over streamflow -- for example, the controversy between development interests as re-

³⁴ Specifically, sections 301, 302, 303, 306, and 307.

presented by the Roanoke County government, and a coalition of environmentalists and river recreationists in the upper Roanoke River -- elevated the issue on the public agenda. The growing support for instream flow protection bore fruit in 1989, when the General Assembly passed several laws affirming the state's interest in protecting instream flows.

Prior to passage of these laws, there was continuing controversy and uncertainty over the state's role in protecting instream flows. Virginia has traditionally been a "riparian doctrine" state, and the General Assembly has been reluctant to exercise the state's police power in water allocation issues. The State Water Control Board (VWCB) has studied the issue for many years, but has also shied away from recommending any movement away from the riparian system. As a result, for many years the VWCB's role was limited to ensuring instream flows that would protect water quality, but which did not necessarily take other instream values into account.

1989 In-Stream Flow Legislation. The groundwork for change was laid in 1989, when the General Assembly passed five bills that authorize a higher level of state involvement in streamflow protection. HB 1837 declared instream uses to be beneficial uses for purposes of the State Water Control Law³⁵. HB 1838 gave the VWCB legal standing to intervene in surface water court disputes. HB 1840 authorized the VWCB to collect data on irrigation withdrawals of more than one million gallons per month and other withdrawals of more than 300,000 gallons per month for all other uses.³⁶ This law ends the exemption of irrigators from water withdrawal reporting requirements. HB 1839 established the Virginia Water Protection Permit program, which provides state authorization for the certification process under Section 401 of the CWA. HB 1841 allows the VWCB to establish "surface water management areas" in which consumptive withdrawals are regulated during low flow periods.

While the declaration of instream uses as beneficial uses under the law is considered by some to be the most important of these changes, it is the permitting programs that may be of most immediate concern to local governments. Regulations implementing the water protection permit program are currently under development by the VWCB, and until they are finalized and promulgated, the details of the programs will remain uncertain. Nevertheless, an examination of what the law says will indicate the general direction.

Virginia Water Protection Permit. The Virginia Water Protection Permit (VWPP) program established by HB 1839 provides independent authorization under Virginia statute of the state's Section 401 certification program.³⁷ The issuance by the VWCB of a VWPP constitutes the certification required under the CWA, and in addition requires a determination by the VWCB that the proposed activity "will protect instream uses." The text of the law reaffirms that instream uses are beneficial uses. Domestic use and "existing beneficial uses" are afforded the highest priority in permitting decisions. The text of the law goes on to require the VWCB to consult with several state agencies prior to issuing a permit, and to "grandfather in" water withdrawals in existence on July 1, 1989.

The VWCB issued the draft Virginia Water Protection Permit Regulation³⁸ on September 21, 1990. A permit is required of "any person who proposes the discharge of dredged or fill material into or adjacent to state waters, including wetlands, or proposes to construct an intake for the purpose of withdrawing water from state waters which has the potential to af-

³⁵ Virginia Code Chapter 3.1 Sec. 62.1-44.3 et seq.

³⁶ Virginia Code Chapter 3.1 Sec. 62.1-44.38(C)

³⁷ Virginia Code Chapter 3.1 Sec. 62.1-44.15:5.

³⁸ VR 680-15-02; in early 1991, VWCB staff is reviewing public comments on the draft with the Board expected to act on final regulations in spring 1991.

fect beneficial use of such waters" (section 2.1(A)). Many activities are excluded from the permit requirements.³⁹

For those VWPP activities that would result in alteration of stream flow, VWCB requires the applicant to submit information on instream uses, up- and downstream water users and dischargers, existing withdrawals, specific proposed withdrawals and withdrawal schedule, and other information, such as modeling studies, that will enable the board to determine the effect of the activity on instream uses. Based on this information, the VWCB can include in the VWPP a range of "instream flow conditions," such as withdrawal restrictions at certain times. (See section 7.1 for further discussion of VWPP and possible effects on wetlands protection.)

Surface Water Management Areas. The Surface Water Management Areas (SWMA) program⁴⁰ is a new departure for the state, a recognition that the riparian system for managing water allocation and providing environmental protection fails under some circumstances. It is not completely unprecedented in Virginia law, however, being modeled after the existing Groundwater Management Areas program. Under the SWMA program, either the VWCB acting upon its own volition, any state agency, or any county, city, or town within the proposed surface water management area may initiate a study proceeding that may result in declaration of a surface water management area. Three conditions must be met: 1) the stream in question must evidence "substantial instream values" -- either fishery, recreation, habitat, cultural, or aesthetic; 2) past records or current conditions must indicate the possibility of low flow conditions that could threaten important instream uses; and 3) current or potential offstream uses contribute to or are likely to aggravate low flow conditions, harming instream uses.⁴¹ If, after proper procedures including a public hearing, the VWCB finds it necessary, it is required to declare the area a SWMA.

Within a SWMA, permits are required for all withdrawals of surface water except for: nonconsumptive uses (i.e., most of the water is put back at or near the point where it is withdrawn); withdrawals of less than 300,000 gallons per month; and withdrawals from a wastewater treatment system. Public water supply system withdrawals in effect as of July 1, 1989, and other "existing beneficial consumer" withdrawals in effect by that date may continue their withdrawals without a permit, provided that they have instituted an approved water conservation program.

Permits issued within SWMAs by the VWCB must include a flow requirement -- determined by the VWCB -- that protects beneficial instream uses without "imposing unreasonable burdens" on any individual offstream user or user group.⁴² Permit conditions are not continuously in force, but rather only apply during low flow conditions as determined by the VWCB. As of early 1991, the VWCB has not drafted SWMA regulations, expecting to complete VWPP rules before doing so.

³⁹ Excluded are those for which no 401 permit is required under the Corps of Engineers permitting program; those activities having VPDES, VPA, VDH, VDWM, or EPA permits; "normal" farming, silviculture, and ranching activities; maintenance of existing structures, construction of farm ponds and irrigate ditches; maintenance (but not construction) of farm drainage ditches; construction of temporary sedimentation basins at construction sites; and construction or maintenance of farm, forest, or mining roads where such roads use BMPs.

⁴⁰ Virginia Code, Chapter 24 Sec. 62.1-242 et seq. (1990)).

⁴¹ Virginia Code, Chapter 24 Sec. 62.1-246(A).

⁴² Virginia Code, Chapter 24 Sec. 62.1-248.

Local Involvement in In-Stream Flow Management

Localities with large populations relative to available quantities of easily accessible surface water sources, particularly sources with important instream uses, should be aware of the potential for conflict between offstream and instream uses. Localities that operate water supply systems may find themselves in the position of advocating and planning for increased withdrawals as population grows or as growth is projected and encouraged. They should recognize that surface water sources are not simply resources that can be used up to satisfy short-term needs of agricultural, urban and industrial growth, at least without diminishing the natural heritage of future generations of Virginians. Although water for human consumption is and will remain the top priority for use of water, instream or offstream, protection of instream uses and values may require localities to make an effort to reduce demand. Demand reduction in SWMA's will include both "hard" methods (i.e., installation of water-saving plumbing fixtures and repair of leaky systems) and "soft" methods, such as public education and curtailing of certain uses during water shortages.

The changes in Virginia's laws regarding instream flows should lead localities to look at their water sources -- the streams, lakes, and rivers in their jurisdictions -- differently. They may discover that the river they took for granted and saw merely in terms of "safe yield" or flood threat also has important values as a river -- for recreation, for fish and wildlife habitat, for aesthetics, or perhaps as the centerpiece and unifying feature of a region. The controversies that can arise when proponents of offstream uses and those of instream uses square-off can have a highly desirable side effect, which is to stimulate public discussion about the value of a river in its (more or less) natural state. With this may come an enhanced appreciation of not only the river but those parts of unspoiled nature that remain.

Table 15 summarizes the local role in managing surface water quantity.

Table 15 Local Role in Surface Water Quantity

<p>Managing Floods and Flood Damage</p> <ul style="list-style-type: none">• Flood plain zoning• Flood damage mitigation projects: local sponsor of federal project; local construction <p>Stormwater Management</p> <ul style="list-style-type: none">• Implementation of erosion & sediment control regulations, and state stormwater management regulations• Operator of stormwater utility (when authorized) <p>Protection of Instream Flows</p> <ul style="list-style-type: none">• Local certification of Virginia water protection permit• Consideration of in-stream benefits when planning water withdrawals for public water systems

7. PROTECTION OF WETLANDS, SHORELINES AND OTHER SENSITIVE LANDS

The land-water interface including wetlands, shorelines and riparian lands offers significant environmental and recreational benefits to the Commonwealth. As a result these have become the focus of a number of management programs involved federal, state, and local agencies.

7.1 Wetlands Protection

Virginia boasts over one million acres of wetlands of which three-quarters are non-tidal, mostly forested, wetlands and one-quarter are tidal marshes and flats. As shown in Table 16, more than half of the wetlands area is in the lower Coastal plain.

During the past two decades, natural scientists, government agencies, and the public increasingly have recognized the environmental and economic benefits provided by wetlands -- value for plant, fish, and wildlife habitat, mitigation of stormwater and erosive flows, non-point source pollution control, and passive recreation. As a result, government programs have been developed to protect this land and water resource.

Table 16 Virginia's Wetlands

	Acres	Location (%)			
		Upper Coastal	Lower Coastal	Piedmont	Mtn Valley
Non-Tidal	808,000	22%	28%	22%	5%
- forested swamps	625,800				
- emergent wetlands	63,000				
- shrub wetlands	63,000				
- freshwater ponds	56,200				
Tidal	236,900	--	23%	--	--
- coastal marshes	135,400				
- tidal flats/beaches	101,500				
Total	1,044,900	22%	51%	22%	5%
Source: VWCB 1990a; VDCR 1989.					

Several agencies have been active in identifying and mapping Virginia wetlands. The U.S. Fish and Wildlife Service (F&WLS) has inventoried the state's wetlands as part of the National Wetlands Inventory. More than 150 Virginia wetlands in 73 counties are included in the *F&WLS Wetlands Priority Protection Plan*.⁴³ Also, the Virginia Institute of Marine Science has a tidal wetlands inventory program. The 1989 General Assembly provided funding to the DSWC to inventory and map non-tidal wetlands (VDCR 1989).

Virginia has had a tidal wetlands protection program since 1972, but only recently has attention been drawn to non-tidal wetlands. The following discussion focuses on Virginia's tidal wetlands program, federal and state wetlands permitting, and wetlands provisions of CBLAB regulations.

Tidal Wetlands

The 1972 Wetlands Act established Virginia's tidal wetland protection program administered by the Virginia Marine Resources Commission (VMRC). The program calls for each local government to set up a wetlands board to establish a wetlands ordinance and to require a permit prior to the use or development of a wetland. Certain uses, such as government activities and road maintenance are exempt. The Virginia Institute for Marine Science (VIMS) assists VMRC and the local boards by inventorying and classifying wetlands and developing evaluation guidelines.

⁴³ These wetlands are listed in *The 1989 Virginia Outdoors Plan* (VDCR 1989).

Local boards should grant a permit only if "the proposed activity would not violate the purposes and intent " of the Act and the benefits of the activity exceed its detriment. In the first twelve years of the Act, only 132 permits were denied of 3,454 applications to local boards, but in many cases potential problems had been negotiated before the application was finalized.

Only 31 of the 46 eligible localities have chosen to establish a local program (VWCB 1990); in the remainder, VMRC reviews applications and grants permits directly. In addition, VMRC has authority to review individual permits or denials issued by local boards either on appeal of the applicant or the local government, or on request of 25 residents or the Commissioner of Marine Resources. This standby authority of VMRC has improved the implementation and effectiveness of the program.

In addition to the state tidal wetlands program, the federal 404 permitting and Chesapeake Bay Preservation Act program (both discussed below) also regulate activities impacting tidal wetlands.

Non-Tidal Wetlands

In 1988, the General Assembly considered a bill (HB 1027) establishing a non-tidal wetland permit program similar to the tidal wetlands program. However, it failed to pass. As discussed below, subsequent efforts to improve non-tidal wetlands management have focused on other approaches.

Federal 404 Permitting and State VWPP. The Corps of Engineers and EPA operate the federal wetlands permitting program under section 404 of the Clean Water Act. Federal permits are required for any activity that results in dredging or filling in wetlands under jurisdiction of the program. These so-called "jurisdictional wetlands" are defined as having certain combinations of three basic characteristics: soils, vegetation, and hydrology (Corps of Engineers 1989). Prior to the Chesapeake Preservation Act, federal wetlands permitting was essentially the only substantive mechanism for managing non-tidal wetlands in the State. It is still the only program for wetlands outside of the Chesapeake Bay Preservation Area.

While the federal wetlands permit program has been in operation for fifteen years, it has undergone several changes. One factor affecting its modification over time is the discretion given the Corps, and individual Corps Districts, in its implementation. Another is the evolving influence of the states on the permitting program.

With regard to the Corps discretion, for example, the agency has chosen to exempt certain activities from permit requirements, including "normal" agricultural activities (e.g., plowing, minor drainage), and conversion of less than one acre of wetlands. Other activities are given "general" permits that may be nationwide, statewide, or regional in scope. In other words, applicants simply need to inform the Corps of their activity and do not need a specific permit. One important category of these general permit activities is disturbing between one and ten acres of wetlands. In other words, filling a wetland less than 10 acres needs only a general permit.

A recent example of the Corps' discretion came in a September 1990 announcement that freshwater wetlands cleared of native vegetation and drained for farming before December 1985 will not be regulated under the wetland permitting program. This category involves about 100,000 acres in Virginia (Kerns, *et al.* 1990).

Section 401 of the Clean Water Act gives states the authority to review the 404 permit applications (as well as other federal water permits or license requests), and to certify accordance with state water quality standards and policies. This provision potentially gives the states considerable influence on wetlands permits, and Virginia has recently taken steps to take advantage of this authority. As a result of 1989 Virginia legislation (discussed earlier

under protection of instream flows in section 6), the state aimed to strengthen its 401 certification program through the issuance of a Virginia Water Protection Permit (VWPP).

Under draft regulations⁴⁴ released September 21, 1990, any dredge, fill, or discharge or any alteration of interstate waters, including wetlands, requires a VWPP. The regulations specify that "management of non-tidal wetlands shall be to achieve no net loss in acreage and function over present conditions." The regulations require that permit applications include a description and classification of the wetland and an assessment of its functional value. When finalized and implemented, the VWCB's VWPP provisions will strengthen the federal wetlands permitting program. Already, the VWCB has requested that wetlands impacts under national permit No. 26 (impacts on one to ten acres) be individually certified under 401, and the Corps has supported this condition (VWCB 1990a).

Chesapeake Bay Preservation Area Regulations. As discussed under section 6.4, the Chesapeake Bay Local Assistance Board (CBLAB) local land use regulations provide protection for wetlands. As shown in Table 9, tidal wetlands and non-tidal wetlands connected to them are included in Resource Protection Areas; special buffer provisions are required for these areas. Other non-tidal wetlands are included in Resource Management Areas, in which less stringent protection measures are required for these areas. The draft CBLAB regulations contained provisions for wetland mitigation, but these were deleted in the final version (Kerns, *et al.* 1990).

Concerns have been raised about the adequacy of Virginia's management of non-tidal wetlands (Kerns, *et al.* 1990). As a result of the report of the Non-Tidal Wetlands Roundtable, the 1990 General Assembly called on the Council on Environment to assess the state's non-tidal wetlands programs (SB 277). The VWPP may address some of these concerns.

As discussed above, local government plays an important role in implementing Virginia's tidal wetlands management program and Chesapeake Bay Preservation program which includes wetlands protection. Beyond these state programs, localities may be able to go further to protect non-tidal wetlands. Legislation passed by the General Assembly in 1990, broadened local authority to develop zoning ordinances to protect "lands of significance for the natural environment,"⁴⁵ including wetlands.

7.2 Coastal Zone Management and Shoreline Protection

In addition to wetlands and tidal flats, environmentally sensitive areas include coastal and freshwater shorelines, primary sand dunes and barrier islands, and a wide range of wildlife habitats.

Coastal Resources Management Program

The Council on Environment administers the Virginia Coastal Resources Management Program, funded in part by the Federal Coastal Zone Management Program within the National Oceanic and Atmospheric Administration (NOAA). The program conforms to the same area addressed by the Chesapeake Bay Preservation Act (see Figure 3). The program funds state and local agency projects designed to improve management of the states coastal resources. For example, for the 1991-92 funding cycle, the program has requested proposals to improve implementation of eight relevant state regulatory programs (e.g. regulation of encroachment on wetlands, dunes, and subaqueous lands; of commercial and recreational fishing; of point and nonpoint water pollution, shoreline sanitation and air pollution), and to develop man-

⁴⁴ Virginia Water Protection Permit Regulations, VR-680-15-02.

⁴⁵ HB 861, in Virginia Code 15.1-489.

agement plans for "areas of concern" (e.g., wetlands, sand dunes, barrier islands, high coastal hazard areas, wildlife habitats, etc.) (VCOE 1990).

Shoreline Protection

The Division of Soil and Water Conservation administers the Shoreline Erosion Advisory Service (SEAS), which offers technical advice to property owners in tidal areas. However, many of the programs discussed in previous sections -- RPA protection in Chesapeake Bay Preservation Areas, flood plain management, protection of water supply reservoirs, several NPS control measures, and others -- can be construed as shoreline protection programs.

In 1988, Virginia's Council on the Environment issued a three-volume report prepared by the University of Virginia's Institute for Environmental Negotiation (IEN) on shoreline management options, tools, and related growth management practices in Virginia (IEN 1988). In the IEN study, "shoreline management" is viewed quite broadly to include a wide range of environmental land protection measures, and the results of the study have been well integrated into companion reports of this project.

7.3 Protection of Other Sensitive Lands

There has been considerable activity, especially at the state and federal level to identify and protect natural lands and waters. At the federal level in Virginia, the National Park Service manages 18 units, totaling 290,791 acres; the U.S. Forest Service, 1,600,000 acres in 2 National Forests; and the U.S. Fish and Wildlife Service, 14 units totaling 110,000 acres. In addition, the U.S. Army Corps of Engineers manage the Flannagan, Kerr, and Philpott reservoirs, providing 35,000 acres of land and 64,000 acres of water for recreation and wildlife habitat. These federal lands contribute significantly to Virginia's environmental resources and their protection (VDCR 1989).

The Commonwealth also manages state parks by Department of Conservation and Recreation (VDCR) (38 units, 51,083 acres), state forests by the Department of Forestry (10 units, 50,000 acres), and wildlife management areas by the Department of Game and Inland Fisheries (33 units, 176,400 acres). Other protection programs, especially the Scenic Rivers and Natural Heritage Program provide greater involvement of localities (VDCR 1989).

The Virginia Scenic Rivers Program⁴⁶ is coordinated by VDCR, but Scenic River designation involves the strong and active support of local governments, community groups, and land-owners. Local governments, groups, or individuals usually initiate the process of nominating a section of river for consideration as a State Scenic River. Nominated rivers are evaluated by the Division of Planning and Recreation Resources in VDCR to determine if they meet the Department's criteria for designation (VDCR 1989). Local study committees are formed for qualifying river segments, and reports are prepared nominating the river for designation to the General Assembly. At this point, resolutions of support from local government are usually required. Designation is achieved by action of the General Assembly. Approximately 346 miles along seventeen Virginia rivers have been so designated (VDCR 1990). Others have been found to be worthy of scenic river status but await local support and legislative action.

Scenic River designation provides certain limited protection, mostly restrictions on government activities that might adversely affect the river. For each Scenic River, the Governor appoints an advisory committee of local people, this committee reviews federally or state-approved project that might effect the natural flow of the river, such as impoundments of interbasin transfers. No restrictions or land use controls are placed on the riparian land-owners.

⁴⁶ Created by the 1970 Scenic Rivers Act: Va. Code Section 10.1-400 et. seq.

Management activities for Scenic Rivers are the responsibility of local governments the advisory board of local citizens, VDCR and possibly other government agencies. Localities can initiate programs to provide additional protection to Scenic Rivers, such as open space tax assessment, conservation easements, and land acquisition programs.

The Virginia Natural Heritage Program is a cooperative effort of Division of Natural Heritage (in VDCR) and the Nature Conservancy designed to preserve a sampling of the State's ecological diversity. The program has several components, currently the most important being the Natural Heritage Inventory. This is a dynamic computerized data base of significant species and critical habitats in Virginia and threats to these areas. This inventory is used to prioritize protection action taken by the Program and can be used to inform local land use decisions.

In addition, two new components of the program are noteworthy. The Natural Areas Preserves System aims to establish a system of state dedicated preserves (dedicated means that the land can't be condemned by local or state government agencies, and is thus a stronger protection measure than simple acquisition). The Natural Heritage Inventory is used to identify areas that warrant preservation. To date, 10 properties, totalling 15,000 acres, have been transferred into the preserve system, including publicly and privately-owned properties. Seventy-five additional areas are proposed (VDCR 1989).

The Virginia Registry of Natural Areas is also a new program. The program contacts public landowners and works with them on land management for rare species habitats and significant ecological communities. Non-binding agreements and conservation easements can be used to help protect the natural areas of interest. This program complements the Natural Conservancy's program of contacting and working with private landowners.

7.4 Local Protection of Sensitive Areas

As discussed above, local governments play an important role in implementing Virginia's tidal wetland program, the Chesapeake Bay Preservation Program, and the Scenic Rivers Program. However, localities can do more if they wish. They can incorporate information from the wetlands inventories, Natural Heritage Inventory, the Virginia Outdoors Plan, and other sources into their comprehensive plans. They can use this information further in land acquisition programs or land use controls. Table 17 summarizes the local role in protection of sensitive areas in the land-water interface.

Table 17 Local Role in Wetlands and Shoreline Protection

- Local Tidal Wetlands Boards permit use or development of wetlands
- Local certification of Virginia Water Protection Permit
- Local implementation of Chesapeake Bay Preservation Act regulations
- Local land use controls can protect wetlands, shorelines, and other sensitive lands: overlay districts, cluster ordinance conservation easements, etc.
- Local sponsorship of State Scenic River designation
- Incorporation of Virginia Natural Heritage Program information into comprehensive plans and land use controls

Prospects for both acquisition and control have been enhanced by recent General Assembly action. Use of conservation easements by public landholding bodies in Virginia has been authorized since 1966. However, in 1988, the legislature passed the Virginia Conservation Easements Act authorizing nonprofit organizations to hold conservation easements for land

protection. In 1990, General Assembly passed legislation broadening local authority to develop zoning ordinances to protect "lands of significance for the local environment."⁴⁷

9. WATER-RELATED RECREATION

With its 112 miles of ocean beaches, more than 3,300 miles of tidal shoreline, 160,000 acres of lakes and reservoirs, and 27,000 river miles, Virginia has tremendous water-oriented recreational resources. Issues related to water-based recreation include minimizing recreation impacts on water quality, providing public access, and protecting recreation as an instream beneficial use.

9.1 Minimizing Water Quality Impacts of Recreation

A principal recreation impact on water quality comes from boat use and accompanying discharges of petrochemicals and sewage. This latter source has been a major concern in the Chesapeake Bay and led the Chesapeake Bay Commission to pass a 1989 resolution to address the problem. Areas sensitive to boat sewage discharge include shellfish beds, public swimming beaches, and poor-flushing tidal tributaries.

The VDH regulates boat sanitation by requiring marinas to have pump-out facilities for boat sanitary holding tanks. Exemptions are granted for marinas having no boats with installed toilets. As of January 1990, out of the state's 773 marinas, 164 have pump-out facilities, and another 181 are exempt (VWCB 1990a).

9.2 Providing Public Access to Virginia Waters

Localities can enhance public access to Virginia waters by acquiring and developing local shoreline parks on rivers, reservoirs, or the Bay. While public parks require fee-simple land acquisition, public access to water bodies can be provided by the use of conservation easements. (See companion report on non-regulatory options.)

The 1989 *Virginia Outdoors Plan* (VDCR 1989) contains a wealth of information on state and regional recreation and open-space resources, including water access, and offers guidance to government agencies on protecting or preserving these resources.

Local governments can play an important role in implementing the Plan by working through mechanisms such as comprehensive and open-space plans to provide for local and regional open-space needs. The protection of wetlands, floodplains, and other water resources can be an integral component of open-space planning guided by the Virginia Outdoors Plan.

The plan contains sections outlining various standards for recreational and open-space lands and the existing supply of and need for reaction areas in each Recreation Planning Region. Perhaps most importantly, the Virginia Outdoors Plan identifies areas that warrant protection and provides data that can be used by local governments and government agencies to plan for this protection. The plan also discusses how special valuation for open-space class land can be used to effect the Plan's goals.

In addition to the Outdoors Plan, the *Bay and River Public Access Guide*, (VDCR 1989) prepared by the states of Virginia, Maryland, Pennsylvania, and the District of Columbia, but published by the Virginia Council on the Environment, provides detailed information on recreation access to the Chesapeake Bay and its tributaries.

⁴⁷ HB 861, in Virginia Code 15.1-489.

9.3 Protecting In-Stream Recreation Uses

As declared in 1989 Virginia legislation, in-stream uses including recreation are beneficial uses under the state's water control law. While much attention has been given to protection of in-stream flows to preserve fish, the flow requirements to protect recreation uses, such as canoeing, are likely to be considerably higher than needed to preserve indigenous fish. Thus, conflicts over in-stream flows are likely to center on impacts on recreation use.

Summary and Conclusions

This report has outlined the major elements of Virginia's complex maze of water management institutions, laws, and programs. That maze has undergone significant change in the past three years as no less than 20 state laws have established new programs and authorities (see Table 18). The 1991 General Assembly no doubt will add to this evolving framework.

Table 18 Major General Assembly Legislation Affecting Local Water Management

1990 General Assembly	
HB 861	Local authority to use zoning ordinance to protect environmentally significant areas
HB 862	Established Commission on Population Growth and Development
HB 471	Authority for counties (with executive form of government) to apply erosion and sediment control to single family residences.
HJR 111	VIMS to study issues of Coastal land management
SB 183	VMRC tidal wetland enforcement authority strengthened
SB 277	CoE study of non-tidal wetland programs
HB 1043	VDH authority to issue sewage treatment and disposal regulations for protection of surface and ground water.
1989 General Assembly	
HB 1846	Orders Statewide Flood Protection Plan; Flood plain management transferred to DSWC.
HB 1847	Flood Prevention and Protection Assistance Fund (federal cost share support)
HB 1848	Local Stormwater Management Program; minimum state regulations.
Gov. Bill	Pesticide Control Act
HB 1837	Uses of state waters limited to protect beneficial instream uses.
HB 1838	VWCB authority to intervene in surface water disputes
HB 1839	Virginia Water Protection Permit to certify federal permits.
HB 1840	VWCB authority to regulate large surface water withdrawals.
HB 1841	Surface Water Management Areas.
HJR	VWCB to study on-site package treatment plants
1988 General Assembly	
HB 925	Chesapeake Bay Preservation Act
HB 38/919	Local comprehensive plans to address ground and surface water
HB 920	Local zoning ordinances may include reasonable provisions, not inconsistent with applicable state water quality standards, to protect surface and groundwater
HB 966	Allows requirement for testing of private wells before issuing building permit for Prince William, Stafford, Fauquier, Loudon, Fairfax, Clarke, and Chesterfield Counties.
SB 152/326	Erosion & Sediment Control Act Amendments
HJR	Joint subcommittee to study pollution from untreated sewage and failing septic tanks

THE ROLE OF STATE AND FEDERAL AGENCIES IN MANAGING WATER RESOURCES

Through this evolution, a number of state agencies have emerged as Virginia's principal water management agencies, but local governments have also been called on to play an increasing role in several programs. Table 19 summarizes the roles of state and federal agencies in managing Virginia's waters. The matrix is organized by the major water-related

Table 19 State and Federal Agency Involvement in Virginia Water Resources Management

WATER MANAGEMENT OBJECTIVE	STATE AGENCY							FEDERAL AGENCY					
	VWCB	VDH	DWM	DSWC	CBLA	MRC	Other	EPA	CORP	SCS	ASCS	FEMA	Other
DOMESTIC WATER SUPPLY	2	1					3 ^a	2					3 ^a
Public System Improvements/Expansion.....	2	1					3 ^a	2					3 ^a
Public Water Source Protection.....	2							3					
Protection of Private Water Supply: Wells.....		1											
Provision of Secure Water for all Virginians.....							2 ^b						
DOMESTIC WASTEWATER	1	1					3 ^a	2					3 ^a
Public Sewer: Treatment/Extensions.....	1						3 ^a	2					3 ^a
Reducing Impacts of On-Site Wastewater.....	2	1											
Provision of Adequate Sewage Disposal to all Virginians.....							2 ^b						
GROUND WATER QUALITY	1	1	1	3	2			1					3 ^e
Implementing Virginia's Anti-Degradation Policy.....	1												
Controlling Sources of Ground Water Contamination.....	1	1	1	3	2			1					
Land Use Effects on Ground Water Quality.....													
GROUND WATER QUANTITY	1												
Controlling Overdraft: GMA.....	1												
Land Use Impacts on Aquifer Recharge.....													
Impacts of Land Disturbing Activity on Wells, Aquifers.....							3 ^c						
SURFACE WATER QUALITY	1	3	3	1	1		2 ^d	2					3 ^e
Virginia's WQS and Progress Toward Attainment.....	1							2					3 ^e
Managing Wastewater Discharges.....	1							2					
Managing Nonpoint Sources.....	2	3	3	1	1		2 ^d	2		2	2		
Virginia's 319 NPS Program.....	2	3	3	1	1		2 ^d	2		2	2		
Erosion and Sediment Control.....				1	1								
Local Watershed Protection.....													
Chesapeake Bay Restoration and Preservation.....	1				1			2					
SURFACE WATER QUANTITY	1			1					1	1		1	
Flood Damage Mitigation.....				1					1	1		1	
Flood Plain Management.....				1								1	
Flood Damage Mitigation Projects and Planning.....	2			3					1	1			
Stormwater Management.....	2			1				2					
Protection of In-stream Flows.....	1												
Managing Water Withdrawals.....	1								1				
Local Involvement in Instream Flow.....													
PROTECTION OF WETLANDS & SHORELINES	2			2	1	1	2 ^f	1	1				2 ^h
Wetlands Protection.....	2			3	1	1		1	1				2 ^g
Coastal Zone Management and Shoreline Protection.....					1	1	2 ^f	1	1				2 ^h
Protection of other Sensitive Lands.....				2	1		2 ^f						2 ^g
WATER-RELATED RECREATION	3	2					2 ⁱ		2				2 ⁱ

1 -- Major Involvement; 2 -- Moderate Involvement; 3 -- Minor Involvement; Blank -- Little or No Involvement

a. VRA; HUD; FmHA. b. VDHCD. c. VDMME. d. VDF; VDMME; VDOT. e. USGS. f. VCoE; VDCR. g. F&WLS. h. NOAA. i. VDCR; NPS; USFS; F&WLS.

Abbreviations: VWCB=Virginia Water Control Board; VDH=Virginia Dept of Health; DWM=Dept of Waste Management; DSWC=Division of Soil & Water Conservation; CBLA=Chesapeake Bay Local Assist. Dept; MRC=Marine Resources Commission; EPA=Environmental Protection Agency; CORP=Corps of Engineers; SCS=Soil Conservation Service; ASCS=Agricultural Stabilization Service; FEMA=Federal Emergency Management Agency; VRA=Virginia Resources Agency; HUD=Housing and Community Development; FmHA=Farmers Home Admin.; VDHCD=Dept of Housing and Community Development; VDMME=Dept of Mines, Minerals & Energy; VDF=Dept of Forestry; VDOT=Dept of Transportation; VCoE=Council on Environment; VDCR=Dept of Conservation & Recreation; F&WLS=Fish and Wildlife Service; NOAA=Natl Oceanic & Atmospheric Admin.; NPS=National Park Service; USFS=Forest Service.

Table 20 Local Involvement in Virginia Water Resources Management

WATER MANAGEMENT OBJECTIVE	LOCAL ORGANIZATION					TYPE OF INVOLVEMENT ^a										
	Local Govt	PDC	SWCD	Multi Juris	NGO ^b	A	B	C	D	E	F	G	H	I	J	
DOMESTIC WATER SUPPLY	1	3		1	3											
Public System Improvements/Expansion.....	1	3		1		X	X	X	X				X			
Public Water Source Protection.....	1	3										X	X			
Protection of Private Water Supply: Wells.....	2									X					X	
Provision of Secure Water for all Virginians.....	2				2	X										
DOMESTIC WASTEWATER	1	3		1	2											
Public Sewer: Treatment/Extensions.....	1	3		1		X	X	X					X			
Reducing Impacts of On-Site Wastewater.....	2									X		X	X		X	
Provision of Adequate Sewage Disposal to all Virginians.....	2				2	X										
GROUND WATER QUALITY	2	3	2													
Implementing Virginia's Anti-Degradation Policy.....																
Controlling Sources of Ground Water Contamination.....	3		2			X	X								X	
Land Use Effects on Ground Water Quality.....	1	3	2						X			X	X		X	
GROUND WATER QUANTITY	2			3												
Controlling Overdraft: GMA.....	3			3			X									
Land Use Impacts on Aquifer Recharge.....	2											X	X		X	
Impacts of Land Disturbing Activity on Wells, Aquifers.....																
SURFACE WATER QUALITY	1	3	2		3											
Virginia's WQS and Progress Toward Attainment.....																
Managing Wastewater Discharges.....	3						X					X				
Managing Nonpoint Sources.....	1	3	2								X	X	X			
Virginia's 319 NPS Program.....	1	3	2								X	X	X		X	
Erosion and Sediment Control.....	1		1							X		X				
Local Watershed Protection.....	1	3										X	X	X		
Chesapeake Bay Restoration and Preservation.....	1	2	2		2					X		X	X		X	
SURFACE WATER QUANTITY	1	3			3											
Flood Damage Mitigation.....	1	3			3					X		X	X		X	
Flood Plain Management.....	1									X		X	X			
Flood Damage Mitigation Projects and Planning.....	2	3			3				X				X		X	
Stormwater Management.....	1	2									X	X	X		X	
Protection of In-stream Flows.....	3				3										X	
Managing Water Withdrawals.....	3						X									
Local Involvement in Instream Flow.....	2					X							X			
PROTECTION OF WETLANDS & SHORELINES	1				2											
Wetlands Protection.....	1									X		X	X	X	X	
Coastal Zone Management and Shoreline Protection.....	2									X		X	X	X	X	
Protection of other Sensitive Lands.....	2				2				X			X	X	X	X	
WATER-RELATED RECREATION	2				2									X	X	

1 -- Major Involvement; 2 -- Moderate involvement; 3 -- Minor involvement; Blank -- Little or No Involvement

a. See Table 21: A. Provider of Services; B. Permittee of State/Federal; C. Grant Recipient; D. Local Sponsor; E. Mandatory Implementer; F. Voluntary Implementer; G. Land Use Controls; H. Planning; I. Land Acquisition; J. Education, Monitoring, Clean-up.

b. Non-governmental organizations include local, regional or state environmental groups and community groups; e.g., Nature Conservancy, Virginia Water Project, local chapter of Sierra Club.

concerns outlined by this report. The principal agencies are given across the top and their relative role (i.e., major, moderate, minor, or none) in managing specific water concerns is given by entries on the matrix.

With regard to state agency responsibility, the VWCB is still Virginia's principal water resources management agency with major responsibility for regulating surface and groundwater pollutant sources and withdrawals, water quality and supply planning, and certifying federal water-related permits. During the past three years, DSWC has emerged as the main oversight agency for land use aspects of water management, having responsibility for the nonpoint source pollution control program, erosion and sediment control, shoreline erosion, flood plain management, dam safety, and stormwater management. CBLAB oversees a major program to control land use and runoff-generated pollution of the Chesapeake Bay. VDH is responsible for regulating public water supply systems, private wells, on-site septic systems, and most recently, on-site package treatment systems. Other state agencies, especially VDWM, VMRC, VDMME and VDES, also contribute to Virginia's overall water management program.

The principal federal agencies are also indicated in Table 19. EPA oversees the state primacy programs operated by VWCB, VDH, VDWM and DSWC under the federal Clean Water Act, F&WL Safe Drinking Water Act, Resource Conservation and Recovery Act, the Superfund Act, and others. EPA is also responsible for the federal Superfund Program, regulates underground injection wells, is party to the interstate Chesapeake Bay Agreement, and assists the Corps of Engineers in the 404 permit program for projects impacting waterways and wetlands. In addition to 404 permitting, the Corps plans and constructs federal flood protection, navigation and related water development projects. FEMA manages the National Flood Insurance Program with its provision for local flood plain management. The SCS is also involved in flood protection and along with ASCS offers financial and technical assistance to control erosion and nonpoint source pollution from agricultural land. The F&WLS and USGS provide valuable data monitoring, inventories, and assessments of the state's water and related land resources. The USFS, NPS, F&WLS, and the Corps also manage significant public lands (totaling 8% of Virginia's land area) that are among the most important watersheds and natural areas in the Commonwealth.

THE ROLE OF LOCALITIES IN MANAGING WATER RESOURCES

In many of these water management programs, Virginia's localities play a key role. The main actors at the local level are city, county and town governments, but planning district commissions and other multijurisdictional bodies such as authorities and soil and water conservation districts also play important functions. Local citizens and environmental groups are also active.

Table 20 outlines the relative importance of the local role in the various water concerns. Localities play the key role in land use planning and control and in developing and managing water and wastewater service. As such, localities are forced to respond to and in many cases, play the critical implementation function for state and local agencies. In addition, local governments in their strategic "field" position end up being the "manager of last resort" -- for those water problems not adequately addressed by state and federal programs, localities are often expected by their residents to provide a solution.

These different roles localities play in water management are summarized in Table 21. These categories are also given in Table 20, showing their relationship to the various water concerns.

Table 21 Roles of Localities in Virginia Water Management

- A. Local Provider of Water-Related Services**
 - owner, financier, planner, manager of water source, treatment, distribution
 - owner, financier, planner, manager of sewage collection, treatment, effluent discharge
 - manager of solid waste collection, recycling, disposal; owner, financier, planner, manager of solid waste landfills
- B. State/Federal Programs: Permittee**
 - landfill owner/operator (DWM)
 - sewage treatment plant discharger (VWCB)
 - water treatment plant/distribution system operator (VDH)
 - major water withdrawer (Corps, VWCB)
- C. State/Federal Programs: Grant/Loan Recipient**
 - wastewater treatment/interceptors construction grants/loans, (EPA, VWCB)
 - grants/loans of water/wastewater improvements (HUD, FMHA, VRA, VWP)
 - planning-related grants (HUD, ARC, others)
- D. State/Federal Projects/Programs Sponsor**
 - water development projects (Corps, TVA)
 - sole source aquifer designation (EPA)
 - state scenic river designation (VDCR)
- E. State/Federal Programs, Mandatory Implementer**
 - through land use controls:
 - flood plain management/zoning (FEMA)
 - erosion and sediment control (DSWC)
 - controls in Chesapeake Bay Preservation Areas (CBLAD)
 - through coordination with CBLAB local health department sanitarians:
 - on-site waste water permitting (VDH)
 - well permitting (VDH)
- F. State/Federal Programs: Voluntary Implementer**
 - through land use controls:
 - non-point source controls (DSWC)
 - stormwater management
 - CBLAB regs outside of Tidewater
- G. Local Land Use Controls Other Than State/Federal**
 - watershed management for water-supply reservoirs: siting, overlay districts, performance standards
 - management of development in aquifer recharge areas: siting, performance standards
 - management of cumulative impacts of on-site wastewater: overlay districts, performance standards, etc.
 - land use control exceeding state/federal requirements: CBLAB regs, erosion and sediment controls, flood plain zoning
 - special use permitting of large water users, wastewater dischargers
- H. Local Planning/Analysis of Water-Related Issues**
 - comprehensive planning: water related elements
 - water protection plans: watershed, groundwater, stormwater management
 - resource inventories: GIS, resource mapping, DRASTIC studies, etc.
 - surveys: well quality, sanitary surveys of septic system areas, etc.
- I. Local Acquisition of Water-Related Land Sources**
 - recreation: parks, access easements, etc.
 - conservation easements for land/water protection
 - cooperative agreements with environmental trusts
 - community group activities
- J. Local Water-Related Education, Monitoring, Clean-Up**
 - community awareness, education, and participation
 - local monitoring of streams, groundwater, on-site, wastewater
 - emergency response to water-related incidents, spills
 - local cleanup days: illegal dump sites, litter control, household hazardous wastes.

Local governments and multijurisdictional authorities, as owners and operators of water and sewer utilities and solid waste management operations, must plan, finance, and construct necessary facilities. In this capacity, they are permittees of state and federal regulatory programs and must respond with necessary upgrades and improvements. They must also finance needed facilities and service extensions through local taxes, the utility rate-base, or loans/grants from state and federal agencies. As state and federal funding for these capital expenditures has diminished, localities have had to look more to their own taxpayers and ratepayers to "foot the bill." As "an ounce of prevention is worth a pound of cure," localities are realizing that water resource protection, especially of current or future sources of drinking water, can forestall or forego costly measures to treat or replace degraded or vulnerable supplies.

Localities are often the principal implementers of state and federal programs, especially when the programs require land use control. The effectiveness of these programs depends entirely on effective local implementation and enforcement. Examples include mandatory erosion and sediment control, flood plain management, tidal wetland permitting, CBLAB regulations in CBPA areas, and coordination of land use controls with local health department permitting of well construction, septic systems and package treatment. Other programs look to localities for implementation, but on a voluntary basis; this is the case for urban nonpoint source pollution control and stormwater management.

Local authority for land use planning and control not only is important for state and federal programs, but also is the primary mechanism for other local water management programs – protection of water supply reservoirs, aquifer recharge areas, and environmentally sensitive areas such as non-tidal wetlands, riparian lands, and shorelines; and control of new water withdrawers and sources of wastewater through zoning and special use permitting,

Recent General Assembly action has expanded local authority for water-related land use planning and control, but other measures, such as stormwater utility fees and transfer-of-development-rights, require enabling legislation.

In addition to land use control, local governments have a responsibility to plan for their communities and prepare comprehensive plans and update them on a five-year cycle. The comprehensive plan and the process of its development offer an important opportunity for localities to take a broader look at its water-related problems and develop comprehensive policies and programs to address them. In this regard, the regional planning district commissions can provide technical assistance to local governments. While this PDC assistance in water matters is quite variable statewide, the experience of the Northern Virginia PDC, the Loud Fairfax PDC, and the Fifth PDC all demonstrate the effectiveness of PDC involvement in local water resources planning. PDCs can also play an important role in developing multijurisdictional solutions to water problems which often transgress local boundaries. The case study on Roanoke Valley Stormwater Management (provided in the companion casebook) illustrates this involvement.

Localities are the "first line of defense" in identifying and reacting to water problems as they develop. Local emergency response teams and planning committees can play a critical role in water pollution spills.

Localities also provide an important education and monitoring function in water management and in this regard, community groups can play an important role. Local water management requires a constituency to politically support programs and ordinances. Education and awareness of water issues is needed to build such constituency. Some volunteer programs such as *Save Our Streams* and campaigns for clean-up of illegal dumps, stream banks, and household hazardous wastes, (described under non-regulatory programs) can help build community awareness and provide local monitoring of water resources.

Table 22 further summarizes the current role of Virginia localities in water management. It lists activities that local governments must do in response to state and federal directives, what they still can do voluntarily having been granted authority to do-so, what they cannot do because of lack of enabling legislation, and finally a commentary on what they should do.

This list has changed considerably in the past three years, especially in the mandatory programs and in the added authority local governments have gained for water management. With these added responsibilities many localities are burdened by added work loads, technical questions, and difficult choices about the appropriate action to integrate water management into local programs.

This report has aimed to illuminate this local role and to serve as a reference to describe the context for local management in a broad range of water issues. Companion reports in this series detail options for technical analysis and control programs to assist localities in protecting water resources.

Table 22 Do's and Don'ts of Local Water Management in Virginia

What Local Governments MUST DO to Manage Water Resources:

- meet VWCB, VDH, VDWM requirements for water/sewage/solid waste treatment monitoring.
- implement flood plain management/zoning (if residents to be eligible for flood insurance).
- implement erosion and sediment control regulations.
- if stormwater management program, then implement DSWC stormwater management regulations at minimum.
- if in Chesapeake Bay Preservation Area, then implement CBLAB regulations.
- consider surface and groundwater in comprehensive planning.

What Local Governments CAN DO:

- participate in Urban Non-Point Source Pollution Control Program.
- implement more stringent criteria than in erosion and sediment control, stormwater, CBLAD regulations; implement CBLAD regulations if outside CBPA.
- enact zoning, subdivision regulations to protect surface and/or ground water, environmentally sensitive areas.

What Local Governments CANNOT DO:

- implement certain land use control programs for which enabling legislation not yet enacted, such as transfer-of-development-rights.
- set up stormwater utility to collect stormwater fees.

What Local Governments SHOULD DO:

- implement mandatory programs effectively.
- implement voluntary programs appropriate to needs.
- control land use in watersheds of present and potential future water supply reservoirs, recharge areas of important aquifers.
- engage in appropriate multijurisdictional agreements for water management, such as water and sewer, stormwater, flood protection, groundwater and watershed protection.
- provide public water/sewage to those in critical need.
- integrate water-related concerns into comprehensive and land use planning.
- involve citizens and community groups in planning, monitoring, and protecting local water resources.

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Appendix A: The Actors in Virginia Water Management

This Appendix introduces the specific actors and laws involved in Virginia's water management. The main actors include a number of state agencies that administer regulatory and non-regulatory programs; several federal agencies that provide guidance, assistance, and some regulation; non-government environmental organizations; regional planning district commissions; local governments; and local citizens groups.

STATE AGENCIES

The principal state agencies involved in water include:

- **Virginia State Water Control Board (VWCB)** has direct responsibility for administering Title 62.1 of the Virginia Code, "Waters of the State, Ports and Harbors." Among other functions, it regulates wastewater facilities and discharges, certain water withdrawals, and underground storage tanks; responds to pollution complaints; manages data on surface water flows and quality; develops surface water quality standards; and prepares water and wastewater plans and assessments.
- **Virginia Department of Health (VDH)** has primary responsibility for administering Title 32.1 of the Virginia Code, "Health." With regard to water, VDH and its 139 field offices regulate public water supply systems, private well construction, and on-site wastewater disposal systems.
- **Division of Soil & Water Conservation (DSWC)** in the Department of Conservation and Recreation (VDCR) administers portions of Subtitle I of Title 10.1 of the Code, "Conservation." It is the lead agency for Virginia's nonpoint source water pollution control program (which is non-regulatory), administers the locally-implemented, regulatory erosion and sediment control and flood plain management programs, and regulates dam safety.
- **Department of Waste Management (VDWM)** administers the Virginia Waste Management Act (10.1-1400 through 10.1-1457). It regulates solid waste and hazardous waste facilities including landfills and administers the Virginia Superfund clean-up program.
- **Chesapeake Bay Local Assistance Board (CBLAB)** has primary responsibility for implementing the Chesapeake Bay Preservation Act (10.1-2100 through 10.1-2115). It develops land use regulations for water quality protection and assists Tidewater local governments required to implement them.
- **Council on the Environment (COE)** (under 10.1-1200 through 10.1-1221) is a general environmental policy and information agency, with a special program to assist local government planning on environmental problems. It also administers the Coastal Resources Management Program.
- **Department of Housing and Community Development (DHCD)** provides information and advice on local comprehensive planning and zoning for a range of objectives including surface and groundwater protection.
- **Virginia Marine Resources Commission (VMRC)** administers the provisions of the Virginia Wetlands Act oversees local wetlands boards, and provides stand-by authority for tidal localities without boards. (62.1-10 through 62.1-13).
- **Department of Game and Inland Fisheries (VDGIF)** administers Title 29.1 of the Code ("Game, Inland Fisheries and Boating") including endangered species program, provides substantive input on biological requirements for minimum in-stream flow, and maintain data inventory mapping for streams, lakes and species habitats.
- **Virginia Natural Heritage Program (VNHP)** in the Department of Conservation and Recreation, maintains databases and inventories on natural areas and endangered species, and provides assistance to local governments on natural inventories and their use in land use planning.

- **Division of Parks and Recreation (DPR)** in the Department of Conservation and Recreation administers the Virginia Scenic Rivers Program and prepares the Virginia Outdoors Plan.
- **Department of Mines, Minerals and Energy (VDMME)** administers Title 45.1 of the Code (Mines and Mining). It regulates coal and non-coal mineral mining and oil and gas exploration and development, including related waste water discharges, and provides the state's geologic information.
- **Department of Emergency Services (VDES)** has primary responsibility in administering Title 44 ("Military and Emergency Laws"). It oversees federal SARA Title III provisions including local Emergency Planning Committees which provides 24-hour response to hazardous materials spills.
- **Department of Agriculture and Consumer Services (VDACS)** administers Title 3.1 ("Agriculture, Horticulture and Food"). With regard to water, it registers manufacturers of fertilizer and pesticides and licenses pesticide applicators.
- **Virginia Resources Authority (VRA)** administers the \$300 million state-bond fund for loans to localities for water and sewer improvements. It also manages the Water Facilities (sewer) Revolving Loan Fund and the Water Supply Revolving Loan Fund from which loans are allocated to localities by VWCB and VDH respectively.
- **Virginia Cooperative Extension Service (CES)** provides technical assistance to local governments, farmers, and others on water protection methods, especially nonpoint source controls and implementation of BMPs.
- **Groundwater Protection Steering Committee (GWPSC)** is an interagency committee made up of management level staff of mine agencies (VWCB, VDH, DCR, DWM, CBLAD, COE, DACS, DMME, DHCD and CES). It was established in 1986 to assess current problems and set priorities for new groundwater protection programs. It provided "A Groundwater Protection Strategy for Virginia" in 1987 and prepares annual reports.

FEDERAL AGENCIES

These state activities are complemented by a number of federal programs. The principal federal agencies administering programs affecting water management include:

- **Environmental Protection Agency (EPA)** is the principal federal environmental regulatory agency; it administers the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and the Resource Conservation and Recovery Act (RCRA), under which Virginia operates approved "primacy"⁴⁸ programs. Several of the state agencies cited above meet the minimum requirements of the federal laws and regulations, and EPA has granted authority to Virginia to implement them in lieu of federal programs. EPA monitors the programs to assure compliance. In addition, EPA has primary responsibility for (a) identifying Superfund sites and specifying clean-up requirements, (b) regulating injection wells, and (c) providing criteria and consultation for permits (sect. 404 [CWA]) issued by the Corps of Engineers.
- **Corps of Engineers** has certain federal responsibility over navigable waters; it permits water withdrawals and works encroaching on channels and shorelines, and wetlands filling (sect. 404 CWA] with EPA). The Corps also plans and develops flood control and navigation water development projects in Virginia; these projects (especially flood control dams and reservoirs) may have supplemental purposes of recreation, fish and

⁴⁸ "Primacy" programs allow state implementation of federal environmental regulations. The federal CWA, SDWA, RCRA, as well as the Clean Air Act provide for, and encourage, state administration under parallel state law. State laws and regulations must meet the requirements of the federal statutes at a minimum; they may require more stringent standards. Once the state-developed program is approved by EPA, applicants for permits required under federal law deal directly with the appropriate state agency, not the EPA. However, state agencies must report their activities, and EPA does oversee and may override state decisions, although this is relatively rare.

wildlife enhancement, water supply, and hydroelectric power generation. The Corps manages these reservoirs and surrounding lands.

- **Soil Conservation Service (SCS)** maintains local offices which assist farmers in preparing and approve soil conservation plans; plans and develops small flood and erosion control projects; and develops county soil surveys.
- **Federal Emergency Management Agency (FEMA)** administers the National Flood Insurance Program, under which it develops local flood plain maps and flood plain management regulations.
- **National Oceanic and Atmospheric Administration (NOAA)** provides weather data and administers the Coastal Zone Management Program.
- **U.S. Fish and Wildlife Service (F&WLS)** manages federal wildlife refuges and provides resource inventories and data as well as comment on water development proposals.
- **U.S. Geological Survey (USGS)** provides data monitoring and analysis.
- **Federal Energy Regulatory Commission (FERC)** licenses all power plants including hydroelectric dams.
- **U.S. Forest Service (USFS)** and the **National Park Service (NPS)** manage large tracts of undeveloped land that serve as important natural areas and watersheds for surface and groundwater.
- **Tennessee Valley Authority (TVA)** provides water resources planning and development assistance in its drainage area which includes far southwest Virginia.
- **Housing and Urban Development (HUD)** and **Farmers Home Administration (FmHA)** provide grants and loans to localities for water and sewer system improvements.

NATIONAL AND STATE ENVIRONMENTAL ORGANIZATIONS

Besides state and federal agencies, there are other non-local actors in water management in Virginia -- national and state environmental organizations. These include those which acquire and preserve natural areas (e.g., Nature Conservancy), those which are legal and administrative watch-dogs (e.g., Environmental Defense Fund), those which provide funding support for water-related information or community projects (e.g., Virginia Water Project, Virginia Environmental Endowment), and those which provide education or technical assistance to local groups (e.g., Isaak Walton League's Save-Our-Streams, Student Environmental Health Project). (See non-regulatory section of companion report, *Regulatory and Non-Regulatory Options for Local Water Resources Management*.)

REGIONAL AGENCIES

Regional agencies can provide an interface and coordination between state and federal agencies and local governments. They can also provide "field level" response to specific problems. Three categories of regional agencies exist in Virginia that are relevant to water management: regional offices of state agencies; planning district commissions; and multi-jurisdictional governing bodies.

- **Planning District Commissions (PDCs)** are responsible for planning the sound and orderly social, economic, and physical development of their regions under Virginia Code, Title 15.1-1400, Chapter 34 (Virginia Area Development Act). There are twenty-one Planning Districts in the Commonwealth. Each District has a commission made up of elected officials and citizens of their member localities and a professional planning staff. The principal role is in technical and planning assistance to their members. There is considerable variability throughout the state PDC involvement in local planning in general and in water resources management in particular. The experience of certain PDCs, specifically the Northern Virginia PDC, Lord Fairfax PDC, and the Fifth PDC, demonstrate the substantive role they can play in local water resources management.

- **Regional/local offices of state agencies.** Many of the state agencies described above operate regional or field offices which serve a locality or region of the state. These include: Regional VWCB offices (Southwest [Abingdon], West Central [Roanoke], Valley [Bridgewater], Northern [Alexandria], Piedmont [Richmond], Tidewater [Virginia Beach]); Local Health Department Sanitarians (counties and cities); Waste Management Regional Waste Consultants (Abingdon, Staunton, Virginia Beach); Soil and Water Conservation Districts (counties); Regional ACS Product and Industry Regulation (Abingdon, Accomac, Charlottesville, Fairfax, Franklin, Harrisonburg, Lynchburg, Richmond, Roanoke, Virginia Beach, Warrenton, Wytheville); Emergency Services (Region I [Pulaski], Region II [Culpeper], Region III & IV [Richmond]...); and local agents of the Cooperative Extension Service (counties and cities).
- **Multijurisdictional governing bodies.** In many areas of the state, local governments have developed multijurisdictional agreements establishing authorities or districts to manage specific problems such as water supply, municipal wastewater, solid waste, and others. The companion report *Multijurisdictional Approaches to Managing Water Resources: Options for Virginia Localities* discusses these organizations in detail.

LOCAL GOVERNMENTS

The principal components of local government which play a role in water management include:

- **Local governing bodies,** including county boards of supervisors and city and town councils, are the principal local decision makers. They approve local plans and ordinances; land development projects; and construction, financing, and operation of local water, sewer and solid waste utilities.
- **Local planning departments and commissions** prepare local comprehensive and land use plans; they develop and implement zoning and subdivision regulations and other local ordinances. Many rural counties do not have planning staffs or zoning regulations.
- Local building inspectors issue building permits and therefore enforce local codes and ordinances. They work closely with local health departments which implement VDH regulations for permitting on-site waste water disposal and individual wells.
- **Public works departments and authorities** develop and operate local infrastructure systems. With regard to water, these systems include water sources, treatment and distribution; wastewater collection, treatment and discharge; stormwater management facilities; and solid waste collection, recycling, and landfill operation. These utilities are managed by individual local governments or by independent multijurisdictional authorities.

LOCAL CITIZENS GROUPS

Community-based citizen's groups are often important actors in the local political process involved in developing plans and ordinances and in decisions in development projects. They can also provide volunteer assistance in monitoring water problems and implementing certain non-regulatory programs.

Appendix B: NRDC Critique of Virginia 319 Plan

In its book, *Poison Runoff*, (Thompson 1989), the Natural Resources Defense Council provides a lengthy case study and critique of Virginia's 319 plan. NRDC states that Virginia's plan provides marked improvement over the past nonpoint source activities. Noting certain limitations, it nonetheless lauded recent legislation and programs concerning Chesapeake Bay preservation, the state cost-share program for farmers, new laws for stormwater management and erosion and sediment control, on-going BMP research, and information programs such as VirGIS.

However, for the most part, the report takes issue with many aspects of the program, which are summarized in Table 8. In particular, it questions the voluntary approach emphasized in the plan, especially for agricultural, forestry, and urban sources. With regard to urban sources, this criticism is supported by the experience of Virginia's statewide section 208 nonpoint source control program implemented in 1980. Like the 319 plan, the 208 program called for voluntary local implementation of urban BMPs through "memoranda of understanding" between local governments and the lead state agency (in this case, VWCB for developed urban areas). Through 1984, the program attracted participation from only 44 of Virginia's 224 local governments. Less than half of these agreed to "direct" officials to implement BMPs when practical; another 40 percent simply authorized officials to do so (VWCB 1984). A 1987 update revealed little additional activity (Cox and Herson 1987).

NRDC's main criticism stems from the lack of a direct relationship to the water quality standards, which it argues should be the cornerstone of the program. "Water quality standards provide the authority to develop controls, and should be used to establish the specific pollutant load reduction goals for individual water bodies" and individual sources (p.410). While the program states that compliance with the water quality standards is its "overriding purpose," NRDC argues this is not supported by the plan itself.

Another major deficiency in the plan is the lack of a watershed-by-watershed approach to NPS control. "The watershed provides the basis for determining what pollutant load reductions are needed to achieve compliance with water quality standards for particular water bodies." NRDC argues that this approach, working backwards from the water quality standards on a watershed basis to determine specific load reductions and NPS strategies, is far more effective than Virginia's source-by-source, "let's-see-what-will-happen" approach.

NRDC regrets that Virginia decided to minimize the role of VWCB, the primary water quality agency, in the 319 plan. While it recognizes the importance of the DSWC in agricultural control, the report states that the secondary role played by VWCB further minimizes the plan's relationship to VWCB's water quality standards.

Table B-1 Natural Resources Defense Council Critique of Virginia 319 Plan

Positive:

- Chesapeake Bay Preservation Program: CBLAD, cost-sharing
- Recent stormwater management and erosion and sediment control legislation
- BMP research
- VirGIS

Negative:

- Over-reliance on voluntary approach: agricultural, urban, forestry
- lack of emphasis on or relationship to water quality standards; inadequate use of water quality information to direct program
- Does not use a watershed-by-watershed approach
- Inadequate involvement of VWCB, Virginia's principal water quality agency
- Questionable effectiveness of regulatory programs that are included: erosion & sediment control; VPA permitting

With respect to involvement of localities in NPS control, NRDC believes the role is crucial, yet questions the voluntary approach of the 319 plan: "although restrictions placed on localities because of Dillon's rule have been eased by recent legislation, it remains to be seen if localities will capitalize on this opportunity by improving water quality protection activities (p.440). NRDC argues that localities should be **required** to address water quality issues in comprehensive plans and ordinances (p.426). The report also criticizes the voluntary nature of local adoption of the State's stormwater management regulations (p.428).

The report also criticizes the plan for not taking full advantage of the planning district commissions, which in addition to offering technical assistance to their members on nonpoint source management, could act in an official planning, coordination, or conflict resolution role in a watershed planning process (p.426).

