JOINT LEGISLATIVE AUDIT & REVIEW COMMISSION

THE VIRGINIA GENERAL ASSEMBLY

PROGRAM EVALUATION WATER RESOURCE MANAGEMENT IN VIRGINIA

September 15, 1976

MEMBERS OF THE
JOINT LEGISLATIVE AUDIT & REVIEW COMMISSION

Chairman
Delegate Edward E. Lane

Vice Chairman
Senator Edward E. Willey

Senator Hunter B. Andrews
Senator Herbert H. Bateman
Senator Omer L. Hirst
Delegate Vincent F. Callahan, Jr.
Delegate W. L. Lemmon
Delegate L. Cleaves Manning
Delegate Theodore V. Morrison, Jr.
Delegate Lacey E. Putney
Delegate Ford C. Quillen
Charles K. Trible, Auditor of Public Accounts

Director
Ray D. Pethtel

STAFF OF THE JLARC
FOR THIS REPORT

Philip A. Leone, Project Director
Mark S. Fleming
Kent S. Jamison
Peggy S. Mobley
Susan L. Urofsky

SUMMARY
WATER RESOURCE MANAGEMENT

Adequate supplies of safe water are vital to the future population growth and economic development of the Commonwealth. Throughout the State's history, nearly every resident has had access to abundant supplies of clean water for residential, recreational, and industrial uses. The management of water was largely the responsibility of local governments and individual users, with minimal State regulation. Since 1940, increased population and industrial growth have created severe water pollution and supply problems, necessitating greater State involvement in water resource programs. During 1975, approximately $17 million was appropriated to support the water related programs of 14 State agencies and an additional $251 million was expended from federal funds for water pollution abatement projects. The Commonwealth's water laws and management programs, however, have not kept pace with the complexities of water problems associated with a growing urban population. The State's approach to water resource management focuses on water pollution control almost to the point of exclusion of other, equally important, problems. For example, there are potentially severe water shortages in major metropolitan areas, possible health hazards associated with the drinking water of a sizable portion of the State's population, and danger of floods that is beyond the ability of local governments to control. And, although water pollution control has received great emphasis, the State has not yet been able to control the discharge of many harmful substances into its waters.

A major obstacle to resolving these problems is the fragmentation of authority for water resource decision making among numerous levels of government. Comprehensive management of water resources by an agency with the authority to plan and implement water resource programs is necessary to ensure the adequacy and safety of this vital natural resource.

WATER RESOURCE PLANNING

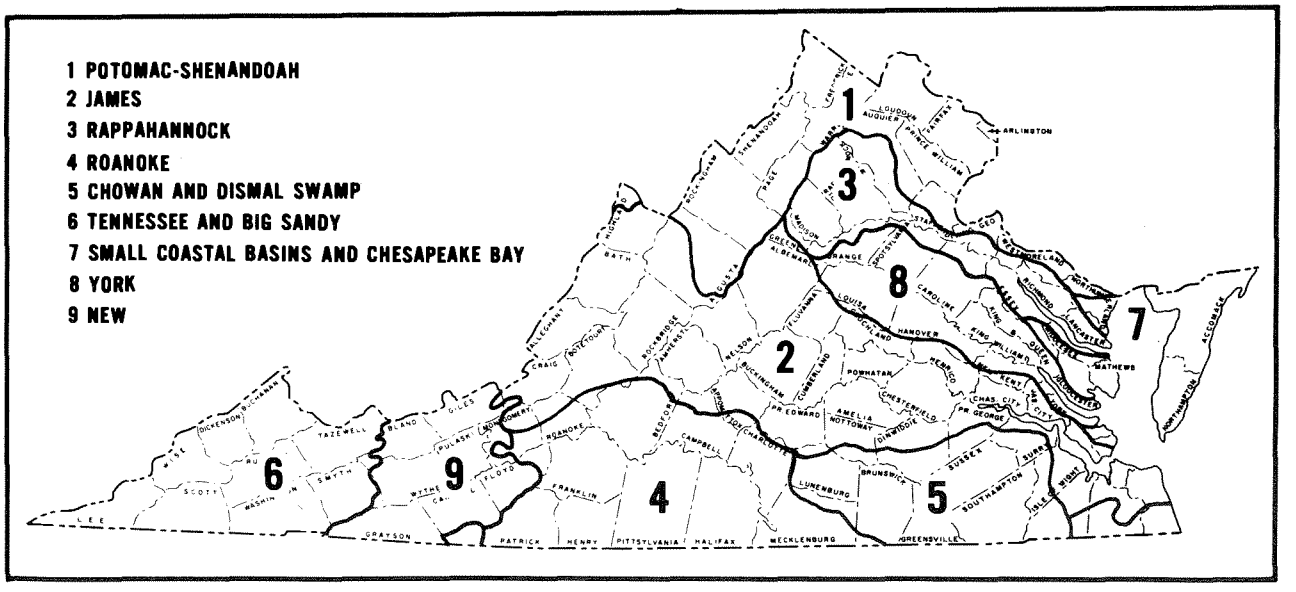
The General Assembly has long recognized the need to plan for the future development and use of water. The State Water Control Board (SWCB) has the statutory responsibility to conduct two types of planning. First, the Board is authorized to devise comprehensive water resource plans for the development of the State's waters to provide for their maximum beneficial use. Important aspects of a water resource plan include: (1) ensuring the adequacy and quality of water supplies for human consumption and other diverse uses, (2) providing maximum protection from natural phenomena such as droughts and floods, (3) promoting economic development such as navigation and power generation, and (4) providing for adequate water-based recreation opportunities. The second SWCB planning function involves preparation of regional and basin plans to protect and maintain water quality. Although this type of planning is an important part of a water resource plan, an imbalance has occurred in the Board's implementation of its legislatively mandated planning responsibilities. SWCB has concentrated on the development of water quality management plans while the preparation of water resource plans for each of the State's major river basins have been given a low priority.

Water Resource Planning (pp. 3-8)

Water resource planning has made limited progress since 1972, when the function was transferred to the State Water Control Board along with the appropriations and personnel of the Division of Water Resources, Department of Conservation and Economic Development. At that time, the scope of SWCB planning and program authority was expanded to include the broader concept of water resource management in addition to traditional pollution control responsibilities. Although prohibited from taking implementation actions, the agency was to develop a coordinated policy, formulate water resource plans, and make specific recommendations about necessary legislation and programs to the General Assembly.

By 1972, planning had already been initiated for each of the State's major river basins and all of the work on two basin plans, the New River and Potomac-Shenandoah River basins, had been completed. Since 1972, SWCB commitment

RIVER BASINS IN VIRGINIA



to water resource planning has been negligible although a draft plan for the James River basin has been prepared. The Board believes that the legislature must first resolve the water rights issue in Virginia before these plans can be produced. Consistent with this belief the Board has diverted personnel and funds originally appropriated by the General Assembly for water resource planning to pollution control programs. This disproportionate allocation of agency funds to pollution control has resulted in relative inattention to other urgent aspects of water resource management. For example, a survey of local government administrators made by the JLARC staff in early 1976 indicates flooding and storm water drainage, and imminent water supply shortages to be the most frequently mentioned

local water related problems,* The low priority assigned to the development of water resource plans by SWCB has severely reduced the Commonwealth's ability to avoid crisis-oriented decision making and to consider the long-range aspects of these types of water related problems. Furthermore, the Board has not provided the General Assembly with recommended legislation or alternatives to remedy water supply problems.

Water Quality Planning (pp. 61-67)

While neglecting its water resource planning responsibilities, the State Water Control Board has made considerable progress in preparing water quality management plans. Over the last four years, SWCB has allocated nearly $4.6 million to water quality planning studies; $1.8 million of this total was used to develop regional plans for each of the State's 22 planning districts. The regional plans were funded by the General Assembly prior to the enactment of the Federal Water Pollution Control Act Amendments of 1972. According to Board officials, the regional plans served as the basis for initially qualifying many local pollution control projects for financial assistance under the federal act. In fact, the information contained in the regional plans enabled local governments to obtain an additional $15 million in project funds during 1973.

SWCB has also made a substantial commitment in staff and financial resources to meet the planning requirements of the 1972 amendments. In general, the amendments established a framework for basin and regional planning that would: (1) analyze water quality conditions, (2) identify facilities needed to control direct discharges of municipal and industrial wastewater, and (3) establish procedures to control pollution originating from such sources as soil erosion and stormwater runoff. The various plans were to become part of a statewide program to control pollution. However, a recent study by the National Commission on Water Quality found that planning has not proceeded according to the intent of the federal legislation. The Environmental Protection Agency is principally to blame because it delayed implementing the regional water quality planning provisions of the act. This has resulted in planning being out of sequence with the construction grant program at both the State and local government level. As of June, 1976, most of the basin and regional water quality plans required under the 1972 amendments had not been completed in Virginia or formally adopted by the Board, even though EPA had already obligated over $300 million for construction of wastewater treatment facilities. In retrospect, the SWCB water quality planning effort under the 1972 act has had little impact on the availability of federal construction funds to Virginia. In fact, states which are behind Virginia in plan completion, such as West Virginia and Pennsylvania, have also received or will receive their full share of federal construction monies. This indicates that SWCB could have obtained federal grant funds without sacrificing its ability to plan for other aspects of water resource management.

---

*In January, 1976, JLARC mailed a questionnaire to chief administrators of all cities, counties, and towns in Virginia. The questionnaire was concerned with various aspects of water resource management including water supply, water quality, erosion and sedimentation, flood control and dam safety, and program coordination.

SWCB believes that $250,000 to $300,000 will be required to annually update regional and basin water quality plans when completed. Additional appropriations for water quality planning, however, should be considered in the context of a careful reassessment of water management needs.

WATER SUPPLY SHORTAGES

Uncertainty about future water supplies exists in approximately one-third of the State's jurisdictions, representing large metropolitan areas with a total population of about two million Virginians. In just four years, residents of Southeastern Virginia may be faced with a critical shortage of water supplies of many millions of gallons daily. The problem is aggravated by water allocation laws which hinder the effective and efficient regulation of surface water and groundwater, and, by a lack of State leadership in resolving water supply conflicts among different users.

Allocation of Water Supply (pp. 14-18)

The use of surface water in the Commonwealth is governed by riparian doctrine--that body of common law which vests water rights in the owners of property adjacent to a body of water. The amount of water use is subject only to the limitation that it is reasonable and does not interfere with other users. Despite an abundance of water in the State, riparian law presents considerable obstacles to the transfer of water out of one river basin into another in which there are shortages. Another limitation of current allocation law is that decisions on water use made by the courts on a case-by-case basis, do not provide the long-range perspective that could be brought to bear through a more comprehensive process viewing both current and projected uses. As might be expected, riparian law creates problems for localities with regard to the continued dependability of their water supplies. Surprisingly, half of the 240 jurisdictions that responded to the JLARC survey felt that the Commonwealth should allocate water rights through a permit system in place of riparian law.

The Groundwater Act of 1973 represents one major departure in the regulation of water use in Virginia. The act authorizes the State Water Control Board to allocate groundwater (water that occurs beneath the land surface or beneath the beds of rivers and lakes) by permit and to ensure its continued availability and quality in specially designated critical areas. The Groundwater Act, although effective in concept, has limited utility. According to a recent opinion of the Attorney General, only industrial users withdrawing more than 50,000 gallons of water per day may be regulated. Withdrawals by all other users, including municipalities are not limited. Furthermore, withdrawal limits for groundwater users located in a critical groundwater area at the time it was designated as such, are set at a level equal to the users' highest previous withdrawal. Thus, in the Southeastern Virginia critical groundwater area, this provision allows prior users to claim twice their normal daily rate of groundwater withdrawal. Indeed, if all prior users withdrew the maximum permitted amounts of water, groundwater supplies would be depleted in Southeastern Virginia. Although the Groundwater Act was intended to facilitate State controls through a permit procedure, exemptions have severely reduced the effectiveness of the law.

The General Assembly may wish to review and clarify SWCB's authority to establish groundwater withdrawal limits for all uses.

Resolving Water Supply Disputes (pp. 8-14)

The recent population and economic growth of the State have increased the possibility of more disputes arising over the use of the Commonwealth's waters. These disputes involve planned use of a body of water for incompatible purposes (industrial sewage or water supply) and competition for control of limited quantities. The General Assembly has authorized the State Water Control Board to recommend solutions to disputes among water users.

SWCB provides little leadership to promote adequate water supplies. The Board has acknowledged its unwillingness to become involved in water supply disputes among local jurisdictions. In two recent cases, this has resulted in federal assumption of leadership while the SWCB postponed decisions in the face of increasingly serious local water supply problems. For example:

- SWCB refused to make a determination of water rights in the Chickahominy River Basin when requested to do so by the political subdivisions involved. Charles City and New Kent Counties were concerned that expansion of the Newport News Reservoir would pre-empt or otherwise limit their own use of the Chickahominy River as a source of water supply. In the absence of SWCB action, the Army Corps of Engineers issued a permit allowing expansion of the reservoir.

- SWCB has maintained official neutrality regarding water shortages in Southeastern Virginia that will reach critical proportions in the next four years. A regional water authority has been established to find water supplies for this area which encompasses approximately 16% of the State's population. There is little available water within the region which necessitates inter-basin transfer of water from other areas. Strong opposition has arisen to all water transfer proposals by other local jurisdictions which fear possible depletion of their own water supplies. SWCB has not endorsed any of Southeast Virginia's proposals and has not made recommendations of its own. It now appears that SWCB will not act until completion of a study of the problem by the U. S. Army Corps of Engineers.

The fact that SWCB has not recommended solutions to current water supply shortages places a limitation on the Commonwealth's ability to manage its water resources. Potentially serious water supply shortages may be faced by as many as one-third of Virginia's political subdivisions by 1990 which will have significant impact on public health, welfare, and economic well being. It is essential that SWCB use timely water resource planning studies to provide information on potential sources of water supply and anticipated demand. Based on the findings of these studies SWCB needs to take a more aggressive posture in regard to making recommendations to the General Assembly to resolve problems in water short areas. Such recommendations may well need to include implementation of water conservation measures or modification of existing water allocation laws.

SAFETY OF DRINKING WATER

Programs to maintain and protect the quality of drinking water have been effective in controlling outbreaks of most major water-borne diseases. However, some drinking water systems are potentially hazardous to public health. The prevalance of toxic substances and industrial pollutants in rivers are now considered to cause long-term threats to human health.

Drinking Water Quality Control (pp. 18-33)

The Bureau of Sanitary Engineering (BSE) of the Department of Health is responsible for administration of a program to ensure the safety of drinking water. This program includes: inspection of water treatment facilities, monitoring of drinking water supplies for bacteriological and chemical content and review of plans for proposed water and domestic wastewater treatment plants. There are major inconsistencies in BSE program implementation. Based on JLARC's sampling of the State's 1,337 public water systems, it was found that over one-third did not have an annual inspection between 1973 and 1975. One-half of the public systems did not have a chemical analysis of their water. Furthermore, BSE records show that actions taken in response to identified water treatment problems are often incomplete or inadequate.

Although the threat of bacteriological contamination of water supplies has been considerably reduced, it remains a problem in certain areas particularly in the western part of the State. In 1971, BSE identified approximately 100 communities in need of new or improved water distribution systems. The JLARC survey of local administrators confirmed that as many as 50,000 people in 46 communities may be exposed to potential hazards from unsafe water delivery systems. BSE estimated in 1971 that $34 million would be needed to correct known deficiencies in distribution systems. There is no doubt that this figure has been greatly increased by the need to meet more stringent drinking water standards contained in the 1974 Safe Drinking Water Act. Meeting these standards will create severe financial hardships for many public and private water treatment plant owners. BSE should identify the most serious problems and recommend alternative ways of financing urgently needed projects.

BSE also monitors drinking water for the presence of chemicals, pesticides and radioactivity. Most substances presently monitored affect taste, odor and color which do not pose a direct threat to human health. A major shortcoming of the BSE monitoring program is that present analytical methods only identify a small number of the many potentially hazardous substances that are discharged into the waters. Many of these substances are believed to be potentially carcinogenic or toxic, such as organic chemicals, heavy metals, and asbestos, posing both short and long-term threats to public health. Although it is neither technologically nor financially feasible to monitor every public drinking water system for the presence of possibly several thousand hazardous substances, procedures should be developed to determine the most harmful substances entering waters of the State that will be used as a source for drinking water.

The General Assembly provided a legislative framework to this problem in the Toxic Substances Information Act, passed in 1976. The act requires the State Department of Health to develop a list of substances that are considered to

be toxic. SWCB is also responsible for identifying harmful wastes treated by industrial and municipal wastewater treatment works which pose a threat to public health. Implementation of the act will identify the type and source of thousands of harmful substances entering the State's waters. BSE should develop procedures to evaluate the impact of the most harmful substances on drinking water supplies and human health.

Coordination with Wastewater Control (pp. 29-31)

Coordination between drinking water and pollution control programs comes about through joint SWCB-BSE regulation of domestic wastewater treatment facilities. Under administrative agreements between the agencies, BSE conducts a preliminary review of proposed domestic wastewater treatment facilities and conducts the only detailed State level engineering review of final plans and specifications. One area of substantial duplication between the SWCB and BSE is engineering inspections of operating treatment plants.

Preliminary review of proposed wastewater treatment facilities appears to be a useful form of coordination which provides BSE with the opportunity to comment on the size, treatment mode, location and other factors that may affect the quality of drinking water supplies. Other aspects of coordination, however, appear less effective. For example, only domestic wastewater facilities are subject to formal joint SWCB-BSE oversight, industrial facilities are excluded despite their potential impact on the safety of drinking water supplies. Furthermore, the detailed engineering review of final plans and specifications for wastewater facilities adds little new information and absorbs a disproportionate amount of BSE staff time. This reduces the Bureau's capability to carry out its primary responsibility of administering the safe drinking water program. In addition, BSE duplicates SWCB field inspections of wastewater treatment plants.

Achieving better coordination between the two agencies requires reassessment of the impact the wastewater control program has on the BSE drinking water program. BSE should place primary emphasis on those program activities that can best achieve the goal of safe drinking water. Less effective and efficient activities should be eliminated. The BSE engineering review of both the final plans and field inspections of the wastewater treatment plants focus mainly on their technical capability. These functions should be the responsibility of SWCB. Duplicative treatment plant inspections by SWCB and BSE should be eliminated. BSE can assess the impact of wastewater discharges by reviewing preliminary plans and proposals for all domestic and industrial treatment plants and by making recommendations to SWCB to minimize their impact on human health.

WATER POLLUTION CONTROL

The SWCB pollution control program was initiated in 1946 and was broadened in scope to conform to the Federal Water Pollution Control Act Amendments of 1972. This act establishes uniform national water quality standards designed to make all waters suitable for the propagation of fish and wildlife and for swimming by 1983. To achieve this goal, SWCB administers a permit system to regulate the introduction of municipal and industrial pollutants into State waters. In addition, SWCB administers a program of federal financial assistance to localities to establish or upgrade wastewater treatment facilities.

Permits and Violations (pp. 67-71)

Under the National Pollutant Discharge Elimination System (NPDES) each municipal and industrial discharger of wastewater into rivers and streams must obtain a permit from the SWCB. The permit is a contract between the discharger and the Commonwealth which establishes a maximum allowable rate and amount of each pollutant permitted to be released into State waters and establishes a sequence of actions to ensure compliance. As of August, 1976, over 1400 permits had been issued which accounts for 90% of industrial and 95% of municipal pollutants discharged into State waters.

Detection of permit violations is accomplished by SWCB monitoring of sewage discharge performance reports submitted by owners of treatment plants, spot sampling of plant discharges, and surveys of treatment plant efficiency. A review of plant performance reports revealed approximately one-third of the 90 major municipal and industrial permit holders violated permit conditions during the period January 1975 to January 1976.

- Of the 39 major municipal plants discharging 81% of the State's sewage flow, 18 exceeded acceptable discharge limits. Six consistently violated these limits and are currently under remedial orders from the Board.

- Of the 51 major industries responsible for 95% of the sewage flow in this category, 15 committed a permit violation. Four were frequent violators of permit standards.

It appears that there is widespread noncompliance among major municipal and industrial permit holders in Virginia. Recurring permit violations involving harmful substances can seriously impair the quality of the State's waters.

Enforcement (pp. 73-76)

SWCB enforcement actions can range from warnings to legal proceedings, but the Board's preferred course of action is to direct the staff to work with plant owners to correct deficiencies. Discharges are allowed to continue while the problem is being addressed. In cases where violations are accidental or limited in severity this cooperative approach to enforcement may be effective, however, legal action may be necessary where recurring violations exist.

During the period March through November 1975, the SWCB did not initiate any court actions against violators of permit conditions--even those identified as frequent violators. One manufacturer failed to submit required performance reports to SWCB for two months and consistently violated discharge standards for lead, nickel, and copper. SWCB did not take enforcement action and the U. S. Environmental Protection Agency warned the SWCB that continued failure to act in these cases would result in federal enforcement actions. In the face of federal sanctions, SWCB issued orders which require permit compliance or threaten civil or criminal penalties.

Another example of the Board's cooperative enforcement approach is illustrated by the handling of the Kepone pollution problem in Hopewell, Virginia. During the ten months that SWCB staff sought to determine the toxicity of the substance and to correct deficiencies at both the sewage treatment plant and

the manufacturer's treatment facility, Kepone continued to be discharged into the lower James River. In light of the continuous and serious violations committed by owners of municipal and industrial treatment plants, SWCB aversion to aggressive enforcement action is inappropriate.

Grant Administration (pp. 77-85)

New and upgraded municipal treatment facilities are necessary to meet national water quality goals. The Federal Water Pollution Control Act Amendments of 1972 expanded financial assistance for construction of such pollution control facilities and established interim goals of secondary treatment (removal of 90% of organic material from wastewater) by 1977 and installation of what is termed the "best practicable control technology" by 1983. SWCB estimates that $1 billion will be spent to meet the 1977 goal and an additional $823 million will be needed to achieve the 1983 quality goal of "swimmable and fishable" waters. In Virginia, local governments and regional authorities are primarily responsible for construction and maintenance of wastewater treatment facilities. The federal grant program is administered by SWCB which places a high priority on obtaining funds for local pollution abatement projects. By July 1976, Virginia's entire share of federal funds ($496 million) will have been obligated, making it one of the first states in the nation to have allocated all of its funds for local pollution abatement projects.

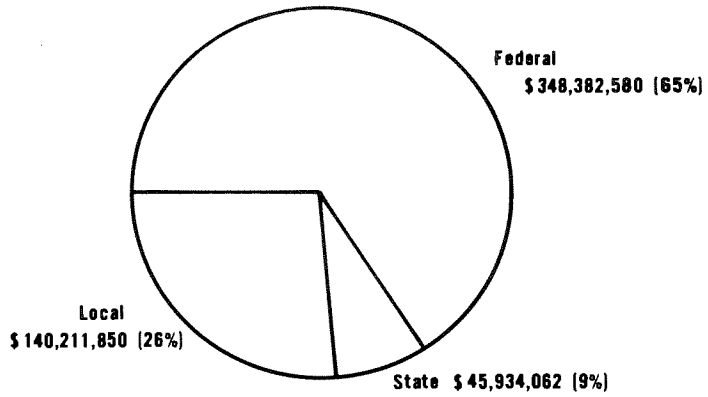
Because of the impoundment of funds authorized by Congress in the 1972 act and delays in congressional appropriation of additional funds, approximately 148 municipal wastewater projects in Virginia will be unable to meet the 1977 goal of secondary treatment. Although SWCB has made significant progress in developing an efficient program for administering construction grants, the program has recently been stalemated by the uncertainty of future federal funding.

Between January, 1965 and October, 1975, SWCB had obligated nearly $400 million in federal and State funds to localities for municipal wastewater treatment facilities. Adding local funds the per capita expenditure for pollution abatement projects in Virginia amounts to approximately $115. Most (53%) of these funds were obligated to communities in the Potomac-Shenandoah River basin with the remaining funds divided among the other eight basins (James - 25%, Roanoke - 14%, all others - 8%) (See figure next page). Given the known pollution problems plaguing the James River basin, especially in Richmond and Tidewater, SWCB grant allocation priorities are disproportionate.

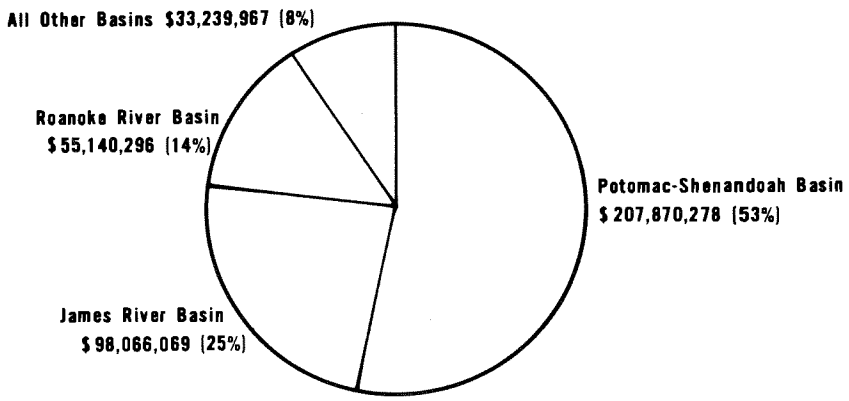
Operator Certification and Training (pp. 82-85)

Well trained operators are needed to run modern wastewater treatment plants. For every dollar invested in operator training $91 is returned in terms of preventing damage to equipment. The General Assembly has recognized the need for trained operators by enacting legislation which requires every treatment plant to have at least one certified operator. According to SWCB staff an estimated 150 industrial and municipal plants are operating without certified operators. Any plant owner or operator doing so is guilty of a misdemeanor offense. The Department of Professional and Occupational Registration is responsible for enforcing operator certification requirements. However, the Department's small staff is unable to effectively enforce the law. SWCB, through its permit process,

DISTRIBUTION OF FEDERAL, STATE, AND LOCAL PROJECT FUNDS
(January 1965 to October 1975)



DISTRIBUTION OF FEDERAL AND STATE PROJECT FUNDS BY RIVER BASIN
(January 1965 to October 1975)



could assist the Department in enforcing the operator certification requirements.

Nonpoint Sources of Pollution (pp. 91-108)

Water pollution control programs have historically focused on discharges of wastewater from municipal and industrial plants. However, significant pollution may be caused by runoff or drainage from land which carries sediment, pesticides and wastes into the water. This type of pollution, commonly referred to as nonpoint sources of pollution, can negate the beneficial effects of even the most modern wastewater treatment plants. The U. S. Environmental Protection Agency estimates that nonpoint sources are responsible for over half of the pollution in the nation's rivers and streams. Studies conducted by the SWCB tend to indicate that pollution caused by nonpoint sources may not be a serious problem in Virginia. Within the next two years regional planning studies will provide

additional data on the type and extent of nonpoint source pollution problems, especially for the urbanized sections of the State.

There is no State program which addresses nonpoint water pollution directly. Rather, it is an indirect concern of several programs focusing on preservation of land resources by such agencies as the Soil and Water Conservation Commission and Divisions of Forestry and Mined Land Reclamation of the Department of Conservation and Economic Development. For this reason, the State Water Control Board has chosen to rely on the assistance and cooperation of State agencies in managing the impact of nonpoint sources on water quality. In implementing this strategy the Board has developed memoranda of understanding with the Soil and Water Conservation Commission, Department of Highways and Transportation, and Division of Forestry. Also, the Board is a member of an inter-agency nonpoint source coordinating committee created by the Secretary of Commerce and Resources.

Although protection of water quality is not the primary objective of erosion control, mining, and forestry programs, each has a beneficial effect on water quality if effectively implemented. However, the impact of these programs in Virginia has been limited by numerous statutory exemptions and low levels of enforcement. For example, the 1973 Erosion and Sediment Control Act requires local governments to control erosion from new development in urban areas but exempts many sources of erosion. Such exemptions include construction of single-family homes not part of a residential subdivision project, surface or deep mining activities, railway facility construction, and agricultural activities. Moreover, most local governments devote little manpower to enforcing the act. Specific programs to prevent erosion of agricultural and forestry lands are voluntary rather than mandatory. The mined land reclamation law lacks control standards for mine spoil (material removed to expose the coal seam).

The Commonwealth's efforts to control nonpoint pollution would be strengthened by better enforcement of existing nonpoint source related programs by State and local agencies. Furthermore, these programs need to be coordinated, reviewed, and evaluated in order to assess their impact on water quality and to minimize nonpoint pollution. SWCB should be responsible for performing these important program functions.

Impact of Water Quality Program (pp. 44-61)

All discharges of wastewater into a stream have a cumulative impact on its overall quality. Therefore, the effectiveness of pollution abatement programs should be reflected in improved water quality as determined by the absence of harmful levels of pollutants. The Environmental Protection Agency and State Water Control Board establish standards for the specific amount of each pollutant that can be tolerated in water.

In its 1975 *Water Quality Inventory Report* SWCB predicts that of approximately 2,000 river miles in Virginia not currently meeting applicable standards, only 96 miles will fail to meet the 1983 goal. JLARC reviewed water quality data and the results of this report in order to determine the validity of quality predictions and to determine trends toward improvement or deterioration of water quality. Generally it was found that, with the exception of

specific pollution problem areas in Richmond, Tidewater and Southwest Virginia, water quality is good for most of the State at this time. However, data suggest that levels of water quality may be deteriorating on the Chickahominy and Rappahannock Rivers, contrary to SWCB reports and that SWCB's conclusion that water quality is improving on the James River cannot be supported. Statistical and procedural inadequacies in SWCB data analyses make it difficult, if not impossible, to accurately determine trends in water quality over time. The analysis does not ensure consistency in the time and location of water sample collection and is not adjusted to account for variables such as river flow. Thus, data can only be considered "snapshots" of conditions existing in a particular place at one point in time and are not necessarily comparable over periods of time, or between sampling stations.

As part of its annual inventory report SWCB needs to develop procedures to accurately assess the impact of its extensive water pollution control program. To do so, SWCB must establish uniform sampling procedures and a statistically valid methodology to make meaningful conclusions about water quality trends.

FLOOD CONTROL

An important aspect of water resource management includes protecting lives and property from floods. The Commonwealth experiences frequent flooding, and damages are estimated to average $40 to 50 million annually. Local administrators reported flooding to be their most serious water related problem. However, State involvement in flood control programs has been minimal. No agency is responsible for development of a State flood management program. Since floods cannot be completely controlled or prevented, flood management programs are essential to reduce the extent of damage, provide emergency assistance and speed recovery of losses.

Flood Management Program (pp. 113-119 and 124-130)

A flood management program is necessary in order to reduce flood losses. Such a program should emphasize both protection and limitation of development in flood-prone areas. Local communities have traditionally relied upon structural alternatives to prevent floods (dams, floodwalls, and levees). However, structural devices have limited effectiveness in reducing flood damages. Despite the expenditure of over $7 billion by the federal government since 1936 on flood control projects, annual losses still exceed $1 billion. In Virginia, for example, the Gaithright Dam now under construction at a cost of over $61 million will reduce just 20% of estimated flood damages in the James River Basin and other existing or planned local flood protection projects along the James River will provide an additional 30% reduction.

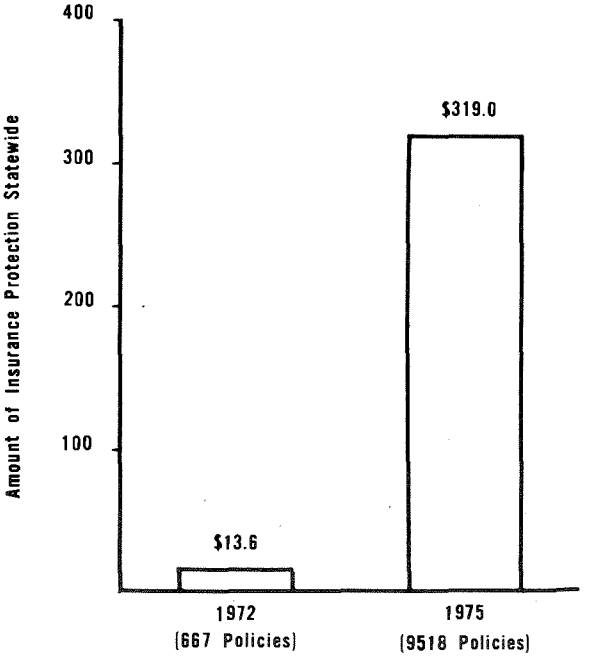
Continually rising damages are caused by unregulated development in flood-prone areas. Therefore, effective reduction of flood damages must include regulation of new development in floodplains. Although Virginia is a flood-prone state, almost two-thirds of the political subdivisions do not regulate development in floodplains. Floodplain ordinances enacted by individual communities may have little effect on reducing damages unless there is some coordination to

ensure compatibility of local management actions. For example, land development can raise flood heights for downstream communities by increasing drainage and runoff areas; construction of a floodwall in one area may increase the velocity of potential flood water in others; and new development in the floodplain is likely to result in flooding of additional land areas. Therefore, flood management is a problem that transcends community boundaries. In the interest of public safety, the State Water Control Board should be authorized to develop a comprehensive flood management program that identifies appropriate structural and regulatory programs for reducing flood losses. Furthermore, as part of this program, the Board should be responsible for establishing minimum floodplain regulations for local government implementation. (pp. 117-119)

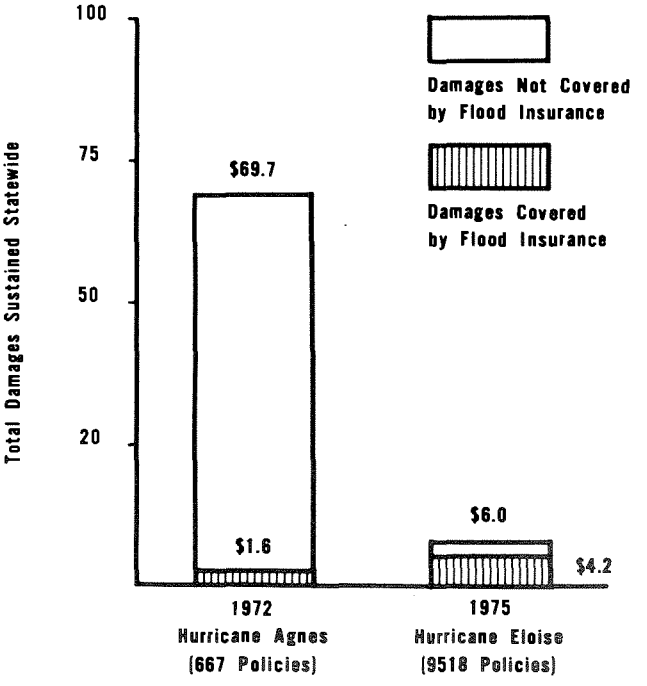
Flood Insurance Program (pp. 119-124)

The national flood insurance program is designed to protect and prevent development in flood-prone areas. The program makes available federally subsidized insurance to property owners to recover damages and makes it mandatory for communities to enact floodplain regulation ordinances to limit new construction. Communities that fail to enact acceptable ordinances are no longer eligible for federal disaster assistance. Moreover, insurance coverage and construction or mortgage loans from federally-regulated lending institutions will not be available to property owners in flood-prone areas. In 1975, a total 9,518 policies were in force in Virginia. The positive impact of flood insurance is demonstrated by the fact that 70% of damages incurred in Hurricane Eloise in 1975 were insured compared with only 2% of the damages in Hurricane Camille in 1968.

AMOUNT OF FLOOD INSURANCE IN FORCE
(Millions of Dollars)



DAMAGES COVERED BY INSURANCE
(Millions of Dollars)



SWCB has actively promoted and assisted local governments to participate in the flood insurance program. A total of 248 communities, representing 98% of the State's population, have been initially enrolled. However, of this number, only 12 have enacted floodplain ordinances and become qualified for more than minimum amounts of flood insurance coverage. The Federal Insurance Administration must first provide detailed floodplain studies to the remaining 236 communities before they are eligible for full insurance benefits. It will be necessary for SWCB to provide assistance to many of these communities in translating technical flood map information into meaningful local floodplain regulation ordinances. However, SWCB has been unwilling to commit its staff to continuing participation in this program. When a federal disaster recovery grant expired this spring, SWCB reduced its entire flood management commitment to one full-time employee with statewide responsibilities. A request for additional appropriations to support flood insurance activities was denied. The seriousness of the flood problem in Virginia deserves more than a token effort on the part of the State. Flood-prone communities and property owners that fail to participate in the insurance program are subject to severe economic losses and personal hardships. Therefore, the Commonwealth should have a significant interest in the program's effective implementation.

Safety of Dams (pp. 131-133)

The failure of a dam can cause a major flood disaster. The State Water Control Board estimates there are over 100 dams whose failure would be disastrous in terms of both human life and property. Thirty-six local jurisdictions responded to the JLARC survey that dams within their jurisdiction had failed; 23 respondents reported resulting damages, and an additional 12 respondents reported that existing structures pose a potential hazard.

Although the 1976 General Assembly enacted dam safety legislation proposed by the SWCB, the effectiveness of the law may be limited by its numerous exemptions and by a 1971 State Supreme Court decision. In the latter instance, the Virginia State Supreme Court ruled (Vaughan vs. VEPCO) that the State Corporation Commission had sufficient authority under the Water Power Act to license all dams proposed to be constructed in "Waters of the State." "Waters of the State" are defined as including navigable streams in which the impoundment would affect the interests of interstate or foreign commerce. Prior to this decision, the SCC only licensed power-related dams. Under the 1976 dam safety law, the State Water Control Board is directed to develop rules and regulations "to ensure that impounding structures in the State are properly and safely constructed, maintained, and operated," but, the law exempts all dams licensed by the SCC. While it is true that the SCC reviews plans for dams, it is not concerned with their construction, operation, or maintenance. This is not a problem with regard to large hydroelectric dams because the Federal Power Commission conducts inspections during construction and for the life of the project. However, the exemption of other SCC dams including those licensed in "Waters of the State" and dams used for storing cooling water for power plants, are beyond the review of the dam safety law. In order to ensure inspections of these dams, the General Assembly may want to clarify the intent of the safety legislation by granting the SWCB sole regulatory authority over all dams constructed in "Waters of the State". Furthermore, regulation of power-related impoundments could become the joint responsibility of SCC and SWCB.

The State's efforts to regulate dam safety will also be hampered by the many exemptions in the dam safety legislation. Exemptions include: dams designed, constructed, or maintained by the U. S. Soil Conservation Service; dams for agricultural purposes; and dams creating impoundments of not more than 100 acre feet capacity and not more than 25 feet in depth. This latter exemption should be of immediate concern since small dams in populated areas can cause extensive property damage and loss of life. For example, in February, 1976 a relatively small structure failed in North Carolina causing four deaths and $1.5 million in damages. The dam had an impounding capacity of only 40 acre feet--smaller than those exempted by Virginia's law. The General Assembly has taken an important step toward ensuring the safety of dams, but it may want to reconsider the kinds of dams exempted from regulation in light of the damage caused by the recent dam failure in North Carolina.

Disaster Assistance (pp. 133-136)

Since floods cannot be completely averted, it is necessary to develop programs to warn communities of possible flooding and assist communities in recovering losses. Lives can be saved by effective warning and communications systems that allow evacuation of population and moveable property before the flood reaches a locality. According to the Office of Emergency Services (OES) there is a local response of only 65% to monthly tests of the present communications system. Local response during flooding in September, 1975 was 60 to 63%. Effective use of warnings depends upon community designed action plans to carry out emergency measures. However, OES officials report that most towns do not have such plans and those plans that do exist for cities and counties are not uniform in quality. Steps should be taken to expedite improvements in over-all communications systems and in emergency plans at the local level.

There is no provision in the Commonwealth's disaster law for financial assistance to local jurisdictions to aid in restoration of services or recovery of losses resulting from floods. All such assistance must be requested by localities from the Federal Disaster Assistance Administration (FDAA). However, federal disaster assistance is available only if the President declares a disaster that is beyond the resources of the State and the local jurisdictions. If the President does not declare a disaster, aid is not available. Federal disaster assistance for damages to public property in Virginia total $19.4 million as of November, 1975. The processing of claims is a complicated procedure that causes local governments problems in documenting expenditures and damages and in determining which projects are eligible for aid. The program is administered in Virginia by the Office of Emergency Services. Of the 87 jurisdictions who responded to a JLARC survey that they had applied for disaster assistance, 57% indicated that they had experienced delays and 18% had received substantial reductions in claim settlements. Localities considered both State and federal processing of claims to be a problem, but those who had experienced reductions tended to consider State processing more of a problem. Both the Federal Disaster Assistance Administration and the State Auditor must review claims for more than $25,000. Delays at the State level have been acknowledged by the State Auditor. As of October 1, 1975 there was a backlog of 19 claims to be audited, dating back to October, 1973. There has also been disagreement over the appropriate depth for a State audit. OES questions the need for the State Auditor to conduct lengthy, detailed evaluations of documents and construction needs in view of the

comprehensive audits performed by the FDAA. This problem should be resolved by the agencies involved.

POWER AND RECREATION

Water is essential in the generation of electric power and in many recreational facilities. Unfortunately, because of the lack of water resource plans, neither use is adequately addressed as part of an overall water management program.

Water Power Act (pp. 141-143)

Steam electric facilities require large amounts of cooling water which may result in chemical or thermal pollution when this water is released back into a stream. Impoundments for cooling water or hydroelectric generation may flood large land areas. State regulation of power facilities, primarily exercised by the State Corporation Commission, takes the form of licensing hydroelectric projects and dams under the Water Power Act.

SCC regulation of power facilities suffers from inadequate implementation of State procedures for licensing and review. Although the State authority over hydroelectric facilities has been generally pre-empted by the Federal Power Commission (FPC) which also licenses such facilities, the State Water Power Law still requires a State license based upon the need for the facility and assessment of its safety and impact on local jurisdictions. Yet, the SCC has not participated in the FPC licensing hearings of the proposed Vepco Bath County pumped storage project. The SCC is generally content to accept the terms of a federal license without a critical State level review. The development of a State position on proposed power projects by SCC prior to federal licensing hearings would be useful. This would be consistent with the intent of House Joint Resolution No. 126 passed by the 1976 General Assembly which urges further representation of the State interest by the SCC before federal regulatory agencies.

Recreation (pp. 148-154)

The Commission of Outdoor Recreation (COR) is responsible for coordinating State and local programs to provide recreation in Virginia. The Commission prepares the Virginia Outdoors Plan which analyzes recreation demand and supply and offers a program for meeting identified needs. However, implementation of the water related recommendations of the outdoors plan is hampered since SWCB has not prepared water resource plans. The unresolved conflict between scenic preservation of a portion of the Roanoke River and impoundment of the river for power generation purposes illustrates the urgent need for State guidance on the use of the Commonwealth's waters.

The State scenic rivers program was established to preserve the free flowing rivers and streams of the Commonwealth in their natural state. The Scenic Rivers Act established natural and scenic values as a beneficial use of water, and provided for designation of scenic rivers which would prohibit impoundment of their waters without authorization from the General Assembly. Although

the COR has identified 29 scenic rivers, only two have been officially designated for protection--Goose Creek and the Rivanna River. Designation of a portion of the Staunton (Roanoke) River as a scenic river has been delayed pending resolution of a dispute over its use for power generation purposes. The lack of success in designating scenic rivers is a result of insufficient local support. Landowners and local governments fear that designation of a river as scenic will limit their use of the river. As a result, local protection of free flowing rivers envisaged by the Scenic Rivers Act has not materialized. If the State has a legitimate interest in preservation, more direct measures may be needed to protect the scenic quality of the Commonwealth's rivers.

A WATER RESOURCE AGENCY FOR VIRGINIA

The General Assembly has long recognized the need for an integrated water resource management program in Virginia. In 1966 the Division of Water Resources was established to plan for and guide the use of water resources in the Commonwealth. In 1972 the Division was merged with the State Water Control Board, the State's water pollution control agency, in an effort to consolidate water management responsibilities. However, despite the merger the SWCB continues to emphasize pollution control to the virtual exclusion of other water resource programs such as water supply, flood control, recreation and power. A water related program which is now outside the scope of SWCB authority is the safe drinking water program conducted by the State Department of Health. This program must be extensively coordinated with the SWCB pollution control program, but present efforts are inefficient. JLARC's evaluation of the State water resource programs has established the need for a strengthened organization and balanced approach to water resource management.

Several studies have recommended changes in the organization of water resource management. Most recently, the Commission on Governmental Management proposed a Department of Air and Water Pollution Control to involve SWCB and the Bureau of Sanitary Engineering of the Department of Health as a means of consolidating similar environmental functions into a single agency. Consistent with the intent of the Commission's recommendations and the findings of the JLARC study, another option is presented--creation of a water resource management agency which encompasses the SWCB and Bureau. The objective would be to establish an agency responsible for assessing the Commonwealth's water resource needs, directing State water resource programs and guiding the activities of local, State and federal organizations toward the common goal of adequate and safe water for all Virginians. Under this arrangement a single agency would be responsible for implementing the Commonwealth's water resource policies and plans. A citizens board would be appointed to assist the Governor and the agency administrator in carrying out their legislated planning and program responsibilities. The board's role would be primarily limited to consultation and advisement which would include such duties as conducting public hearings; participating in the development of a statewide water resource policy for the approval of the General Assembly and Governor; reviewing and commenting on plans; recommending agency program priorities; and establishing water quality standards. This type of organization would provide the opportunity for a comprehensive approach to water management and enable the Commonwealth to effectively and efficiently respond to the full range of water resource problems. (pp. 161-165)

AGENCIES INVOLVED IN WATER RESOURCE MANAGEMENT

Federal Agencies

Agricultural Stabilization and Conservation Service	ASCS
Army Corps of Engineers	Corps
Department of Housing and Urban Development	DHUD
Environmental Protection Agency	EPA
Federal Disaster Assistance Administration	FDAA
Federal Insurance Administration	FIA
Federal Power Commission	FPC
National Oceanic and Atmospheric Association	NOAA
Nuclear Regulatory Commission	NRC
Soil Conservation Service	SCC
U. S. Geological Survey	USGS
Water Resource Council	WRC

State Agencies

Commission of Outdoor Recreation	COR
Council on the Environment	COE
Department of Agriculture and Commerce	DAC
Department of Conservation and Economic Development	DCED
• Mined Land Reclamation	MLR
Department of Health	SDH
• Bureau of Sanitary Engineering	BSE
Division of State Planning and Community Affairs	DSPCA
Marine Resources Commission	MRC
State Corporation Commission	SCC
State Office of Emergency Services	OES
State Water Control Board	SWCB
Virginia Beach Erosion Commission	VBEC
Virginia Institute of Marine Science	VIMS
Virginia Soil and Water Conservation Commission	SWCC

TABLE OF CONTENTS

VII. ORGANIZATION AND COORDINATION

FOREWORD

The General Assembly has authorized the Joint Legislative Audit and Review Commission to conduct operational and performance evaluations of State agencies and programs. Each study is designed to assess the extent to which legislative intent is being met as well as the efficiency and effectiveness of program activities. This evaluation deals with various State water resource management programs.

Management of the Commonwealth's waters is carried out through a complex governmental structure involving a wide array of federal, State, and local agencies. The agencies are governed by an equally complex and proliferated body of law which deals with specific aspects of water management. This report addresses four basic questions about water resources of concern to the General Assembly: (1) Are there safe and adequate supplies? (2) Is water pollution effectively controlled? (3) Is there adequate protection against flooding disasters? and (4) Does the present organization for resource management promote an efficient and effective program?

A major finding of the report is that a very low priority has been assigned to water supply planning and management by the State Water Control Board during the last four years despite evidence of impending critical shortages. In August and September, 1976, however, the SWCB initiated two significant actions that should give added priority to water supply issues. First, each SWCB Board member has been assigned a specific resource management responsibility in the area of water supply, quality, use or conservation as well as administrative oversight concerns. Second, a series of statewide public hearings have been initiated on water allocation laws.

JLARC policy calls for efforts to keep agencies informed of the progress of the reviews at various stages of the evaluation process. On July 21, 1976, appropriate agencies were provided a preliminary draft report for comment as part of an extensive validation process. JLARC staff also met with several agency representatives requesting special meetings to discuss certain functional sections at length. Many revisions were made to the initial draft as a result of these discussions. Some written comments were submitted and are included in the Appendix.

On behalf of the Commission staff, I wish to acknowledge the cooperation and assistance provided by every agency contacted during this study. Special appreciation is extended to the staff of the State Water Control Board, the State Department of Health, and the Council on the Environment for assistance during the review and for commenting in detail on the findings of the report.

September 15, 1976

Ray D. Pethtel
Director

WATER SUPPLY

Nearly two million residents of Virginia's major metropolitan areas face potentially severe water supply shortages. In Southeastern Virginia, recent estimates indicate that a water shortage could occur as early as the 1980's. Many other regions in the State also experience supply shortages--especially in times of drought. In order to ensure adequate water supplies for all areas, the General Assembly has authorized the State Water Control Board to develop water resource policies and river basin plans and, to make recommendations to resolve problems in water short areas. However, the Board has not provided aggressive leadership on water supply management issues over the last several years. In light of the seriousness of water supply problems, the Board should assume a more active role in regard to making recommendations to the General Assembly on effective methods to solve these problems.

The Bureau of Sanitary Engineering, State Department of Health, is responsible for programs to ensure the safety of drinking water. The BSE program focuses on 1,337 public water systems and has largely succeeded in eliminating bacteriological contamination as a health risk in these systems. A major gap in the program is the existence of potential health hazards affecting a sizeable population served by small public wells and inadequate water delivery systems in communities unable to finance needed improvements.

The Bureau of Sanitary Engineering is also responsible, jointly with the State Water Control Board, for the regulation of domestic wastewater treatment projects. Within the past four years, BSE has had to divert a substantial amount of manpower from its drinking water program to conduct preliminary and final engineering reviews of proposed wastewater projects. Moreover, there is duplication between the State Water Control Board and BSE in the area of wastewater treatment plant inspections. In order to enhance the efficiency and effectiveness of the drinking water program, the authority to conduct engineering reviews of final plans and field inspections of wastewater treatment plants could be combined in one agency.

This chapter reviews several dimensions of the State's water supply program including organization, planning, ground water and surface water allocation, and safety.

I. WATER SUPPLY

Virginia has an abundant supply of water within its boundaries but, ironically, water is not always available in the areas with the greatest need. In fact, inadequate quantity is the most serious water supply problem in the Commonwealth and three major metropolitan areas representing almost half of the State's population face serious shortages at present or in the near future. The most critical shortage threatens the Norfolk-Portsmouth metropolitan area where a deficit of 8.0 million gallons per day is expected by 1980. The Northern Virginia suburbs presently experience occasional shortages during peak demand periods and the Newport News metropolitan area is expected to fall about 20 million gallons short of its daily water needs by the year 2000. Other areas of the State have enough water but the quality does not meet public health standards. Such problems are found throughout the State but are particularly widespread in the Shenandoah Valley and the Southwest.

These quantity and quality problems are not new; they have been a matter of concern for many years. However, they have persisted and intensified because of inaction, a lack of coordinated effort, or both. This chapter examines the role of the State in providing adequate and safe water for public consumption. Three aspects of water supply management are explored: (1) planning for future water supply needs, (2) legal mechanisms for allocating water among competing uses and users, and (3) the safety of public drinking water supplies.

Legislative Intent

Article XI of the Virginia Constitution provides the basis for State involvement in water supply programs. Section 1 states that "To the end that the people have clean air, pure water, and the use and enjoyment for recreation of adequate public lands, waters, and other natural resources, it shall be the policy of the Commonwealth to conserve, develop, and utilize its natural resources..." Section 2 adds that "In the furtherance of such policy, the General Assembly may undertake the conservation, development, or utilization of lands or natural resources of the Commonwealth..." Implementing these constitutional provisions the General Assembly has enacted several water supply laws:

- The *State Water Control Law* directs the State Water Control Board to plan for the development, conservation, and utilization of water resources and to make recommendations to resolve conflicts.

- The *Public Water Supply Law* directs the State Board of Health to regulate the sanitary and physical quality of water provided for human consumption to guarantee its purity.

- Privately owned water systems are classified as public service corporations and placed under the regulatory jurisdiction of the State Corporation Commission.

- Cities, counties and towns are authorized to acquire and develop public water systems, either singly or jointly, and are vested with the authority to protect their sources of water.

These statutes illustrate four areas of legislative concern about water supply; and, in them, the extent of State involvement in assuring adequate water quantity is clearly spelled out. The State Water Control Board is authorized to collect information, develop plans, and make recommendations, but it is expressly prohibited from implementing its plans and recommendations. The safety of water supplies also emerges as a major interest of legislation. Authority is granted to the State Board of Health to safeguard human health by conducting a program of sanitary and physical regulation of drinking water. Most important is that the act of providing water service is not seen as a State responsibility, but is left to local governments and private entrepreneurs. The State's responsibility is to ensure that water will be available when needed and that where water is provided for human consumption, it is safe.

Organization

Legislation specifies the major State agencies concerned with water supply although all levels of government--federal, State and local--are involved. The following list shows the agencies and organizations which have significant responsibilities for water supply in Virginia and briefly describes the role of each.

- The *U. S. Environmental Protection Agency* promulgates regulations for and administers the Safe Drinking Water Act of 1974. EPA evaluates and certifies State programs for primary enforcement authority under this act.

- The *U. S. Army Corps of Engineers* engages in water resource planning and project construction activity--much of which is related to water supply.

- The *U. S. Department of Housing and Urban Development* and the *Farmers Home Administration* administer federal grant and loan programs which can be used to construct water supply systems in small communities and rural areas.

- The *State Water Control Board* has the responsibility for water resource planning and for administration of the Groundwater Act of 1973. Under the latter, the Board may regulate the use of groundwater in designated critical areas while the former authorizes the Board to develop a State policy and to prepare water resource plans for guiding the use of the Commonwealth's water resources.

- The *Virginia Department of Health* is charged with the responsibility for ensuring the safety and purity of water provided for human consumption. Regulation is conducted through five regional offices and in cooperation with 131 local health departments.

- The *State Corporation Commission* regulates the rates and service of public utilities, including privately owned water companies.

- The *Virginia Soil and Water Conservation Committee* and local *Soil Conservation Districts* engage in activities which can involve storage of water for use as water supplies.

- The *Council on the Environment* reviews and comments on proposed water resource projects through the environmental impact statement process.

- The *Division of State Planning and Community Affairs*[1] works with local governments and planning districts, providing information and assistance, particularly for comprehensive planning which encompasses water supply.

Actual water service is provided by a multitude of publicly and privately owned water utilities which develop and maintain systems for delivering water to consumers. There were 1,337 such systems in Virginia as of September 1, 1975, serving an estimated 90% of the Commonwealth's population. One half of these systems are small, serving less than 300 persons and, of the total, 70% are privately owned. In addition, there are an estimated 6,000 on-site systems serving restaurants, schools, and other institutions open to the public. The large number of agencies and organizations involved in supplying water requires a complex web of interrelationships between the public and private sectors and among levels of government.

Program Appropriations and Personnel

The lead agencies for the Commonwealth's water supply programs are the State Water Control Board and State Department of Health. During the 1974-76 biennium, appropriations for the Bureau of Sanitary Engineering (the agency within the Department of Health which has responsibility for ensuring drinking water safety) totaled approximately $1.3 million. This appropriation supports 30 authorized engineer positions, 16 of which are assigned to the water program. In addition approximately 400 sanitarians in various local health departments are also involved in water supply activities to a limited degree. The State Water Control Board has 97 positions authorized in its water conservation program for the current biennium and a total appropriation of $3.4 million, almost twice the amount of the 1970-72 biennium. The Public Utilities Division of the State Corporation Commission has one engineer responsible for its water and sewer company regulatory activities.

PLANNING FOR WATER SUPPLY

Ensuring that adequate water is available for residential, commercial, and industrial use is largely a function of the individual distributors of water, both public and private. The various suppliers plan for, locate and develop new or additional sources of water. The principal constraints on this process are riparian doctrine and in designated areas of the Commonwealth provisions of the Groundwater Act. Riparian doctrine vests the right to use surface water in adjacent owners' property and disputes between competing users are decided on a case-by-case basis by the courts. Groundwater law provides for a system of allocation by the State Water Control Board (SWCB) for groundwater in areas it designates as "critical groundwater areas".

Despite the fact that water supply planning is for the most part conducted by local suppliers, the Commonwealth is also heavily involved. There are two primary forms of State involvement. One is the development of comprehensive

plans for localities which is done in cooperation with the Division of State Planning and Community Affairs. Although the detail may vary considerably, each comprehensive plan includes an assessment of water supply needs of a particular jurisdiction, as well as policies for meeting these needs. As of December, 1974, 47 counties, 34 cities, and 43 towns had such plans. The second and more important State role in water supply is the development of a statewide water resource policy and comprehensive water resource plans. The policy and plans can serve as a guide for water supply decisions in Virginia. The responsibility for developing this policy is vested in the State Water Control Board and constitutes the primary form of State activity in the area of water supply.

Legislative Intent

The mandate for the development of a water resource policy and plan is found in the State Water Control Law.

> Being cognizant of the crucial importance of the State's water resources to the health and welfare of the people of Virginia, and of the *need of a water supply* to assure further industrial growth and prosperity for the State, and recognizing the *necessity of a continuous cooperative planning and effective State-level guidance in the use of water resources,* the State Water Control Board is assigned the responsibility for planning the development, conservation, and utilization of Virginia's water resources...the Board shall formulate a coordinated policy for the use and control of all the water resources of the State and issue a statement thereof.[2] (Emphasis added)

This legislation also establishes several principles to be considered in the formulation of water resource policy. Two of these are especially important to the present discussion: (1) the protection of existing private water rights subject to the principle of public ownership, and (2) ensuring a safe and adequate supply of water for human consumption. The SWCB is also authorized to make recommendations to resolve any conflict over water use either on request or on its own initiative, and to make plans, including comprehensive river basin plans, for the development of State water resources.[3] The SWCB is prohibited from implementing its plans and is directed to recommend to the General Assembly legislation necessary for the accomplishment of its water resource plans and programs.

Existing State involvement in water supply planning is based largely on the findings and recommendations of the 1965 Governor's Special Committee on Water Resources. This study committee had found that the State legislation and governmental organization were inadequate to permit the Commonwealth to respond effectively and efficiently to water resource problems. Specifically, the committee found that the State was unable to: (1) develop its own water resource plans and programs, (2) represent its own interests in relation to the federal government, or (3) provide reliable comprehensive leadership and coordination for the benefit of its political subdivisions and private interests.[4] The committee proposed the creation of a single agency to lead and coordinate State water resource programs.[5]

The committee was very clear as to how this leadership and coordination was to be accomplished; namely, through the analysis of water resources and needs in each of the river basins. In a detailed appendix to the report the committee outlined the contents of these basin plans and the approximate time and cost for each.[6] The plans, estimated to cost $5.5 million over a ten year period, were to

determine specific measures which could be taken to alleviate or forestall potential difficulties and to expand opportunities in the areas of domestic and industrial water needs, water quality control, flood prevention, land stabilization, agricultural irrigation, fish and wildlife, and recreation. By the mid-1970's both the policy and basin plans were expected to be in place. Although the committee report called for a strong agency to provide leadership and coordination in water resource management, implementing authority was specifically exempted from the recommended legislation, and water resource policy development and coordination were assigned to the Division of Water Resources (DWR) of the Department of Conservation and Economic Development.[7] In 1972 the division was transferred to the SWCB in an effort to consolidate the Commonwealth's water management functions in a single agency. This transfer did not alter the legislative mandate for policy, planning, and coordination which was incorporated into the State Water Control Law.

Legislative intent is quite explicit on two points. One is that the SWCB is to be actively involved in evaluating the need for and use of water resources in the Commonwealth, especially the use of water for human consumption and industrial purposes. Here, SWCB authority and responsibility to develop policies and plans are clear. The second point to be drawn from legislative intent is that the General Assembly does not want the SWCB to be the decision-making body for water resources. This reservation of authority is an extension of long standing policy which is evident in earlier studies of water resources in Virginia. The General Assembly has indicated a policy of keeping the solution of supply problems in the hands of the governing body closest to the people concerned. As a result, the SWCB is authorized to collect and analyze water resource data and to make recommendations when water supply problems are identified. However, final decision-making authority is reserved for the General Assembly or localities and riparian owners. Two important performance measures arise from this intent: (1) the extent of preparation of water resource policies and plans, and (2) the extent to which SWCB has made recommendations to resolve critical water supply problems.

Policy and Planning

The SWCB is clearly mandated by the Water Control Law to prepare a statewide water resource policy and a plan for each of the Commonwealth's major river basins. This section evaluates the SWCB compliance with legislative intent on the basis of: (1) the development of water resource policy and the extent to which it addresses major water supply problems, and (2) completion of comprehensive water resource plans.

Water Resource Policy. In June of 1974 the SWCB adopted its water resource policy. This policy is outlined in a twenty-two page document titled *Commonwealth of Virginia Water Resources Policy* and covers such areas as environmental protection, pollution and wasteful use, and water supply and storage. The policy was established some eight years after the General Assembly called for its development and as it relates to water supply the policy is largely inadequate. The policy fails to address a major concern of the legislature--meeting the domestic and industrial water supply needs of the Commonwealth in the future. The SWCB policy recommends that municipal areas have adequate off-stream storage and that water systems be interconnected. Other policy elements emphasize such management practices as protecting reservoirs or establishing criteria for groundwater withdrawal. However, no policy is established regarding the transfer of

water from one area of the State to another to meet demands for water which cannot be adequately met by local sources. At a time when there is substantial controversy over interbasin water transfers, SWCB policy does not specify criteria for evaluating the desirability or feasibility of such water transfers. After a decade of effort, the State policy toward water supply management consists of a series of general statements which do not effectively address the serious water supply problems facing metropolitan areas in Virginia.

The need for adequate supplies of water is emphasized in the State Water Control Law and reflects one of the major concerns of the Governor's Special Committee on Water Resources, yet SWCB policy ignores this entirely. Consequently, it must be judged inadequate in fulfilling legislative intent.

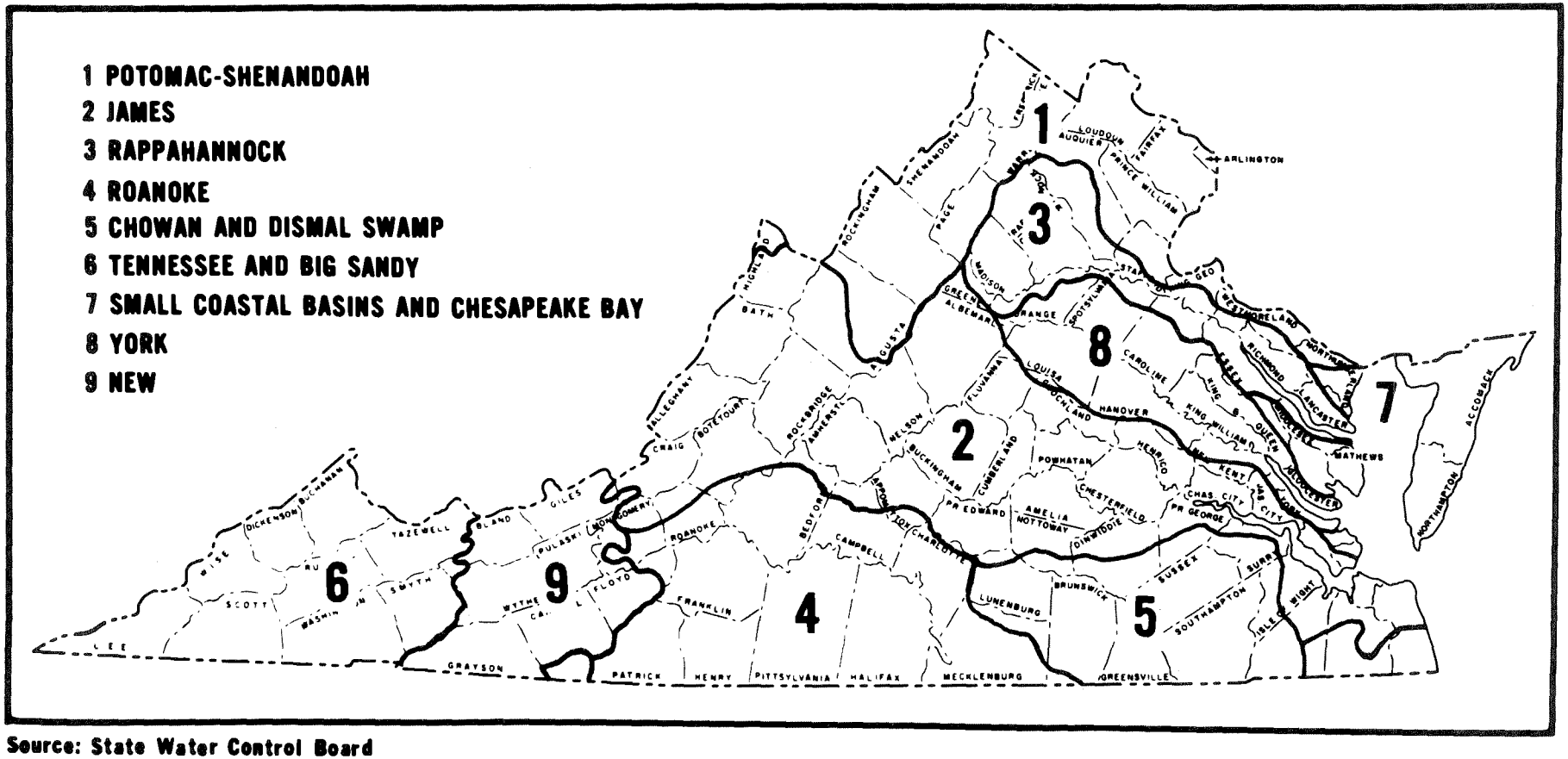
Comprehensive River Basin Planning. In-depth analyses of current supply and demand were considered by the Governor's Special Committee to be essential to the development of comprehensive water resource plans. A water resource plan serves as a guide for making decisions on the use of the State's waters. Usually, a plan includes an analysis of water supply, water quality, flood prevention and control, recreation, power, and navigation. A completed plan provides the information necessary to ascertain water resource needs and presents strategies for meeting them. A plan was to be developed for each of the nine major river basins in Virginia (Figure 1) and $4.3 million was spent for comprehensive basin planning between 1966 and 1975.[8] During the period 1966-72, the Division of Water Resources expended $4,120,010 for water resource planning. In comparison, after the merger in 1972, the SWCB spent only $180,065 for the preparation of water resource plans and $3.8 million for water quality management planning.* Although water quality considerations are an integral part of water resource plans, recent Board actions to emphasize water quality planning activities have diverted attention from other important water resource concerns such as water supply shortages in Southeastern Virginia. Since 1966, only two water resource plans have been completed, the New River Basin and Potomac-Shenandoah River Basin, and neither has been formally adopted by the State Water Control Board. It should be noted that both of these plans were prepared by the Division of Water Resources. The Executive Secretary of the Board has stated that the New River plan is "technically unimpressive" and the Potomac-Shenandoah plan does not "provide a meaningful assessment of the problems". The other seven basin plans are in various stages of preparation. In essence, ten years after initial authorization, only the background data and water quality elements of the water resource plans have been completed.

SWCB's commitment to the preparation of water resource plans has been negligible. SWCB officials report that beyond completing a water resource plan for the James River basin, no additional work is scheduled on the other six basin plans.[9] Data derived from the fiscal year 1975 SWCB Project Summary Report show that very little staff time is devoted to water resource planning--approximately 4%. It appears that the SWCB regards water resource planning as an additional function which is beyond the scope of its existing program responsibilities, to be undertaken only if additional federal or State funding is provided. SWCB budget

**Water quality planning* is primarily concerned with identifying pollution problems; developing plans for control of existing or potential problems; orderly implementation of the plan which usually includes a schedule of specific construction measures to control pollution. On the other hand, *water resource planning* encompasses all phases of water--supply, conservation, use, and water quality.

Figure 1

RIVER BASINS IN VIRGINIA



Source: State Water Control Board

exhibits for both the 1974-76 and 1976-78 biennia include requests for increased appropriations to conduct comprehensive water resource planning, but both requests were denied. This means that the funds and personnel originally provided for water resource planning under the Division of Water Resources (an estimated $500,000) have been and continue to be used to finance the SWCB water quality program. This shift in priorities occurred despite the fact that the legislation merging the two agencies contemplated no change in the water resource planning program.

The Executive Secretary of the SWCB claims that it is impossible to develop water resource plans under the State's existing riparian doctrine. (Refer to page 14 for a discussion of water allocation laws in Virginia.) Over the past four years, the Board has pursued a strategy of attempting to interest the General Assembly in conducting a comprehensive study of riparian doctrine and water rights laws in Virginia. This approach seems to be contrary to the legislated responsibilities of the Board which specifically direct it to perform an assessment of statewide water resource needs, develop water resource plans, and then recommend legislation to the General Assembly for the accomplishment of such plans.

SWCB Actions to Resolve Problems

The second major intent of the General Assembly is that the Commonwealth, through the SWCB, take a leadership role by providing advice and consultation and by making recommendations designed to resolve water supply problems and disputes or to correct inadequacies in water supply management. The extent of SWCB leadership in water supply is measured here on the basis of: (1) SWCB actions to resolve water supply problems; (2) water supply legislation recommended to the General Assembly; and (3) assistance provided to localities.

Resolving Water Supply Problems. The lack of adequate water supply sources was an important concern of the Governor's Special Committee. In 1965 the Commonwealth had just experienced several years of drought which reduced even normally adequate supplies to a critically low status. In addition, the Committee felt that economic growth would also necessitate action to ensure adequate water supplies. According to a JLARC survey of local administrators*, water supply continues to be a cause for major concern--78 of 240 responding jurisdictions indicated uncertain volumes of water at present or by 1990. The JLARC survey and recent reports by the U. S. Army Corps of Engineers indicate a pattern of scattered geographical water supply shortages which can significantly affect many Virginians. Three of the Commonwealth's larger metropolitan areas representing two million Virginians face shortages of water (See Appendix I for population data). SWCB response in each of these urban areas can serve as a measure of its performance.

*In January, 1976, JLARC mailed a questionnaire to chief administrators of all cities, counties, and towns in Virginia. The questionnaire was concerned with various aspects of water resource management including water supply, water quality, erosion and sedimentation, flood control and dam safety, and coordination. Survey responses are reported throughout this report where appropriate. The questionnaire is contained in the Technical Appendix.

The *Southeastern Virginia* area has the most critical water supply problem in the Commonwealth. The area includes Isle of Wight and Southampton Counties and the cities of Chesapeake, Franklin, Norfolk, Portsmouth, Suffolk, and Virginia Beach. It accounts for approximately 16% of the State's estimated 1973 population. None of the watersheds in the immediate area can adequately support all of Southeastern Virginia's future water needs, and groundwater is also in critical supply due to heavy industrial pumping. The Corps of Engineers projects substantial growth in demand for water which will result in an 8.0 million gallon per day (mgd) deficit (Table 1) for the area by 1980, and 116 mgd in 40 years. Such shortages can have a significant impact on the future growth of Southeast Virginia. To meet water volume needs, the eight localities in the Southeastern Virginia Planning District formed the Southeastern Public Service Authority (SEPSA).

Table 1

ADEQUACY OF PRESENT WATER SUPPLY SYSTEMS
NORFOLK METROPOLITAN AREA[a]
(millions of gallons per day)

	1980	2000	2020
Public Water Demand	98.5	114.0	206.5
Present Capability	90.5	90.5	90.5
Deficit	8.0	53.5	116.0

[a]Includes only urbanized portions of Norfolk, Portsmouth, Virginia Beach, and Chesapeake.

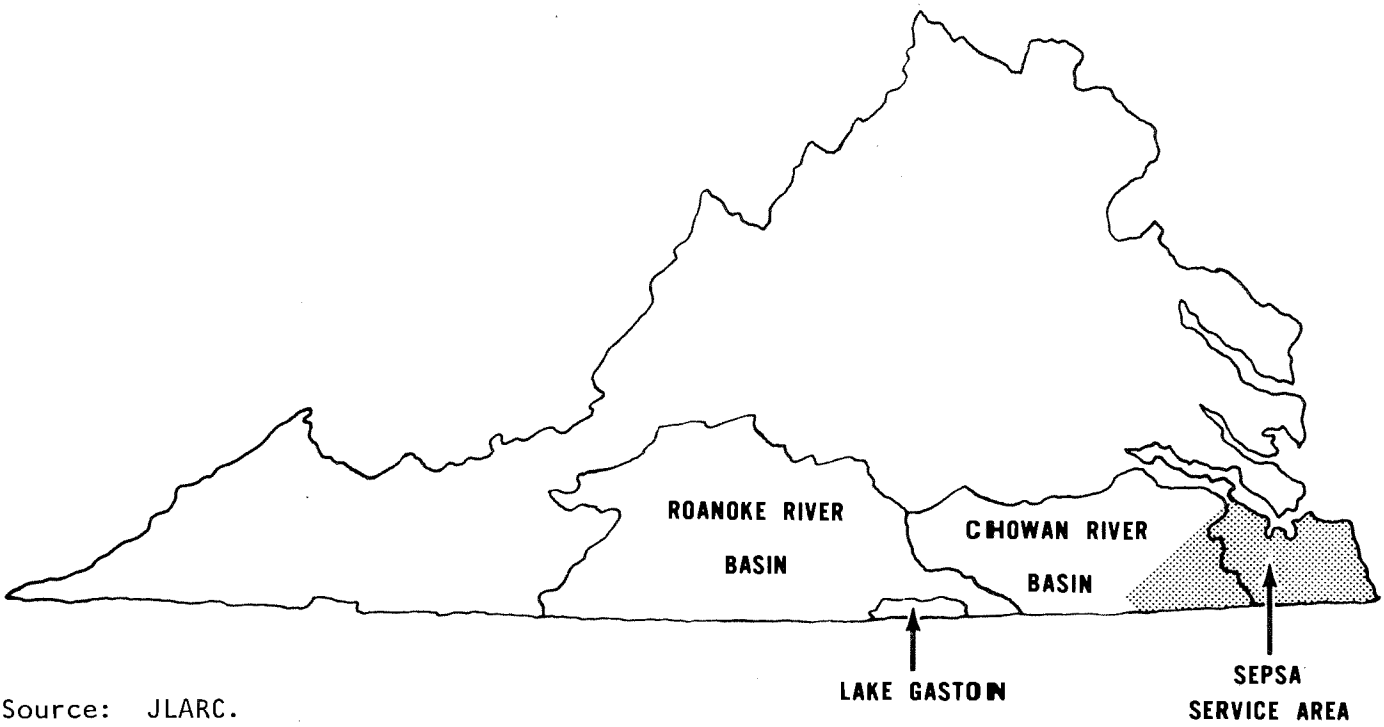
Source: U. S. Army Corps of Engineers, *Northeastern U. S. Water Supply Study, Preliminary Study of Long Range Water Supply Problems of Selected Urban Metropolitan Areas*, Volume II, 1973. p. 360.

Since there are no substantial sources of additional water in Southeastern Virginia, water must be obtained from other parts of the State. SEPSA has been seeking a new source since 1970. Two plans have been proposed--one which would draw water from the Chowan River Basin and a second drawing water from the Roanoke River Basin (Figure 2). The Chowan alternative, with a potential capacity of 60 mgd, was originally selected by SEPSA's consultants as the most feasible. However, the state of North Carolina objected to any reduction in river flow or quality in the Blackwater River where withdrawal would occur. To meet this objection SEPSA proposed augmenting the Blackwater River with water from the James River. This latter proposal was abandoned because of potential adverse environmental impacts on the flow of the Blackwater River.

With the elimination of the Chowan alternative in 1974, SEPSA sought to develop a source in the Roanoke River Basin. This has been SEPSA's main proposal in recent years and it has generated much opposition from the localities surrounding Lake Gaston, a manmade lake located in Mecklenburg County. SEPSA's proposal also includes development of the last remaining Southeast Virginia water source, the Northwest River in Chesapeake which would provide 10 mgd capacity, enough to satisfy the water needs of the area until 1982. Withdrawals from Lake Gaston of

Figure 2

ROANOKE AND CHOWAN RIVER BASINS



Source: JLARC.

15 mgd would begin in 1982, and expand to 45 mgd by 1993. Total costs for this alternative were estimated in July, 1975 to be $77.5 million. The widespread opposition to this proposal stems from the fact that the Lake Gaston communities regard it as a threat to their economic base which is largely oriented toward recreational activities. Additionally, the local governments also fear that water would be unavailable for their own use if SEPSA is allowed to make its withdrawals. In response to those objections the two Corps of Engineers districts (Norfolk and Wilmington) have recently required SEPSA to prepare environmental impact statements, a requirement which will further delay action on the proposal.

SEPSA has also explored other possibilities for obtaining water including purchases from the Appomattox River Water Authority. Such purchases have been opposed by some members of the latter authority and have not progressed beyond the proposal stage. Other alternatives include desalinization of salt water, use of icebergs from arctic regions, and a strict water conservation program. The first two alternatives are not economically feasible at this time and the latter has not been pursued with much vigor. Indeed, only the cities of Norfolk and Chesapeake reported conservation plans on the JLARC survey of local administrators.

The SWCB is officially neutral on the Lake Gaston proposal and it has refused to make any recommendations for resolving the Southeastern Virginia water supply problem. Instead it has supported a resolution for the Corps of Engineers to study the situation and has received a briefing on it. The SWCB has also promoted the Virginia-North Carolina water resource agreement signed by the

governors of the two states. However, none of these actions has yet produced a solution or recommendations, and SEPSA officials admit that they are entirely frustrated in their search for water. The result of the SWCB position is that a decision is likely to be delayed for several years and will probably be resolved only by federal action or the courts.

Northern Virginia, with a population of approximately one million persons, supports a rapidly growing part of the Washington, D. C. metropolitan area. The metropolitan area suffers from the lack of a dependable source of water supply to meet a steadily growing demand. The primary source of supply, the Potomac River, has more than enough water *on the average* to meet any foreseeable needs (Table 2), but is unreliable during periods of low river flow. (The occurrence of a drought could make the water supply problem even more critical.) Thus, the problem is one of meeting peak load demands, and it is significant to note that Table 2 shows the Virginia suburbs requiring an increasing share of this water. The situation is further complicated by the fact that the Potomac, as it flows between Virginia and Maryland, is considered to belong to the latter state. Virginia is currently questioning the right of Maryland and the U. S. Army Corps of Engineers to allocate the waters of the Potomac during periods of low river flow or drought.

Table 2

WASHINGTON, D.C. METROPOLITAN AREA AND NORTHERN VIRGINIA
AVERAGE MONTHLY WATER DEMAND AND SUPPLY PROJECTIONS
(millions of gallons per day)
1975-2020

Year	Average Potomac Flow	Average Regional Demand	Average Northern Virginia Demand	Ratio of Northern Virginia Monthly Average to Regional Monthly Average
1975	7000	463.2	137.7	29.7%
1980	7000	515.5	161.6	31.3%
1990	7000	617.3	199.1	33.2%
2000	7000	717.5	239.1	33.3%
2010	7000	818.1	278.5	34.0%
2020	7000	916.9	317.1	34.6%

Source: U. S. Army Corps of Engineers, *Washington Metropolitan Area Water Supply Study of the News Study, Water Supply, Demand and Deficit*, Annex B, October, 1975 (Draft), and Virginia, Division of Water Resources, *Potomac-Shenandoah River Basin Comprehensive Water Resources Plan*, Richmond, 1969, Vol. IV, p. 29.

The present strategy for meeting the District of Columbia metropolitan area water needs is through management of the Potomac River. River management regulates a free flowing river in order to provide more reliable volumes of water. The Corps of Engineers has proposed a series of dams on major tributaries of the Potomac River. One of these will be located in Virginia at Verona in Augusta County. The Division of Water Resources basin plan for the Potomac-Shenandoah Rivers recommended construction of this project, and officials of the

major utilities serving Northern Virginia indicate that the Verona project will solve their water supply problems through the year 2000.

The Verona Dam was initially proposed by the Secretary of the Army in 1970 and was authorized for Phase I planning by Congress in 1974. Phase I planning is an update of the original estimates and benefit-cost ratios to determine if the project is still feasible. At the time the project was first proposed it was supported by local governments in both Northern Virginia and Augusta County. Since that time opposition in Augusta County has led the Board of Supervisors to reverse its original position. Residents are opposed to the flooding of their land and the resulting loss of homes and farm production to serve the needs of Washington, D. C. area residents.

The SWCB has taken a position in support of increased water supplies for Northern Virginia and has endorsed the Verona project as a means for accomplishing this. The Baltimore District of the Corps of Engineers reports extensive consultation with both SWCB central and regional offices on this water supply matter.

Newport News-Hampton is another Tidewater area plagued by limited water sources (Table 3) although the problem is not as severe as that on the southern side of Hampton Roads. The region is served by reservoirs located within the area and one located in the Chickahominy River basin. Present plans call for expansion

Table 3

ADEQUACY OF PRESENT WATER SUPPLY SYSTEM
NEWPORT NEWS METROPOLITAN AREA
(millions of gallons per day)

	1980	2000[a]	2020[a]
Public Water Demand	40	70	117
Present Capability	50	50	50
Deficit	--	20	57

[a]Data for these years include Williamsburg and James City County.

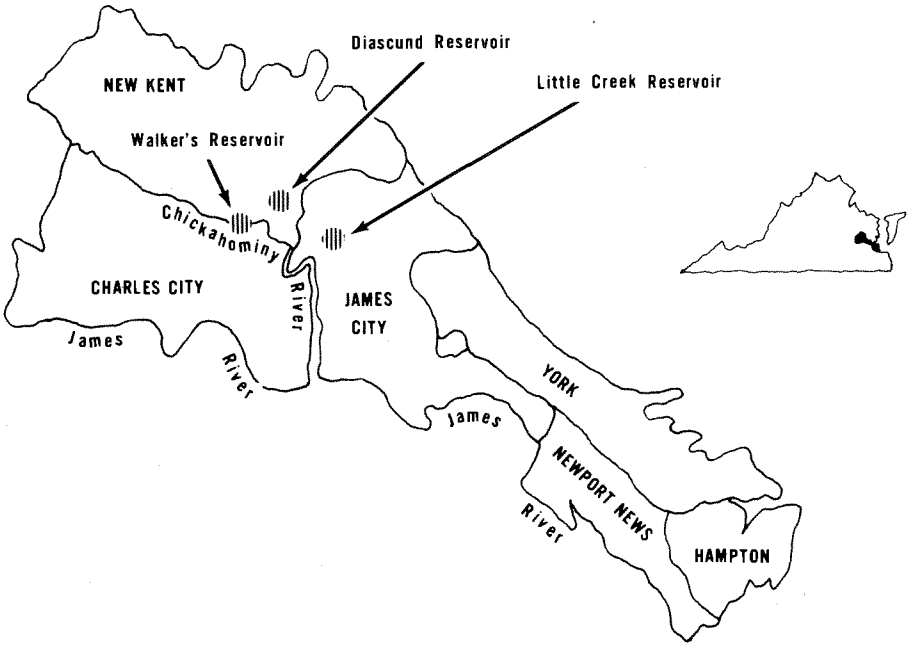
Source: U. S. Army Corps of Engineers, *Northeastern U. S. Water Supply Study, Preliminary Study of Long-range Water Supply Problems of Selected Urban Metropolitan Areas*, Vol. II, p. 341.

of this latter source, the Diascund Reservoir, by means of an impoundment and pump station on Little Creek. (Figure 3)

Under federal law the SWCB must certify that water projects will not have an adverse impact on water quality. When the Little Creek proposal came before the SWCB for certification in 1974, Charles City and New Kent Counties (which surround the proposed site) voiced concern that Newport News might pre-empt the waters of the Chickahominy Basin and that should the two counties need water, no water would be available.

Figure 3

RESERVOIR PROJECTS IN THE CHICKAHOMINY BASIN



Source: JLARC.

The SWCB directed its staff to take steps necessary for the issuance or denial of certification, but on the advice of the Attorney General limited its consideration to water quality and stated that:

> The Board...does not intend...either to affect, in any way, or make any determination concerning the legal right of any person to make use of the State waters of Chickahominy Lake.[10]

Certification was never issued or denied because the SWCB did not meet the Corps' one year deadline. SWCB staff members have stated that the reason for this failure was that the Board sought to obtain an agreement on water sharing among the three localities. However, conversations with local officials in Charles City and New Kent counties and Newport News produced no evidence of any serious attempt to reach some agreement.

Water Supply Legislation. A review of SWCB records shows that no legislation concerning water supply has been recommended to the General Assembly by the SWCB since 1972, and only one piece of legislation relating to the adequacy of water supplies has been enacted: the Groundwater Act of 1973. This act authorizes the SWCB to monitor groundwater usage in the Commonwealth and to regulate usage in designated critical areas. The act was originally conceived by the Division of Water Resources but enacted after the merger with SWCB in 1972.

Assistance to Localities. The final measure of SWCB involvement in water supply issues is the extent to which it actually works with the various water utilities in locating and developing new sources of supply. Overall, of

the 240 local administrators responding to the JLARC water resources survey, only 20% indicated receiving aid from the SWCB on water supply problems. Of the 78 respondents reporting present or future water problems, 47% indicated receiving aid. Interestingly, half of these jurisdictions reporting water supply problems did not receive assistance from SWCB. SWCB assistance appears to be directed primarily toward future water supply problems--only three of the 26 jurisdictions reporting present water supply difficulties indicated receipt of aid, another indication of SWCB limited involvement in current water supply problems.

Conclusion

In 1966 the General Assembly established its intent that the Commonwealth begin to provide leadership and coordination for meeting the water supply needs of the Commonwealth. It saw the need for a State strategy to ensure that sufficient water would be available for both human consumption and economic growth and was quite specific as to the kind of policy that was needed, the means for developing this strategy, and the time frame for its development. This intent has not been carried out. The SWCB has completed no water resource basin plans since 1972 and its water resource policy ignores certain critical aspects of water supply management including interbasin transfers of water. Virginia has neither a relevant water resource policy, nor a comprehensive plan for water resource management by the time that the General Assembly felt both should be firmly established.

Similarly, the SWCB provides little leadership on water supply issues in the Commonwealth. The Board has remained officially neutral while the Southeastern Virginia localities are seemingly unable to obtain water to meet immediate needs and has expressly avoided making any recommendations for resolving the water supply problems. Thus, resolution of water disputes between local governments must be made by the parties at issue, which means that any larger public concerns go unaddressed. The SWCB has taken a position in support of increased water supply for Northern Virginia, but it is significant to note that this position came in response to a plan formulated by a federal agency, the U. S. Army Corps of Engineers. In addition, the SWCB has made no recommendations on water supply to the General Assembly as authorized by the State Water Control Law. It appears, then, that SWCB is willing to respond to initiatives taken by other agencies on water supply, but will not take the initiative on its own.

The SWCB bases much of its reluctance to prepare water resource plans and to provide leadership in local water supply disputes on its lack of authority to interfere with existing water rights. Because the legal framework influences the ability of the Commonwealth to deal effectively with water supply problems, it is examined in the following section.

WATER ALLOCATION IN VIRGINIA

The legal framework for allocating water in the Commonwealth is composed of riparian law and the Groundwater Act. These two laws represent two diverse approaches to the allocation of water, embracing radically differing philosophies of water management.

Riparian Doctrine

Riparian law is a doctrine based on common law which vests the right to use surface water to the owners of property adjacent to a body of water (riparian owners). The amount of water use is undefined, subject only to the limitation that it be reasonable and not interfere with the right of other riparian owners to also make use of the water. Riparian law has several shortcomings as a system of water supply management. First, it gives preference to owners of property in a river basin; consequently, it can be difficult, if not impossible to transfer water from areas of surplus to areas of scarcity, especially when the two areas are in separate river basins. A second problem is that under riparian law decisions on water use are made by the courts on a case-by-case basis, thus eliminating both the perspective and long range considerations that could be brought to bear on a decision through a more comprehensive process; supply and demand are considered only insofar as they affect the parties to a court action. Third, because water use decisions under riparian law are made by the courts, there is always the possibility of legal entanglements and delays which can prevent a water supply from being developed in time to meet a need even though it might have been known well in advance. And even if a source can be developed, it is always possible that the actual use may have an adverse impact on a downstream riparian owner, leading to legal action to limit use of the source.

The JLARC survey of local administrators indicated that 17 localities encountered problems with riparian law--12 jurisdictions with populations less than 25,000 and more significantly, 5 jurisdictions over 100,000 in population. These respondents indicated that riparian law creates problems of undependable sources of water supply. Most surprising, approximately half of the 240 respondents to the survey believed that the Commonwealth should allocate water rights through a permit system. This belief is particularly evident among the State's cities (65% in favor compared to 42% for counties and 49% for towns) and is an indication that many local public officials in Virginia believe that water supply problems require a greater State involvement than at present.

The uncertainty resulting from reliance on riparian law complicates water management; any attempts to control the use of water will encounter opposition on the grounds that "I may not need it now, but if I let someone else use it how do I know that it will be there when I do need it." For this reason, the General Assembly amended the Water and Sewer Authorities Act to prohibit one political subdivision from constructing an impoundment for water supply outside of its own boundaries without first obtaining the permission of the political subdivision where the impoundment is to be located.[11] According to one local administrator this was an attempt to give localities control over their own water.

Southeastern Virginia's search for water provides a good example of the problems caused by riparian law. Under riparian law, SEPSA has no guarantee that the water it needs will actually be available even if the Corps of Engineers issues a water withdrawal permit for Lake Gaston. A suit by a riparian owner could challenge SEPSA use of water as an illegal non-riparian use since much of the water will be used outside of the Roanoke River Basin. Similarly, when the localities surrounding Lake Gaston need water, there is no guarantee that this source of water will not have already been pre-empted by SEPSA. Thus, there is considerable room for inefficiency in a water use system based on riparian law, inefficiency that is likely to be exacerbated by future growth or by drought.

Although the intent of the 1966 water resource planning legislation specifically prohibited the alteration of existing water rights, the intent that water supply management be efficient and effective seems to contradict this prohibition. Perhaps there was a recognition of the need for future changes in Virginia's water rights law. Riparian law is more appropriate where all areas of the State have access to adequate amounts of water, but a major portion of Virginia's population lives in increasingly water short areas. As a result, it may be that efficiency and effectiveness in water supply during the last quarter of the 20th Century will require some alteration of traditional water allocation practices.

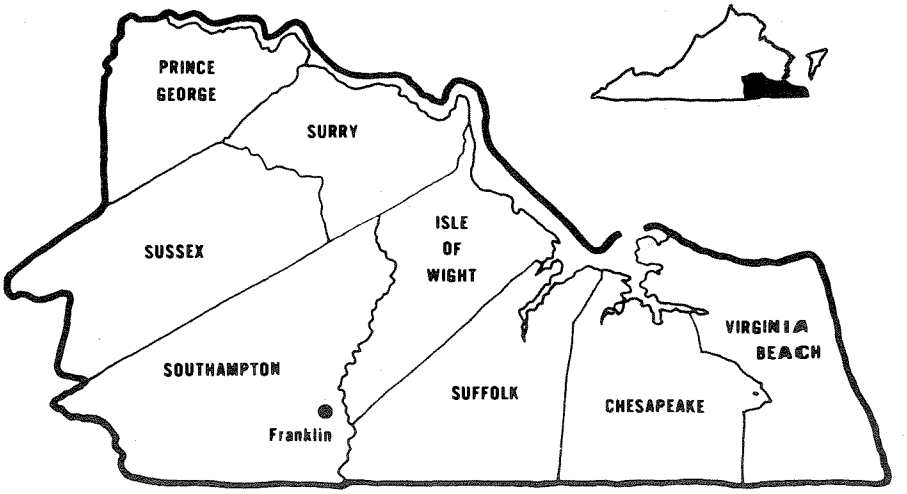
Groundwater

The Groundwater Act of 1973 represents a major departure in the regulation of water use in Virginia. The act allows the State Water Control Board to allocate the use of groundwater by permit in specially designated critical groundwater areas. (Groundwater may be defined as all water found beneath the land surface or beneath the beds of rivers and lakes.) The 1973 act was enacted in response to the declining level of groundwater around the City of Franklin in Southeastern Virginia. The purpose of the act is twofold: (1) to ensure continued availability of groundwater; and (2) to prevent the intrusion of contaminants due to excessive pumping.

Only one critical groundwater area (CGA) has been designated to date--the Southeastern Virginia CGA (Figure 4)--and the SWCB is still developing procedures to implement the law. Implementation has been delayed by uncertainty over the law's exemptions. One of these exemptions specifies that users of groundwater

Figure 4

SOUTHEASTERN VIRGINIA CRITICAL GROUNDWATER AREA



Source: State Water Control Board.

on the date of CGA declaration are guaranteed continued use and may claim as a right an amount equal to the maximum daily use for any date up to two years prior to the declaration. This provision in effect may allow prior users to claim more total groundwater than is available. For example, the Southeastern Virginia CGA users claim more than 100 mgd but only withdraw 64 mgd.[12] The result, however, is that new users are denied access to groundwater while prior users may continue to make withdrawals at a rate which threatens to deplete groundwater resources and impair its quality. A Tidewater local official responding to the JLARC survey stated:

> The local groundwater source is being exploited by industry. Local land owners (farmers) and local governments have and will continue to experience tremendous escalation in cost of water due to industrial exploitation. Eventually the groundwater supply will be destroyed unless there is vastly improved state responsibility.

To close this gap in the Groundwater Act, SWCB staff proposed a system which would establish both a daily maximum and a monthly or yearly average maximum. It was felt that this would be more realistic in light of actual withdrawal rates, yet would still preserve the maximum right as stipulated by statute. The SWCB was uncertain about the legality of such a proposal. There was also a question about the law's scope--does it apply to all users of 50,000 gallons per day or only industrial users withdrawing more than this amount? A task force composed of two SWCB members and a member of the Attorney General's staff was created to resolve these questions, but was unable to do so and requested a formal opinion from the Attorney General.

The Attorney General's opinion stated that the SWCB is empowered only to establish a maximum daily limit for prior users and has no authority to establish any other limits. The scope of the statute was interpreted to apply only to industrial users withdrawing more than 50,000 gallons per day, leaving withdrawals for agriculture, livestock watering, and human consumption or domestic (including municipal use) purposes unregulated. Other sections of the opinion affirm SWCB authority to establish a single daily maximum for multiple well systems and to regulate municipal groundwater users to the extent that they supply water to industries utilizing more than 50,000 gallons per day.

The effect of this interpretation, according to some SWCB officials, is to severely reduce the effectiveness of the law. The Attorney General's opinion is a literal interpretation of the law,[13] which suggests the possibility that the Groundwater Act may have been poorly drafted relative to its intended purposes. Present SWCB plans are to implement the statute as outlined by the Attorney General, but it is felt that such an approach will do little to prevent serious depletion of Southeastern Virginia groundwater.

Conclusion

At present the allocation of water in Virginia is both diverse and inefficient. It is diverse in that varying systems of regulation are in effect for the same basic resource; it is inefficient in that it does not permit prospective users to know whether or not water will be available when needed, and if so, how much. This uncertainty can adversely affect both economic growth and quality of life in the Commonwealth.

The problems with water rights are not new, they have been the object of much consideration in the past quarter century. A series of water resource studies conducted in 1953, 1955, 1958, and 1965 attest to this concern. These studies parallel the gradual trend toward comprehensive water resource management. At each stage of this progression, the legal framework of riparian law has been retained, but recognition that its utility may be substantially diminished by urbanization and industrialization has accompanied these decisions. The need for effective regulation of groundwater in Southeastern Virginia and the water supply problems of the State's metropolitan areas are indications that further changes in the laws are necessary.

Regulation of use on the basis of supply appears necessary. The Groundwater Act of 1973 should be amended so that it applies to all users of more than 50,000 gallons per day and to limit prior claims to amounts which more realistically reflect actual usage (such as a monthly or yearly average). Consideration should also be given to modifying the riparian law to permit comprehensive regulation (i.e., in terms of supply and demand) of surface water use and more flexibility in water management. Substantial assistance and information can be provided by other states, such as Maryland, which have already established administrative supply regulations. However, issues which must be addressed prior to initiating any changes in the law include the goals to be achieved and the effects of various legal alternatives for achieving these goals. The comprehensive water resource management plan mandated by the General Assembly can serve as an excellent vehicle for establishing goals of a water allocation program and evaluating alternatives for their achievement. Therefore, it is critical that a State water resource plan be completed as a first step toward any modification of existing water law.

Conservation of water can also provide some relief from impending shortages, but this alternative is not widely encouraged or used by owners of water distribution systems in Virginia. Based on the JLARC survey, only one locality in ten reported having a conservation plan in effect, and few of these respondents are those with water supply problems. The SWCB should actively promote water conservation as a viable alternative in water short areas and assist local governments to implement such programs.

SAFETY OF WATER SUPPLIES

Water is vital to public health since it is necessary for the maintenance of biological life and it is also central to adequate sanitation. This dual role of water is the source of one major health dilemma in that water used for human consumption is also used for disposal of waste and toxic substances. This fact can pose both short and long-term threats to public health, ranging from such illnesses as intestinal diseases and chemical poisoning to cancer. The list of potential hazards is quite extensive and is complicated by the fact that they are difficult to trace and evaluate, particularly for diseases which develop over a long term. A recent study conducted by the U. S. Environmental Protection Agency noted that:

> For decades most Americans have confidently relied upon their public drinking water, assuming that the Nation's drinking water was free of microbiological and other harmful contaminants. In view of recent findings, however, the assumption that our water is "safe" is

> subject to question. Investigations have found that outbreaks of disease or poisoning attributed to drinking water have not been completely eliminated. Also of concern are recent findings that our drinking water contains substances which are believed to be potentially carcinogenic or otherwise toxic, such as various organic chemicals, certain heavy metals, radionuclides, and asbestos.[14]

The goal of a safe drinking water program is to eliminate or reduce these threats by ensuring that water for human consumption is of appropriate quality.

Safe drinking water programs have traditionally been the prerogative of the states, but in recent years the federal government has begun to take a more active role, particularly in the area of water quality control. In 1974 the U. S. Congress enacted the Safe Drinking Water Act which prescribes a minimum public drinking water program to be maintained by the states. This statute has already had a significant impact on the Commonwealth's drinking water program and is expected to be a major factor in the future.

Legislative Intent

The General Assembly has addressed the public health aspects of water through the Public Water Supply Law and the State Water Control Law. Responsibility for the safety of public water supplies is vested entirely in the State Department of Health (SDH), which is charged with "general supervision and control over all water supplies and water works in the State insofar as the sanitary and physical quality of water furnished for drinking or domestic purposes may affect public health,"[15] and may promulgate "...rules and regulations...designed to protect the public health and guarantee a supply of pure water in relation to such matters."[16] Virginia's first such law was enacted in 1916 and sought to bring the resources of the Commonwealth to bear on what were then major health problems stemming from public water supply such as cholera, typhoid and dysentery. Since that time other threats to the purity of drinking water, such as carcinogens and pesticides, have become known and it is reasonable to infer that the Public Water Supply Law contemplates a State role in the reduction of these dangers as well as the more traditional ones. In addition, SDH is also responsible, jointly with the SWCB, for the regulation of sewerage systems and sewage treatment plants, an activity which has a significant impact on drinking water safety.[17]

By law, any waterworks serving more than 25 individuals or more than 15 residential connections is defined as a public water supply and must obtain a written permit from the State Board of Health. Two categories of waterworks fall within this definition. The first is comprised of 1,337 municipal, private, and industrial water systems; the second includes approximately 6,000 individual water supplies at various establishments (e.g., service stations, restaurants, schools) which serve more than 25 persons or are required by law or State Board of Health regulations to have an approved water supply. For convenience, the term "public water supply" will be reserved for the former and the term "on-site supply" will be used to describe the latter. Despite this artificial distinction, it should be noted that all of these waterworks are actually public water supplies.

Program Scope

The State Department of Health, headed by the State Health Commissioner enforces the Public Water Supply Law. The Bureau of Sanitary Engineering (BSE) in the Division of Engineering is responsible for overseeing the 1,337 public water systems while the Bureau of Environmental Health in the Division of Local Health Services regulates the approximately 6,000 on-site supplies through local health department sanitarians. The sanitarians of the Division of Local Health Services also evaluate and offer advice on individual residential water supplies, but this is done as a service to homeowners and these supplies do not fall within the scope of the Public Water Supply Law.

Appropriations to BSE for both drinking water and sewerage programs are shown in Table 4. During the 1974-76 biennium the Bureau was authorized 33 engineer positions, including the director and assistant director. These engineers work out of five regional offices (Figure 5) and oversee the operation of the 1,337 waterworks and approximately 450 sewage treatment plants. The number of authorized positions remained constant between fiscal years 1969 and 1976, but the 1976-78 biennium budget includes funds for new engineer positions.

Table 4

APPROPRIATIONS FOR BUREAU OF SANITARY ENGINEERING

Biennium	General Funds	Federal Funds	Total
1976-78	$1,427,350	$1,518,500	$2,945,850
1974-76	1,264,820	--	1,264,820
1972-74	1,107,930	--	1,107,930
1970-72	985,025	--	985,025
1968-70	647,015	--	647,015
1966-68	486,825	--	486,825

Source: Commonwealth of Virginia, *Budget* (years indicated).

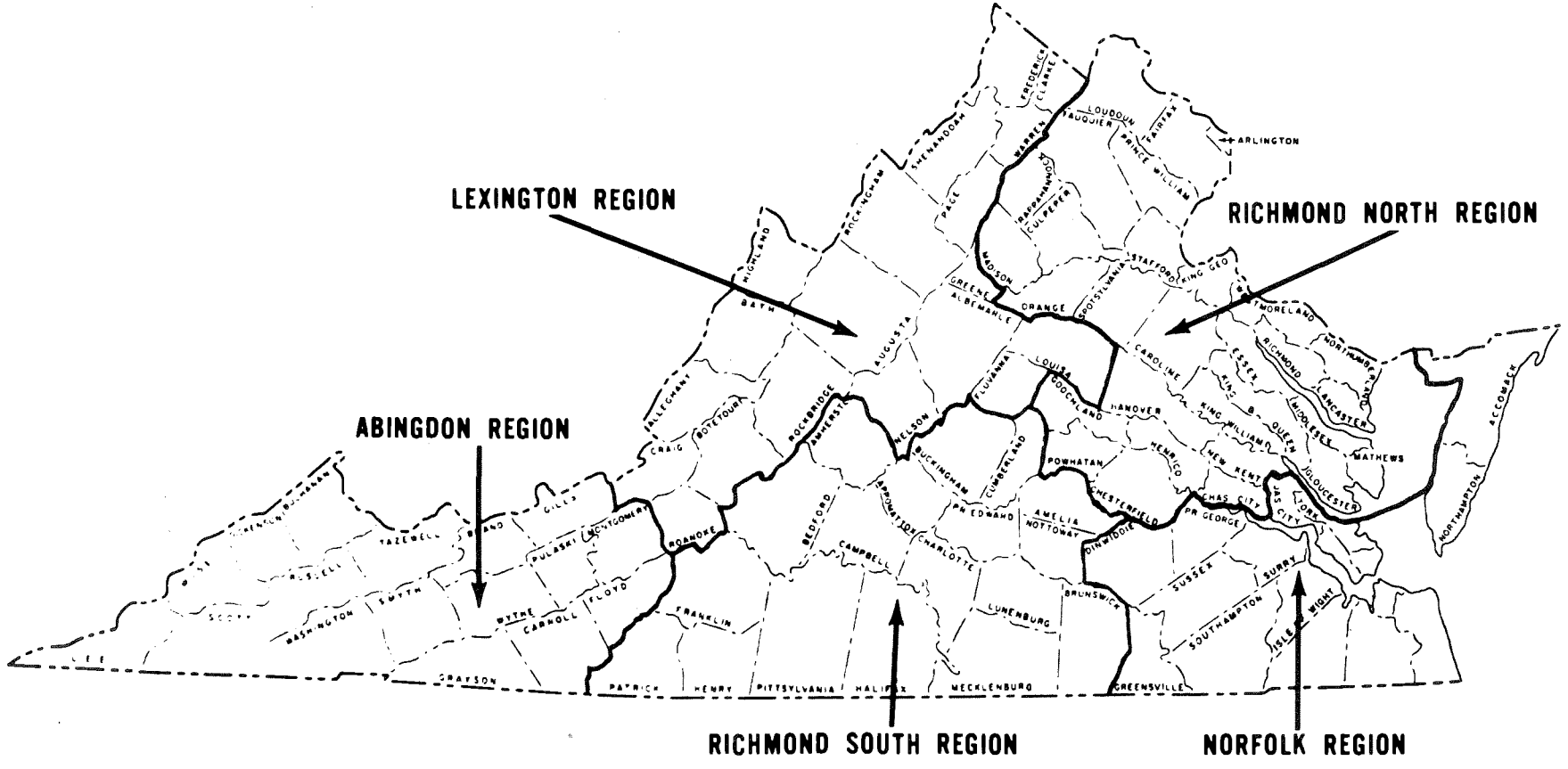
The impact of the Safe Drinking Water Act is readily apparent in BSE appropriations; most of the growth is the result of anticipated federal grants for development of State programs available under this legislation. In previous years the drinking water program was funded entirely by the State. Beginning in fiscal year 1977, the Commonwealth and the federal government will share program costs almost equally. Budget data for the Bureau of Environmental Health which monitors the on-site water systems are not separately available. The "on-site" program is estimated to cost approximately $522,000 per biennium (400 sanitarians @$10,000 per year spending 6.9% of their time on water activities).

The division of work activity between BSE drinking water and sewerage programs may be seen in Table 5. It is readily apparent that while activities related to drinking water takes the most time of bureau engineers, wastewater activities represent a substantial portion of agency effort. The activities of the Bureau of Environmental Health focus largely on areas other than water--6.9% of sanitarian activity was devoted to water supply matters in fiscal year 1974. The major identifiable activity is collection of water samples (Table 6), but most

Figure 5

BUREAU OF SANITARY ENGINEERING

ADMINISTRATIVE REGIONS



Source: State Department of Health , Bureau of Sanitary Engineering

of the activities fall into the "other" category, which includes a wide range of services such as technical assistance provided to owners of privately operated water supplies. Complaint investigation, supply approval and permit issuance are relatively minor components of the Bureau of Environmental Health program.

Table 5

PROGRAM ACTIVITIES
BUREAU OF SANITARY ENGINEERING
(July 1975-March 1976)

Activity	Drinking Water	Wastewater	Total
Project Review	13%	29%	42%
Surveillance and Monitoring	16	5	21
Training	4	2	6
Information and Technical Assistance	4	3	7
Enforcement	10	--	10
Special Projects	1	2	3
Administration	7	4	11
Total	55%	45%	100%

Source: Bureau of Sanitary Engineering, Monthly Reports, July 1975-March 1976.

Table 6

WATER SERVICES PERFORMED BY PUBLIC HEALTH SANITARIANS
(Fiscal Year 1974)

Service	Number	Percent of Total
Approve Supply	1,198	1%
Investigate Complaint	614	1
Permit Issued	699	1
Sampling	33,461	38
Other	51,849	59
Total	87,821	100%

Source: State Department of Health, *Annual Statistical Report*, 1973.

The scope of SDH drinking water programs is quite broad, encompassing over 7,000 water systems ranging in size from a well serving a gasoline station in a rural area to large water utilities serving several hundred thousand customers in metropolitan areas. To assess the effectiveness of SDH drinking water programs JLARC staff reviewed its impact on public health. Direct measures include the number of outbreaks of disease which can be traced to water, potential health hazards, and quality of water delivered to consumers. Indirect measures are those program elements such as surveillance, enforcement and design review, and program

planning which can be reasonably expected to reduce the likelihood of potential health hazards.

Outbreaks of Disease and Health Hazards

Outbreaks. One criterion now available for evaluating the effectiveness of the Commonwealth's drinking water programs is the number of illnesses which can be traced to public water systems or on-site supplies. This criterion is consistent with the legislative intent that water delivered to consumers be safe. On the basis of this criterion, the program appears to be effective. Data provided by the State epidemiologist show four reported outbreaks of waterborne disease in Virginia since 1960, the last of which occurred in 1967. Three outbreaks were traced to privately owned wells and one occurred at a convention center with an on-site system. No outbreaks have been reported from public systems. These data do not mean that water has no health impact; many instances of waterborne illness are not recognized as such and are generally seen as a minor discomfort of short duration requiring no medical attention. In addition, many serious health problems, such as cancer, are beginning to be suspected to result from the ingestion of small amounts of substances over a long term, and it is difficult to trace their cause to water. However, it is possible to conclude from these data that the threat of major epidemics has been virtually eliminated in Virginia.

Potential Health Hazards. A second criterion for assessing drinking water program effectiveness is the existence of potential health hazard areas. Potential health hazard areas are those communities identified by local administrators where residents are served by inadequate or unsafe water which poses a threat to human health. Forty-six respondents to the JLARC Survey reported potential hazards within their jurisdictions; a figure which equals 20% of the respondents and includes 31 counties, 2 cities and 13 towns. This list of potential health hazards closely corresponds to SDH designations of certified health hazards and jurisdictions in need of water supply distribution systems. Most of these hazards are located in rural areas, but at least five jurisdictions represent urban or urbanizing areas.

Approximately 50,000 persons are exposed to these potential health hazards which affect a population ranging from a few individuals to over 10,000 persons. The City of Chesapeake and Loudoun County identified the greatest number of people exposed to health hazards, with over 10,000 persons in each case. In the latter jurisdiction this figure represents older subdivisions and communities with obsolete distribution systems or poor water supply sources. Loudoun officials report that approximately half of the affected persons are in areas under consideration for federal sewage treatment funds. Officials in Chesapeake indicate a lack of confidence in many privately owned water systems and wells serving individual homes. Other major problem areas include:

- Alleghany County where 130 families in one subdivision are served by water supplies contaminated by open sewers and privies and drinking water must be imported in bottles. The subdivision is a low income area and cannot afford needed improvements, federal funds have been obtained to construct a sewage system, but no funds are available for a water system.

- A Smyth County community of 1400 persons is served by an obsolete distribution system which is contaminated by surface drainage and lacks sufficient facilities for treating and storing available water. The local health department has identified the problem but no funds are available to correct it.

- Buchanan County suffers from a falling water table and the water that is available has high iron and sulfur content which produces bad taste, odor and color. The Town of Grundy has depleted its water source and that which is available must be boiled before use. SDH and SWCB are working with local, regional, and federal officials to develop water and sewerage systems. $4.8 million in federal loans and some grants have been authorized for development of a water system and $9.0 million in grants for a sewer system.

- Bath County relies primarily on wells and cisterns for its water supply. Water sources are contaminated by privies and septic tanks. The county has been certified as a health hazard by SDH and SWCB has designated federal funds to plan for a regional sewerage system. Funds are not currently available for development of a water system.

Financing Waterworks. Most of the 46 jurisdictions reporting health hazards also indicated a need for better water distribution facilities. However, the burden for financing these facilities rests solely with those desiring to develop a system. Communities are eligible for federal loans and some grants which can be used to finance a water distribution system. However, many administrators maintain that they are unable to finance systems even with this kind of assistance. In 1971, BSE identified approximately 100 communities in need of new or improved public water systems. The total cost of projects to meet these needs was estimated to be approximately $34 million. The Bureau of Sanitary Engineering proposed a State grant program to finance 75% of the cost of these improvements, but the program was not funded. Based on the JLARC survey, twenty-three of the original 100 communities report continuing potential health hazards, an indication that water supply problems remain or are becoming worse.

Although the Commonwealth's safe drinking water program appears to be effective in preventing epidemics of communicable disease, the large number of potential health hazards reveals a major gap in the program. Many Virginians are exposed to health hazards because of unsafe or insufficient water supplies. SDH is aware of many of the potential health hazards identified by the JLARC survey, but the lack of adequate financial resources retards the elimination of these hazards.

Drinking Water Safety

The quality of water provided to customers of public waterworks can also serve as a measure of drinking water safety. Drinking water quality is measured in terms of the presence of potentially harmful bacteria, chemicals, or other substances. Criteria for evaluating drinking water quality are those established by the BSE *Waterworks Regulations* which prescribe the essential systems, procedures, and standards for waterworks development, operation and expansion. The *Waterworks Regulations* establish maximum levels for various substances which were used by JLARC staff to review present drinking water quality. JLARC made a

statistical analysis of water supply sampling data submitted by local waterworks to the Bureau of Sanitary Engineering during the period July 1, 1973 to June 30, 1975. A review of bacteriological and chemical sampling data was performed at four BSE regional offices. (Refer to Technical Appendix for the methodology.) The results of this analysis follows.

Bacteriological Quality. Total coliform is the most commonly used indicator of bacteriological quality. Coliform bacteria are not harmful of themselves (they are present in large numbers in the human body and in the intestinal tract of warm-blooded animals) but are considered to be an indicator of other, more harmful bacteria, such as those which cause typhoid or cholera. Approximately 11,600 bacteriological samples submitted by 104 different waterworks were analyzed during the review period. Two hundred and twenty-nine samples from 39 waterworks showed positive results (i.e., presence of excessive coliform bacteria), approximately 2% of all samples analyzed. Of these, 61 samples from 16 systems were confirmed positive (failure to obtain negative results in two consecutive samples taken at the same point), a rate of one in every 200 samples for the two year period. Significantly, one system suffering from a chronic problem accounted for 35 of the 61 confirmed samples, leaving 15 waterworks with only 26 confirmed positive samples in two years, a rate of less than one per system per year. This pattern is uniform for water systems of all sizes and for each of the four BSE regions surveyed and indicates that while there are occasional variations, the bacterial quality of water provided by Virginia public water systems is generally acceptable.

BSE records do not contain complete follow-up information for each sample violating drinking water standards and therefore JLARC staff was unable to systematically document Bureau follow-up activities. When bacteriological standards are exceeded, "check samples" must be taken daily at the same point until the results from at least two consecutive samples fall within specified limits. Generally, this is done, but in many cases the next regular sample, if below the maximum standard, is accepted as sufficient. In other cases, only one check sample was submitted. However, where sample results are consistently unacceptable, Bureau personnel work with waterworks personnel to rectify problems. This kind of follow-up was noted in three instances.

Chemical and Other Quality. The *Waterworks Regulations* specify limits for concentrations of chemicals, pesticides, and radioactivity, and also prescribe standards for the physical quality of water. Two kinds of limits are established: (1) health limits for substances hazardous to human health; and (2) aesthetic limits for factors that render water less than desirable for use, such as taste and odor. Examples of the former are arsenic, lead, pesticides, and radioactive nuclides and are usually introduced into a water supply by industrial discharges and urban run-off. Examples of the latter are copper, iron, zinc and color which commonly result from natural processes. The regulations state that limits are set only for those substances recognized as being detrimental to the health or well-being of the consumer. In all, some 33 chemicals and 12 pesticides are specified in the *Waterworks Regulations.* BSE analysis of these substances is less frequent than bacteriological analysis. BSE officials state that their practice is to conduct one chemical analysis per year. However, of the 104 waterworks sampled, JLARC found that 46 systems had not received a chemical analysis in the two year review period. Overall, chemical quality at the remaining 58 waterworks was generally good.

Analyses for radiological and pesticide quality are very infrequent; only three of each involving two systems were performed during the sample period. All were satisfactory. BSE conducts these analyses only in areas where there are reasons to suspect pesticide or radiological contamination (e.g., downstream from a farm or nuclear power plant). All radiological and pesticide analyses reviewed were conducted for this purpose. The water system for the City of Hopewell represents a special case. The city suffered extensive environmental contamination with Kepone, a pesticide produced by a local industry. Kepone can be highly toxic in large quantities but the long-term effects of low level exposure are unknown at this time. BSE records indicate that continuous pesticide surveillance has been maintained in Hopewell since October, 1974 when the Kepone problem was first detected. Slight traces of Kepone have been found in some of the 60 samples taken, but none have approached the limit of one part per billion considered to be unsafe. The highest concentration found in water for human consumption was 0.05 parts per billion.

Conclusion. The bacteriological and chemical analyses reveal only sporadic problems and suggest that drinking water in Virginia is of acceptable quality. However, the conclusion must be qualified in view of the relative infrequency and narrow scope of chemical analysis. Only 45 out of possibly several thousand substances are analyzed despite the fact that many are introduced into the waters of the Commonwealth through industrial and domestic wastewater discharges and are suspected of having long-term health impact.

Although there are numerous substances in drinking water which may have an impact on human health, comprehensive surveillance monitoring of these substances does not appear to be desirable at this time because there is a general lack of knowledge about the short- and long-term health effects of many of these substances. However, a first step toward more comprehensive surveillance would be to perform more chemical and other analyses for each water system and to ensure that all are sampled. A second step would include the development of a statewide drinking water profile, shared by the BSE and State Water Control Board, showing locations and discharges of municipal and industrial wastewater plants as they relate to existing and potential drinking water sources. A water quality profile could also provide a data base for organized research on health impact of certain substances and facilitate incorporation of new research findings.

BSE capability to monitor substances introduced into the State's waters will also be enhanced by the Toxic Substances Act passed by the 1976 General Assembly.[18] This act provides for the collection, evaluation and dissemination of information pertaining to the manufacture of substances which can pose an immediate or long-term health hazard to humans, aquatic organisms or animals. A companion measure[19] requires owners of sewerage systems and treatment plants to conduct a survey of industrial discharges to those systems. Information derived from both of these sources will provide BSE valuable tools for evaluating the safety of drinking water supplies.

Program Administration

The preceeding output measures are direct indicators of public health relative to drinking water. They represent the impact, both actual and potential, of drinking water on human health. The manner in which the water supply program is administered, while not translatable directly into public health impact, can

serve as a direct measure of program efficiency. This section reviews program activities of BSE--physical surveillance and follow up, design review and permit issuance, training, enforcement, wastewater review and program planning.

Physical Surveillance. In addition to the various water quality sampling and analysis activities, BSE personnel also monitor waterworks operation through on-site inspections during which they may observe system operations and personnel and evaluate the performance of each. Sanitary surveys are regular systematic inspections of waterworks. Although no set number of surveys per year is specified in the *Waterworks Regulations*, BSE officials indicate that Bureau policy is to conduct four per year for plants that use surface water sources, two per year for systems using groundwater. However, this goal is rarely achieved. JLARC sampled 112 of the 1,337 waterworks and found that BSE personnel averaged slightly more than one visit per year to 77 systems (Table 7). Nonetheless, almost one-third of the water systems sampled were not visited for a sanitary survey at all between 1973 and 1975. The amount of attention varies directly with the size of the system, but despite the fact that the large population concentrations may be given greater surveillance, there is still a substantial number of persons across the State whose water systems are only occasionally inspected, and many, not at all.

Table 7

SANITARY SURVEYS
(July 1, 1973 to June 30, 1975)

System Serves a Population of	No. of Surveys Conducted 1973 - 1975	No. Systems	Yearly Average
5,000 and Over	41	12	1.7
500 - 4,999	51	22	1.1
Under 500	80	43	0.9
Total	172	77	1.1

(N of systems = 112)

Source: JLARC Waterworks Survey, 1975.

BSE engineers also conduct inspections in response to specific problems which are identified in three ways: (1) BSE engineers review sample analyses, or other data, (2) requests from waterworks personnel, and (3) consumer complaints. BSE records are too incomplete to allow analysis of follow-up efforts. Memoranda of actions taken are not always filed nor do they necessarily refer back to specific problems. Records of complaints and actions taken on them are also incomplete. Generally, actions taken on longer term or major problems can be traced; three such instances were identified in the survey of waterworks. In one case this process involved several days of intensive effort by Bureau personnel, while the two others show a continued involvement over a longer period.

BSE functions in part as a "consulting engineer" for water systems which do not employ engineering personnel. Much of the correspondence in

waterworks files for smaller systems deals with operating problems (e.g., reducing high iron content, what kind of equipment will serve a certain need, locating and developing new sources) while information in files for larger systems is general correspondence.

Design Review and Permit Issuance. By law, no owner may construct or operate a public water supply without a written permit from the SDH. Such permits are reviewed and signed by the BSE, the Division of Engineering, and the State Health Commissioner. BSE reviewed 411 sets of waterworks plans and specifications between August, 1974 and June, 1975, an average of 37 per month. From July, 1975 to March, 1976, 499 sets were reviewed, an average of 55 per month. During the latter period 77 waterworks construction permits and 435 operation permits were issued. New permits are being issued under the recently adopted *Waterworks Regulations.* As of April 15, 1976 operating permits have been issued to 1,157 systems, representing 86% of the systems in Virginia. Originally, all permits were to be issued by September 1, 1975. Bureau officials now indicate that permitting will be completed "as soon as possible."

Despite these safeguards, some waterworks do operate without permits. Instances of such operation were identified by both BSE personnel and JLARC staff. Examples of such systems are:

- Community water systems (approximately 65) in which customers have rights and services deeded to them. In effect, each is an "owner" and in order to enforce the Public Water Supply Law, it is necessary to take action against each owner, a process which can involve up to several hundred persons. According to BSE personnel, Commonwealth's Attorneys are reluctant to take such action.

- Correctional unit #21 in Stafford County serves over 100 persons with water drawn from a well constructed in an unacceptable manner and operates without a permit. Records indicate that this situation has existed for ten years.

In addition two systems were found to have received new permits despite their failure to submit bacteriological samples during the two year survey period.

Training for Waterworks Operators. Operator training is an on-going process which has as its purpose enhancing the capability of waterworks to consistently deliver water of acceptable quality. Two short schools, one basic and one advanced, are held annually for waterworks operators. One hundred forty-seven operators attended the basic course in 1975 (up from 89 in 1974) while 40 operators (compared to 18 the previous year) attended the advanced school. Total attendance at these schools is approximately 20% of all waterworks operators. On-the-job training is conducted by BSE personnel as part of sanitary surveys. BSE spent 90 man days per month conducting on-the-job training during July-October, 1975. This is approximately 14% of total BSE activity time and is four times greater than personnel time devoted to the more formal short schools, an indication that informal training is the primary mode of training for water plant operators.

There are two gaps in State training programs for waterworks operators. Only a small proportion of operators receive formal training at the short schools and training during sanitary surveys is limited by the fact that surveys are conducted infrequently and in many cases not at all. BSE should seek to promote

greater attendance at training schools and to increase the frequency of on-the-job training. In addition, several operators interviewed expressed a desire for training to help them qualify for certification, and the failure rate for the waterworks operators certification examination (47% in September, 1975) is an indication that such training is needed.

Enforcement. The *Waterworks Regulations* are enforced by means of notices, orders and court action. Notices are sent by BSE to inform waterworks owners of practices or conditions which violate BSE regulations. Orders are directives issued by the State Health Commissioner specifying corrective action which must be taken by a certain date.

The enforcement process consists of three levels of hearings and court action. Informal hearings may be held between BSE staff and waterworks operators with emphasis on voluntary compliance. Adjudicatory hearings are formal proceedings before BSE staff and the State Health Commissioner which may result in the issuance of orders. BSE emphasizes voluntary compliance rather than legal or administrative action, and BSE monthly reports for July, 1975 to March, 1976 (no earlier data are available) reflect this approach. During the period reviewed, 697 notices were issued and 130 hearings were held. Ninety-five orders were issued, but all of these were operating permits which included schedules to be implemented in order to bring the systems into compliance with the *Waterworks Regulations*.

In general, BSE tries to work with waterworks owners to remedy a problem rather than bring action against them and as long as owners demonstrate a willingness to cooperate BSE considers them to be substantially in compliance. Where this cooperative approach fails to produce results, the next step is the issuance of an order by the Commissioner and if no results are forthcoming, the owner can be prosecuted in court. Only one order for specific and continuing violations has been issued since the *Waterworks Regulations* were adopted in 1974. In this case the Broadview Water Company in Montgomery County still failed to comply with the Commissioner's order, and BSE initiated court proceedings and obtained an order directing compliance. The regional director for the area says that "despite some foot dragging," the owner has now complied.

The enforcement process generally resolves problems through persuasion, but it can be slow and cumbersome and at times, wholly ineffective. The Broadview case took approximately five years to resolve; an order to the Totopotomy subdivision (never issued because the system was taken over by Hanover County) came more than a year after the initial problems were discovered. In addition, some violations are tolerated, such as the two systems noted earlier which failed to submit samples, and in a third case an owner has refused to submit samples and will not accept any communication from the Bureau but is permitted to continue operation. Violations of the regulations can exist for substantial periods under the BSE enforcement procedure and although voluntary compliance is obtained in most cases, BSE cannot deal expeditiously with uncooperative owners.

Wastewater Control. A program to ensure safety of drinking water must of necessity be concerned with the quality of rivers and streams used for water supplies. Control of municipal and industrial discharges to rivers and streams is one means of guarding this quality. In Virginia this function is divided between SDH and SWCB.[20] Under a memorandum of understanding between the two agencies, SDH is authorized to review and comment upon proposed domestic or municipal sewerage

facilities and to conduct the only detailed engineering review of final plans and specifications for such projects performed at the State level. In addition, SDH also inspects sewage plants when they are in operation.

Despite this statutory and administrative arrangement, there is only partial coordination between wastewater control and drinking water programs. The primary limitation results from the fact that industrial wastewater discharges are excluded from formal joint BSE-SWCB oversight. Only municipal wastewater treatment plants are under the purview of both agencies and consequently, a major source of pollutants is not evaluated substantially in terms of potential impact on surface and groundwater drinking water sources. To ensure consistent and comprehensive coordination BSE and SWCB should establish a formal review process for evaluating proposed industrial projects. A review could include project location, type, and quantity of effluents being discharged, length of stream impacted by effluents, and identification of existing and potential public water supplies. Such a formal review could be made part of the SWCB industrial permit process.

Coordination between drinking water and domestic sewage control is accomplished by BSE review and comment on preliminary project proposals and a detailed engineering review of final plans and specifications. Review of preliminary project proposals is the most effective mechanism for coordination in that BSE has wide latitude to comment on the size, location, treatment mode and other factors which can affect the quality of drinking water sources. The detailed engineering review focuses on the ability of a sewage treatment plant to meet SWCB stream standards and appears to only marginally enhance coordination despite the fact that it represents a major portion (29%) of all BSE staff activity.

Inspection of sewage treatment plants represents an area of substantial duplication between SWCB and BSE. Both agencies conduct engineering inspections of wastewater treatment plants and are concerned with the same areas. SWCB inspector training materials direct inspectors to examine plant flow, connections, historical operation data, process units, operating procedures, personnel, and laboratory facilities. No formal procedure exists for BSE engineers but the procedure generally emphasizes review of operational data, functioning of plant systems, condition of equipment, and personnel. SWCB conducted approximately 1,100 inspections of sewage treatment plants in fiscal year 1975 while BSE engineers made 551 inspections. The only apparent difference between the two is that SWCB has authority to order corrective action.

BSE devoted 2,163 man hours to surveillance and monitoring of wastewater treatment plants between July, 1975 and March, 1976, an average of 240 man hours per month. This equals a yearly average of approximately 1.4 man years for wastewater plant inspection at an estimated cost of $20,000. Since BSE inspections duplicate those of the SWCB, these funds and personnel resources could be saved annually by the elimination of BSE wastewater plant inspection activities.

BSE officials emphasize that virtually all deficiencies observed by JLARC in the drinking water program are the result of personnel shortages occasioned by the increase in the number of plans requiring review under the wastewater control program. The number of plans to be reviewed expanded significantly after 1972 when the federal government began funding the construction of wastewater treatment plants (Table 8). However, in fiscal year 1975 the number of

Table 8

FINAL PLANS AND SPECIFICATIONS APPROVED SEWERAGE WORKS
(Fiscal Years 1971-1975)

Fiscal Year	Plans and Specifications Approved
1971	317
1972	373
1973	588
1974	594
1975	453

Source: Virginia Department of Health, *Statistical Annual Reports*, 1971, 1972, 1973; and BSE, *Statistical Annual Report Summary*, July 1, 1974 to June 30, 1975.

plans reviewed by BSE decreased, and the SWCB anticipates only 100 grant projects during each year of the 1976-78 biennium.[21] The grant review project reduction will reduce the workload, but the activities associated with the wastewater program will continue to interfere with the drinking water program.

In practice, coordination between wastewater control and drinking water programs is fragmented. Industrial wastewater discharges are not included within the scope of this coordination and as a result, a potential source of pollution escapes BSE review. In addition, the detailed engineering review of proposed sewage treatment plants requires a substantial investment of BSE program resources which has, in the past, interfered with the administration of the drinking water program.

Program Planning. Accountability requires that BSE detail the relationships between program activities and outputs as well as develop a plan for allocating financial and staff resources among its program activities. BSE has failed to indicate what levels of program activity are necessary to maintain the desired level of drinking water safety. There is no internal work program that establishes program objectives, priorities, structure, or desired outputs. What is lacking is a program plan which spells out ways to meet the drinking water goals mandated by the General Assembly. Such planning is crucial for determining the need for, and requisite financial and staff resources to support an effective and efficient drinking water program.

Similarly there is a need for accurate and timely information about BSE program activities. This is an area in which BSE appears to have made progress in the past two years; from little or no such data to the use of detailed information on Bureau activities in each program area. Such data not only provide information on program activities but can also be used to determine the relationship between program activities and outputs. As yet BSE has not used this data as output measures.

Personnel. The type of personnel employed is also a factor in determining the level of program activity and here there are opportunities for greater efficiency. BSE has limited itself to professional engineers in implementing its

program, but the Bureau feels that it has too few engineers and cannot retain them. One possibility for maximizing use of personnel resources is less reliance on professional engineers and the introduction of technicians competent to handle many routine program activities such as sample collection and a certain level of plant inspections. This is consistent with BSE proposals for bringing the 6,000 on-site systems under its jurisdiction when it obtains primary enforcement authority under the Safe Drinking Water Act--water supply specialists have been considered for use in regulating these systems. Since many public water systems are no more complicated than these on-site water supply systems (approximately half of the former are wells with no treatment), it is logical to believe that technicians with professional support can provide adequate surveillance, thus releasing the engineers for more demanding duties.

Impact of the Safe Drinking Water Act

The federal Safe Drinking Water Act of 1974 was enacted by Congress with the intention of upgrading all public water systems to a uniformly high level. The act also expressly contemplates a primary role for the states in its administration and enforcement.[22] BSE is working with the U. S. Environmental Protection Agency to develop a program to bring the Commonwealth's safe drinking water program into compliance with the act. The *Waterworks Regulations* were promulgated in 1974 and since that time the Bureau has been engaged in re-issuing waterworks permits. These permits include orders and compliance schedules to bring the waterworks up to standards established by the U. S. Environmental Protection Agency. Program elements for implementing the Safe Drinking Water Act have been promulgated by EPA.[23] Virginia's program now includes all required elements, but the exact details of what EPA will require for each element have not yet been established. However, some current BSE activities, such as sanitary surveys and enforcement, will have to be improved to meet federal regulations. In addition, program data, which is now kept by hand, will have to be more efficiently managed to facilitate reporting and evaluation.

The Safe Drinking Water Act is likely to create severe financial problems for many local waterworks. It was noted earlier that lack of funds is a major obstacle to correcting major deficiencies for many water systems. Meeting the water quality standards established by EPA may pose difficult choices for many water suppliers; they will be faced with making large expenditures or closing down their systems. Several respondents to the JLARC local administrators survey expressed concern about the costs of these programs. One noted:

> One major problem, of course, is economics, that is the ability of small and rural units of government to adequately respond to the demands for expanded services and in compliance with expanded State and federal regulations. The tremendous fixed and operating costs all but make water resource implementation programs prohibitive.

No federal grant funds for improving water systems are expected under the Safe Drinking Water Act and the result is that the costs will be borne by the water systems themselves or the State. BSE is urged to prepare an analysis of the structural and financial needs of the Commonwealth's water systems. Such an analysis will assess the impact of new requirements and facilitate development of a State strategy for improving the quality of water works in Virginia.

Conclusion

The Commonwealth's programs to ensure the safety of drinking water have virtually eliminated bacterial contamination as a major threat to public water systems. There have been few outbreaks of communicable disease and those which may be caused by drinking water are relatively minor and are not seen as a serious problem. Consequently, much waterborne disease may go unnoticed. Not surprisingly, the bacteriological quality of drinking water distributed by public water systems was found to be quite good.

The major shortcoming of the drinking water program is that it does not address potential health hazards in a systematic manner. As a result, many persons now use unreliable and potentially unsafe water. At best, SDH identifies potential hazards and offers suggestions and advice, but local administrators also report that often this amounts to no more than pointing out problems and leaving solutions to them. In addition, the Commonwealth's program does not deal with the problem of financing needed water systems and improvements. Consequently, it is often difficult for many systems to upgrade facilities as required by SDH. This is a problem which can be expected to intensify as the requirements of the Safe Drinking Water Act are implemented.

The wastewater control program represents an area of substantial duplication between the State Water Control Board and Bureau of Sanitary Engineering. Moreover, wastewater activities interfere with the BSE's ability to conduct an effective safe drinking water program. For these reasons the wastewater program ought to be transferred to the State Water Control Board. However, BSE and the SWCB should establish formal procedures for improving coordination between the safe drinking water and water pollution control programs.

The lack of program management within BSE limits the efficiency and effectiveness of the safe drinking water program. No work plan exists and targets are not specified nor are personnel given clear directions on the scope of their duties. The result is that essential program elements such as sanitary surveys and chemical sampling are not adequately implemented and the scope of State regulation is correspondingly reduced. The present BSE program appears to embody all necessary elements of a safe drinking water program but improved management of both personnel and procedures is needed.

This review has not dealt extensively with the role of the local health department sanitarians and the Bureau of Environmental Health, but these also have a role in protecting public health from waterborne disease threats. Conversations with health officials throughout the Commonwealth indicate that most of the illness caused by water is unreported, and the JLARC survey of local administrators indicated that poor sewage disposal, especially that caused by septic tanks, is a major problem. The sanitarians can aid in reducing these threats through investigation, advice and regulation. In addition, their input can help identify health hazard areas which can be used by BSE and SWCB in assessing the statewide scope of such threats.

CONCLUSION

A review of the major areas of State involvement in water supply shows that, with the exception of regulation of water for domestic consumption, the

Commonwealth has not yet developed policies and programs to ensure adequate and safe supplies of water for all Virginians. This shortcoming can be attributed to the inadequacy of the present legal framework (riparian doctrine and Groundwater Act) to effectively and efficiently allocate water and, the unwillingness of the State Water Control Board to assume an active leadership role on water supply matters and develop meaningful comprehensive water resource policies and plans as mandated by the General Assembly. The inadequacy of water laws and the lack of State leadership have prohibited the Commonwealth from effectively addressing the problem of water shortages which may affect up to two million people in the Commonwealth's major metropolitan areas of Southeastern Virginia, Newport News, and Northern Virginia.

Drinking water safety has received more attention than the availability of water supply in Virginia. As a result, the threat of major epidemics has been virtually eliminated. Despite this apparent success, a substantial number of Virginians continue to rely on water which is considered to be potentially hazardous by local administrators and health professionals. New threats to human health are posed by the expansion of industrial technology and its consequent pollution of the State's waters, yet State Department of Health programs focus on the engineering aspects of drinking water safety and wastewater control, rather than the impact or potential impact of pollutants on human health. The SDH should devote more attention to the environmental health aspects of drinking water programs.

Management of water supplies should be accomplished efficiently and effectively and in a manner more consistent with legislative intent. The need for regulation of groundwater in Southeastern Virginia and the water supply problems of three major metropolitan areas are indications that changes are necessary in the Groundwater Act and riparian doctrine. The comprehensive water resource plans could serve as an information base for recommending modifications to these laws, as well as proposing alternatives to resolve water supply problems in various sections of the State. Therefore, it is imperative that the State Water Control Board complete as soon as possible the water resource plans mandated by the General Assembly ten years ago. Futhermore, the SWCB should begin to provide leadership in water supply matters. This leadership could be enhanced by changing the permissive language of the present law to direct SWCB to make recommendations to the General Assembly and the Governor to resolve water disputes.

Drinking water safety can be improved by closer coordination between programs presently conducted by the Department of Health, Bureau of Sanitary Engineering, and State Water Control Board. Coordination exists to some degree now through informal contact and statutory mandate, but it is irregular and ineffective in its present form. What is needed is a regular exchange of information between the two agencies so that each will be aware of the other's program activities and how these impact on their own. Specifically, information about amounts, type and location of wastewater discharges should be provided to BSE by the SWCB while the latter should receive comparable information on waterworks from BSE. In addition, the Bureau of Sanitary Engineering should be relieved of its responsibility for inspecting wastewater plants and conducting detailed engineering review of wastewater plant construction plans. In its place, BSE should be given authority to review any proposed uses of water which would impact on public water supply. Within BSE greater attention should be paid to program management and the development of a safe drinking water supply program as a clearly identifiable program. An internal program plan should be prepared and

updated each year. Additionally, consideration should be given to greater use of para-professional talent to extend the reach of the water supply program within the limits of funding.

Greater attention must be focused on the problem of providing adequate water distribution systems to minimize health hazards. The present approach is fragmentary; the Division of Local Health Services certifies health hazards to the State Water Control Board upon request, and the Bureau of Sanitary Engineering has offered a one-time proposal to upgrade or build new facilities for health hazard areas. Both agencies should prepare and continuously update an inventory of health hazard areas involving water and wastewater problems and use this inventory as the basis to develop a program of remedial action.

WATER POLLUTION CONTROL

The enactment of the Federal Water Pollution Control Act Amendments of 1972 has shaped the character of the State Water Control Board's approach to water quality control management. The federal law authorized $496 million to the State for wastewater treatment plant construction and established two important water quality goals for the future: first, all municipal wastewater treatment plants are to have secondary treatment facilities installed by 1977; and second, all waters of the nation are to be clean enough to support wildlife, fish, shellfish, and all forms of water recreation, including swimming by 1983. In Virginia, these goals will not be fully attained within the prescribed time periods because of federal delays in obligating funds to states and a shortage of funds to construct all necessary municipal treatment improvements.

The State Water Control Board has been effective in obtaining federal funds to finance local wastewater treatment projects. Since 1972, this program activity has been a top priority of the U. S. Environmental Protection Agency and SWCB. But, by mid-1976, all funds originally allotted to Virginia under PL92-500 were committed to local pollution control projects. Additionally, the future availability of federal construction funds to finance remaining pollution abatement projects is uncertain.

The SWCB's water pollution control activities have grown dramatically in the last four years. In its effort to meet federal requirements and qualify the State and local governments for construction grants, the Board has placed a low priority on several of its assigned duties. As a result of this strategy: (1) Most regional and basin quality management plans are in various stages of preparation and have not been integrated into a statewide plan for managing water resources; (2) Water quality monitoring and evaluation procedures have not been developed that accurately reflect water quality trends over time; and (3) There are weaknesses in the administration of the water quality program in the areas of organizational management, information reporting, and program evaluation. It is clear that the Board must begin to devote increased attention to managing its wide-ranging water program functions and to integrating water quality activities with other aspects of water resource management such as water supply, conservation, and use.

The SWCB has recently been criticized by EPA for its unwillingness to take strong enforcement action against industrial and municipal violators of pollution discharge (NPDES) permits. The SWCB cooperative enforcement approach and the nature of continuing permit violations is discussed.

This chapter reviews important components of the State Water Control Board water pollution control programs including: (1) program impact on water quality, (2) water quality management planning, (3) permitting and enforcing, (4) grant administration, and (5) program administration.

II. WATER POLLUTION CONTROL

Water pollution problems continue to plague sections of the State, mainly in the densely populated areas of Richmond and Tidewater, and in rural Southwest Virginia. Municipal and industrial pollutants pose significant dangers to public health and the environment. The Kepone contamination of the lower James River has imposed tremendous health hazards and economic hardships on thousands of Virginia citizens. A recent draft report prepared by the State Department of Health estimated that the public and private costs associated with Kepone contamination may be as high as $9 million.

The Legislature has expressed its concern over water pollution problems by passing statutes designed to prevent the biological, chemical, or physical degradation of the waters of the State. In addition to State legislation, the Congress of the United States enacted the 1972 Federal Water Pollution Control Act Amendments empowering the Environmental Protection Agency to play a prominent role in State operated water quality programs. This latter development has had a profound impact on Virginia by accelerating municipal wastewater treatment plant construction and industrial pollution abatement programs.

The State Water Control Board is authorized to administer pollution control programs. Activities of the Board include planning, monitoring, permitting, enforcing, and financing. Of special concern to JLARC is the impact of the Board's activities on improving and maintaining the quality of the Commonwealth's rivers and streams.

Legislative Intent

Virginia's involvement in water quality programs and activities began as early as 1875 when the General Assembly enacted legislation prohibiting persons from disposing poisonous substances or dead bodies into rivers and streams above Tidewater. Since then, the General Assembly and the Governor have continued to show concern for the quality of the Commonwealth's waters; as evidenced by the number of special studies conducted dealing with various water pollution issues within the past 50 years. As areas of Virginia became urbanized, pollution problems resulting from industrial and municipal sewage became more acute. Governor Trinkle in his address to the Assembly in 1924, recognized water pollution as having serious impact and saw the inherent conflict "between manufacturing interests and commerce, on one hand, and land owners, the delvers for water products and bathers on the other."[1] Three years later in 1927, a legislative study commission surveyed the status of the seafood industry and concluded that its decline was mainly attributable to the pollution of tidal waters. In 1933, the Sprately Commission, established by the Governor to investigate and study all problems relating to the pollution of the waters of the Tidewater area, found pollution to be injurious to the seafood industry, a menace to public health, and having a grave effect on the bathing resorts and water places. Recommendations of this commission eventually led to the creation of what is now called the Hampton Roads Sanitation District. The enactment of the 1946 Water Control Law has represented the height of the State's concern to protect the waters of the Commonwealth from pollution. This legislation was progressive for its time and still serves as the basis of the General Assembly's intent with respect to water quality:

> It is the policy of the Commonwealth of Virginia and the purpose of this law to (1) protect existing high quality State waters and restore all other State waters to such condition of quality that any such waters will permit all reasonable public uses and will support the propagation and growth of all aquatic life, including game fish, which might reasonably be expected to inhabit them, (2) safeguard the clean waters of the State from pollution, (3) prevent any increase in pollution, and (4) reduce existing pollution, in order to provide for the health, safety and welfare of the citizens of the Commonwealth.[2]

In another section of the law the General Assembly reiterated its position regarding waste dischargers:

> It is hereby declared to be against public policy for any owner who does not have a certificate issued by the Board to (1) discharge into State waters inadequately treated sewage, industrial wastes, other wastes, or any noxious or deleterious substances, or (2) otherwise alter the physical, chemical or biological properties of such State waters and make them detrimental to the public health, or to animal or aquatic life, or to uses of such waters for domestic or industrial consumption, or for recreation, or other uses.[3]

Although Virginia has a comprehensive law to control water pollution, the federal government has had a great influence in shaping the State's water quality program. This influence accelerated after Congress passed Public Law 92-500, the Federal Water Pollution Control Amendments of 1972, spelling out specific water quality goals for the nation to attain:

- By July 1, 1983, the act provides for the attainment of a level of water quality to support fishing and swimming.
- By 1985 all discharges of pollutants into navigable waterways are to be eliminated. (EPA believes that this goal cannot be implemented under the authority of the existing 1972 act.)

For a variety of reasons, which will be considered later, the achievement of these goals within the time frames specified by Congress is doubtful.

While providing EPA with the necessary authority to clean-up the nation's waters, Congress realized that this mammoth task could not be accomplished without the cooperation and assistance of the states. The amendments declare that:

> It is the policy of the Congress to recognize, preserve, and protect the primary responsibilities and rights of states to prevent, reduce, and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources and to consult with the Administrator (EPA) in the exercise of his authority under this Act.

The State Water Control Law has been amended somewhat to conform with federal requirements. Prior to PL92-500, SWCB planning, surveillance, enforcement, and financing capabilities were limited, due largely to the lack of funds, manpower, and political support to bear down on large municipal and industrial polluters. The enactment of PL92-500 removed many of these obstacles by infusing

large sums of money for construction of municipal wastewater treatment plants and instituting a restrictive permit system requiring municipalities and industries to install pollution abatement equipment to meet stringent discharge standards. In the words of one SWCB official, the major difference between the federal and State law is that there was more enforcement flexibility under the latter: "If the Board had the political support to reduce pollution it did, but if it did not, nothing was accomplished."

A review of the Board's responsibilities under PL92-500 leads to the conclusion that federal law, to a large extent, has pre-empted the Water Control Law as the primary policy-setting and regulatory instrument for controlling pollution in the State. The achievement of the 1983 goal is of paramount importance to SWCB. Therefore, although the intent of State and federal legislation is generally the same--to clean-up the State's waters--PL92-500 has had a significant effect on the Commonwealth's water quality program.

Organization

The principal State and local organizations involved in water pollution control programs include the State Water Control Board (SWCB), the State Department of Health (Bureau of Sanitary Engineering), Consolidated Laboratory Services, Virginia Institute of Marine Science, planning district commissions, local governments, sewer authorities and interstate commissions. The SWCB, composed of seven citizens appointed by the Governor, is responsible for all phases of the State water pollution efforts--policy making, planning, monitoring and surveillance, permitting, enforcing, and administering construction grant applications. During the past two years, the Board has experienced a significant turnover in membership; four different chairman have presided over the Board since 1972. An executive secretary and a total authorized staff of 350 assist the Board to carry out water quality programs and activities. In 1972 SWCB established six administrative regions across the State to assist in the implementation of water programs (Figure 6).

The State Department of Health, Bureau of Sanitary Engineering (BSE) and SWCB are jointly responsible for reviewing sewerage system plans and specifications. Authority to approve or disapprove a plan rests with the SWCB (This activity is discussed in Chapter I).

Analysis of SWCB water samples is performed by the Division of Consolidated Laboratory Services. During 1975 the Division analyzed over 24,000 water samples for 208,000 analyses.

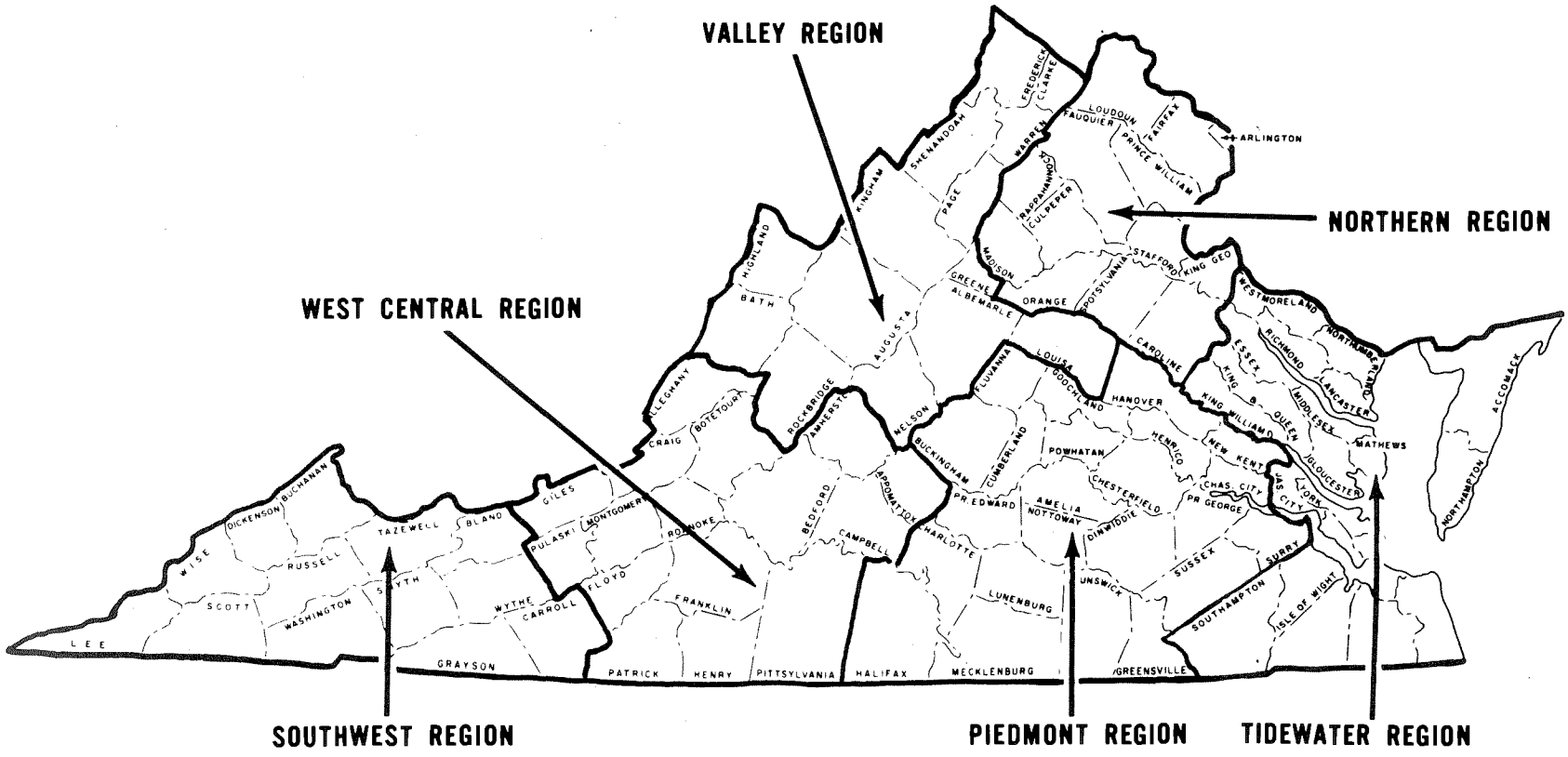
Planning districts are primarily involved in preparing water quality management plans and reviewing construction grant applications for federal assistance to ensure that proposed projects are consistent with regional plans.

Local governments, sanitary districts, and sewer authorities implement water quality programs by providing sewer services to residences, industries, and businesses.

The Virginia Institute of Marine Science and Virginia Polytechnic Institute and State University Water Resources Research Center conduct research in the area of water pollution control. SWCB provides funds to VIMS under the Cooperative State Agency (CSA) agreement to conduct water quality modelling activities.

Figure 6

STATE WATER CONTROL BOARD ADMINISTRATIVE REGIONS



Source: State Water Control Board

Virginia participates in the activities of two interstate commissions concerned with water pollution abatement, the Interstate Commission on the Potomac River Basin and the Ohio River Valley Water Sanitation Commission.

The Environmental Protection Agency is authorized by Congress to administer the Federal Water Pollution Control Amendments of 1972. In general EPA is responsible for developing regulations to be followed by the states, establishing municipal and industrial wastewater effluent standards, submitting progress reports to Congress on major program areas such as planning, funding municipal wastewater treatment plant construction, and conducting research. Through its ten regional offices (Virginia is in the Philadelphia region which also includes Delaware, Maryland, Pennsylvania, West Virginia, and the District of Columbia), EPA must also approve and review applications for federal grants, state program plans, and permit programs, provide technical assistance to state and local governments and enforce pollution controls where states fail to do so.

Program Expenditures

Nearly all federal and State funds used to support water pollution control operations are appropriated to SWCB. Auxiliary services are provided by the State Department of Health and Consolidated Laboratory Services, but funds appropriated for these program activities are not presented in Table 9.

Table 9

APPROPRIATED FUNDS
CONTROL, PREVENTION, AND ABATEMENT OF WATER POLLUTION
(Operating Expenses)

Fiscal Year	Federal Share	State Share
1968-69	$ 201,743	$ 410,700
1969-70	200,000	612,590
1970-71	200,000	1,065,740[a]
1971-72	200,000	1,090,760
1972-73	208,400	1,901,275
1973-74	1,072,548	3,072,577
1974-75	1,218,813	2,347,203
1975-76	1,601,579	2,441,795
1976-77	1,000,000	2,996,785
1977-78	1,000,000	3,262,620

[a]An additional $122,445 had to be appropriated because of a deficit at the end of fiscal year 1971.

The share includes $1,293,579 in regular 1976 funds and $308,000 in federal transit quarter funds.

Source: State Water Control Board.

Since fiscal year 1969, appropriated funds for operating and maintaining pollution control programs have increased significantly. This increase has largely come about because of two factors: (1) widespread public concern for environmental protection and (2) enactment of Public Law 92-500. Section 106 of PL92-500 authorized federal funds to assist states in administering water quality programs. During fiscal year 1976, the SWCB pollution control operating budget was slightly less than $4 million. (In April, 1976, SWCB received an additional $207,000 from EPA to be used for administering pollution control programs.)

IMPACT ON WATER POLLUTION

The general goal of federal and State water pollution control programs is to provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water by July 1, 1983. It is implied that the attainment of this goal will result in good water quality. In order to determine the amount of progress being made toward meeting this goal it is imperative to develop meaningful measures. The presence of certain substances in the water which would likely lead to undesirable health or ecological outcomes can be detected or measured. The discussion that follows reviews SWCB efforts at establishing, analyzing, and evaluating these measures of water quality program impact. A JLARC review of SWCB water quality data for two parameters, dissolved oxygen and fecal coliform, is also presented.

Water Quality Standards

Standards represent a yardstick to measure the effectiveness of a water quality control program. Standard-setting first emerged in 1965 when Congress passed the Water Quality Act, requiring all states to prepare stream standards for interstate waters by June 30, 1967. By the early 1970's, numerous problems developed with the manner in which states were setting standards. As a result of these problems, Congress enacted PL92-500 radically changing the traditional approach to water quality standard-setting by placing more emphasis on the quality of industrial and municipal discharges as opposed to the quality of the water in the receiving river or stream.

The SWCB publication *Water Quality Standards* states that "standards consist of word descriptions and numerical values assigned to certain primary indicators of water quality. They describe the quality that water should be, in various geographic areas of the State, in order that it be suitable for certain uses."[4] The Board is authorized to establish and periodically revise water quality standards and, if desirable, set standards which are more restrictive than those required under federal law. EPA must approve the standards established by the State. SWCB water quality standards have three major components: (1) criteria, (2) stream use classifications, and (3) anti-degradation statement.

Criteria. EPA is responsible for determining criteria for designated uses. Criteria are scientific measurements of the specific amount and quality of each pollutant that can be tolerated in the water for a particular use at any given time. For example, the amount of pollutants allowed in water used for swimming purposes will be lower than for waters not used for this type of recreational activity. Limits on pollutants such as bacteria, metals, toxic substances

or pesticides are expressed in terms of maximum concentration. Other types of pollutants have their limitations expressed narratively. Water quality standards are based on criteria that apply whenever river or stream flows are equal to, or greater than, the lowest seven-day drought flow within a ten-year period. Criteria for designated uses are identified extensively by the SWCB in its publication *Water Quality Standards* and include measures of acidity/alkalinity (pH), temperature, dissolved oxygen, fecal coliform, suspended solids, ammonia nitrogen, nitrates, metals, pesticides, toxic substances, chlorides, and phosphates.

Two problems are commonly associated with establishing water quality standards. First, a river can be contaminated by a toxic substance discharged from an industry, but the pollution control agency is not aware of the pollutant being in the water. Therefore, no standard is established for the substance. Second, because of the short duration of pollution control research, the long-term health hazards posed by such substances as Kepone and polychlorinated biphenyls (PCB's) are still largely unknown.

Stream Use Classifications. Because water quality standards are closely integrated with the 1983 goal of "Protection of fish, shellfish and wildlife, and recreation in and on the water," SWCB stream use classifications are described in terms of two classes of recreational uses of water.

- Class A: Propagation of desirable species of fish and wildlife.
- Class B: Propagation of desirable species of fish and wildlife and primary water contact recreation (such as swimming).

By 1983 the goal of the nation's water quality program is to raise water to either a Class A or Class B recreational use. The only difference between A and B is that the latter has lower maximum levels of one pollutant--fecal coliform organisms. There has been considerable debate over the need to upgrade all rivers and streams to a common standard suitable for aquatic life *and* swimming. Many knowledgeable experts in the pollution control field believe that the 1983 goal is too stringent. For instance, who would want to swim in waters adjacent to a power or chemical plant? There are many advocates of the former "water use designation system" which identified desired uses of water for public water supply, industrial, or recreation purposes and accompanying standards. These same advocates now believe that under PL92-500 clean water seems to be an end in itself without due regard for specific uses of water. But, as already noted, Congress was not able to effectively demonstrate what optimum water quality level for any given river or stream should be, and there was no guarantee of long-term safety regarding human health for any specific amount of pollution. Consequently, Congress established a common goal for all waters of the nation--"fishable, swimmable" water by 1983.

Anti-Degradation Statement. Every state is required by EPA to have an adopted statement certifying that degradation of water quality is prohibited except as a result of necessary, economic development. The SWCB policy is:

> Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained in high quality; provided that the Board has the power to authorize any project or development, which would constitute a new or an increased discharge of effluent to high quality water, when it has been affirmatively demonstrated that a change is justifiable to provide

> necessary economic or social development; and provided, further, that the necessary degree of waste treatment to maintain high water quality will be required where physically and economically feasible. Present and anticipated use of such waters will be preserved and protected.[5]

This policy statement is quite vague and, to date, SWCB has not developed any specific guidelines with respect to its application in situations where high water quality is being degraded.

Water Quality Monitoring

Surface water and groundwater monitoring activities are conducted on a regular basis by SWCB.

Surface Water. Surface water monitoring is, by far, the most extensive and elaborate method used by SWCB for collecting data to analyze the effectiveness of the State's water quality program. The surface water monitoring program was initiated on a small scale in the late 1950's. Since then the program has grown dramatically to 1,000 fixed sampling stations located in different parts of the State, one of the larger networks in the nation, according to EPA. About 500 stations are monitored once a month throughout the year, with the remaining stations monitored once per month in May, September, and October, and twice per month in June, July, and August. Most stations are located on major rivers and lakes and sampled by boat or from a bridge. Parameters sampled on a routine basis for all stations include: pH, temperature, dissolved oxygen, fecal coliform, and nutrients. Other types of parameters are obtained where pollution problems exist. At certain times of the year selected stations are monitored for pesticides and metals.

A shortcoming of the sampling program is that SWCB does not take into account variations in stream flow to determine the concentration of a pollutant in water. At best, the present sampling system provides a "snap-shot" of water quality, specific to a particular time, location, and environmental circumstance. Average daily stream flow data are currently being collected as part of the SWCB water quality information system (STORET), but have yet to be used in analyzing water quality samples.

It is also difficult to assure consistency of location and depth in sample drawing. For example, many samples are drawn by throwing a bucket into the water from the middle of a bridge. As a result, monitoring samples are subject to variance. A review of sampling data revealed differences in the way rivers and streams are sampled across the State.

Four different federal and State agencies currently collect sampling station data in Virginia--SWCB, Virginia Institute of Marine Science, Department of Health, and United States Geological Survey. In the interest of program efficiency, SWCB, with the assistance of EPA, should develop a coordinated water quality monitoring strategy for Virginia. An SWCB task force has already been organized to study and to recommend improvements to the present SWCB monitoring and surveillance program. This study should enable the SWCB to develop a more efficient and effective monitoring system.

Due to the large number of stations added in recent years, variations in sampling frequency, and the lack of stream flow data, it is difficult to perform an accurate trend assessment of the quality of State waters. The SWCB should establish a network of stations for each river basin and develop a statistically valid procedure for monitoring improvement or degradation of water quality over time. Until such a network is established, the present "snap-shots" cannot be translated into definitive statements on the overall quality of Virginia's water.

Groundwater. The groundwater section of the Bureau of Surveillance and Field Studies and the regional offices are responsible for maintaining a groundwater quality sampling program. Each SWCB region selects a certain number of wells and springs and collects grab samples quarterly. Approximately 10 to 15 samples are collected per month for each station. The SWCB has 58 observation wells throughout the State used to monitor groundwater conditions. An exploratory well-drilling program was proposed and partially funded for 1977-78 to monitor closely the groundwater conditions in the Southeastern Virginia Critical Groundwater Area. A major purpose of these wells is to monitor the intrusion of saltwater.

Analysis of Water Quality

When evaluating the impact of water quality management programs on the quality of State rivers and streams, four questions need to be addressed: (1) Where are the significant pollution problems? (2) To what extent are applicable water quality standards not being met? (3) To what extent is the quality of rivers and streams improving or deteriorating? and (4) Are appropriate measures to halt deterioration being pursued?

SWCB Analysis. The SWCB is responsible for conducting an evaluation of its water quality programs as part of its annual water quality inventory report for EPA and Congress. The 1975 report stated that "High water quality and absence of significant pollution problems, except in relatively few areas of the State, reflect a long standing and aggressive water pollution control program."[6] According to this report about 2,032 stream miles, or 8.4% of the total stream miles in Virginia, were not meeting the 1983 goal of "fishing and swimming."[7] SWCB predicts that by 1977 the number of stream miles unsuitable for aquatic life and swimming will be reduced to 1,435, and by 1983 only 96 miles.[8] However, this progress is entirely dependent on the availability of federal funds to upgrade municipal treatment plants. SWCB projects only three segments may not meet the 1983 water quality standards--Dismal Swamp, Contrary Creek, and the North Fork Holston River.

JLARC Analysis. JLARC reviewed the SWCB analysis of water quality conditions in the State. The 1975 *Water Quality Inventory Report* was used as the basis for this review. The report had two serious weaknesses in its analysis of water quality conditions: (1) the location of sampling stations was not held constant over a specified period of time; (2) the number of observations taken at each sampling station was irregular. JLARC adjusted for these variations in SWCB station locations and sampling frequency by holding a group of stations constant over a long period of time and by substituting missing values (See Technical Appendix for methodology). However, because SWCB lacked stream flow data, JLARC did not include such data in its analysis. JLARC was primarily concerned with the extent to which applicable water quality standards were being met and whether

water quality was improving or deteriorating. At least one representative river from each major river basin was selected for analysis. An important criterion for selection was the availability of sampling station data since 1970 for dissolved oxygen and 1971 for fecal coliform bacteria; a total of 106 stations were selected for analysis representing 20 different rivers from eight major river basins (See Figure 7).

The next major step was to identify those water quality parameters most likely to indicate whether the 1983 water quality goal was being met. JLARC chose dissolved oxygen and fecal coliform:

- Dissolved Oxygen - dissolved oxygen is essential to oxidizing organic wastes. If it is not present in sufficient quantities, wastes accumulate and the water becomes septic. Therefore, dissolved oxygen is a good indicator of other organic waste material being in the water.

  Oxygen must also exist in sufficient quantities to allow fish and other aquatic life to breathe. For the rivers evaluated by JLARC, 4.0 mg/l was used as the minimum standard for protection of aquatic life.

- Fecal Coliform - fecal coliform bacteria are found in human feces. Although generally harmless to man, public health sanitarians believe the occurrence of coliforms are a good index to the presence of harmful fecal-borne pathogens that are difficult to detect. Since pathogenic organisms can cause dysentary and other diseases, close monitoring of fecal coliform bacteria is an important concern of the public.

  For all rivers that were classified by SWCB as secondary contact recreation (boating, fishing, etc.), JLARC used the fecal coliform standard of 2000/100 ml. For rivers classified as primary contact recreation (swimming, water skiing, etc.) JLARC used the standard of not to exceed a log mean of 200/100 ml.

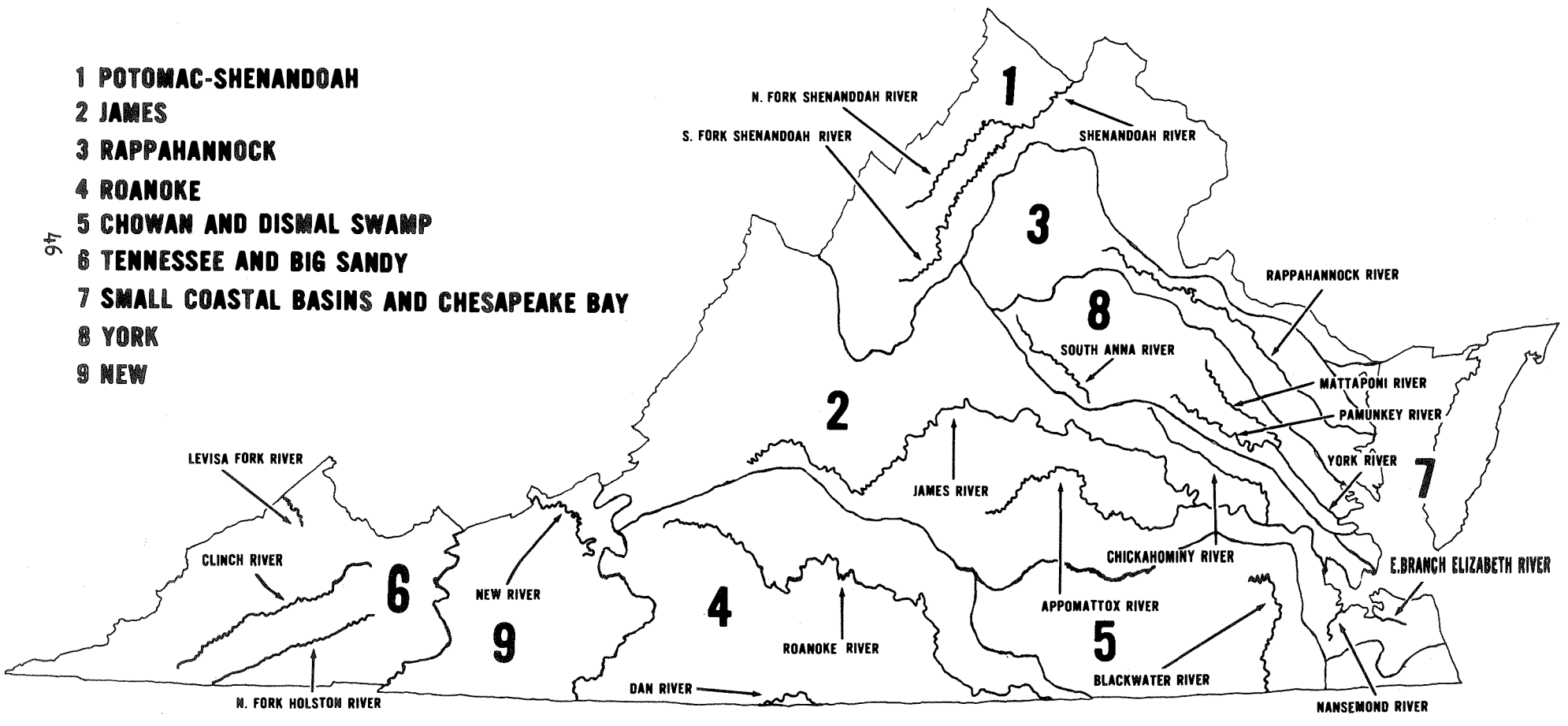
It should be noted that these two water quality parameters are, at best, general indicators for assessing SWCB effectiveness in meeting the 1983 goal. There are a number of other parameters sampled by SWCB, but not included in this analysis.

As an extension of the water quality analysis a review was conducted of the location and incidence of fish kills across the State. This was done to determine whether there was any relationship between poor water quality conditions and reported fish kills by major river basin.

A detailed analysis of water quality conditions for each of the 20 rivers is presented on the following pages. The presentation is somewhat technical and may not be of interest to the reader. Therefore, a brief summary of JLARC findings precedes the technical discussion for those readers wishing to pass over this section of the report.

Figure 7

RIVERS SELECTED FOR WATER QUALITY ANALYSIS, BY RIVER BASIN



Source: JLARC

SUMMARY OF FINDINGS

Overall, it appears that the quality of the State's waters is generally good. However, the SWCB prediction that by 1983 only 96 of the State's stream miles will be unsuitable for aquatic life and swimming is probably overly optimistic. Based on available dissolved oxygen and fecal coliform data, the East Branch Elizabeth, Clinch, Levisa Fork, and parts of the Chickahominy and James Rivers may not meet the 1983 goal. Portions of the Rappahannock River showed signs of declining levels of dissolved oxygen, primarily during the summer months when river flows are the lowest. If additional federal construction grant assistance is not forthcoming after 1977, smaller tributaries of the rivers and streams included in the JLARC analysis may also fall short of meeting the 1983 deadline.

The data suggest that SWCB has identified significant pollution problems in the State, and has recommended appropriate measures for their elimination or reduction. However, many projects are still in the planning and construction phases and have yet to impact on water quality.

A serious deficiency of the SWCB water quality monitoring and surveillance program is the lack of a systematic and statistically valid procedure for evaluating the quality of rivers and streams over time. The statistical procedures used to locate sampling stations and develop the water quality inventory report are less than adequate for reaching definitive conclusions on the Commonwealth's water quality. Although capable of providing the data necessary to perform an accurate trend assessment of water quality conditions, the extensive fixed station monitoring network has not been properly utilized by SWCB for this purpose. SWCB has already identified many shortcomings in its present monitoring and surveillance network in a report being prepared by its own task force. Modification of the present SWCB surface water monitoring and surveillance system appears necessary in order to more efficiently and effectively evaluate the quality of the State's waters.

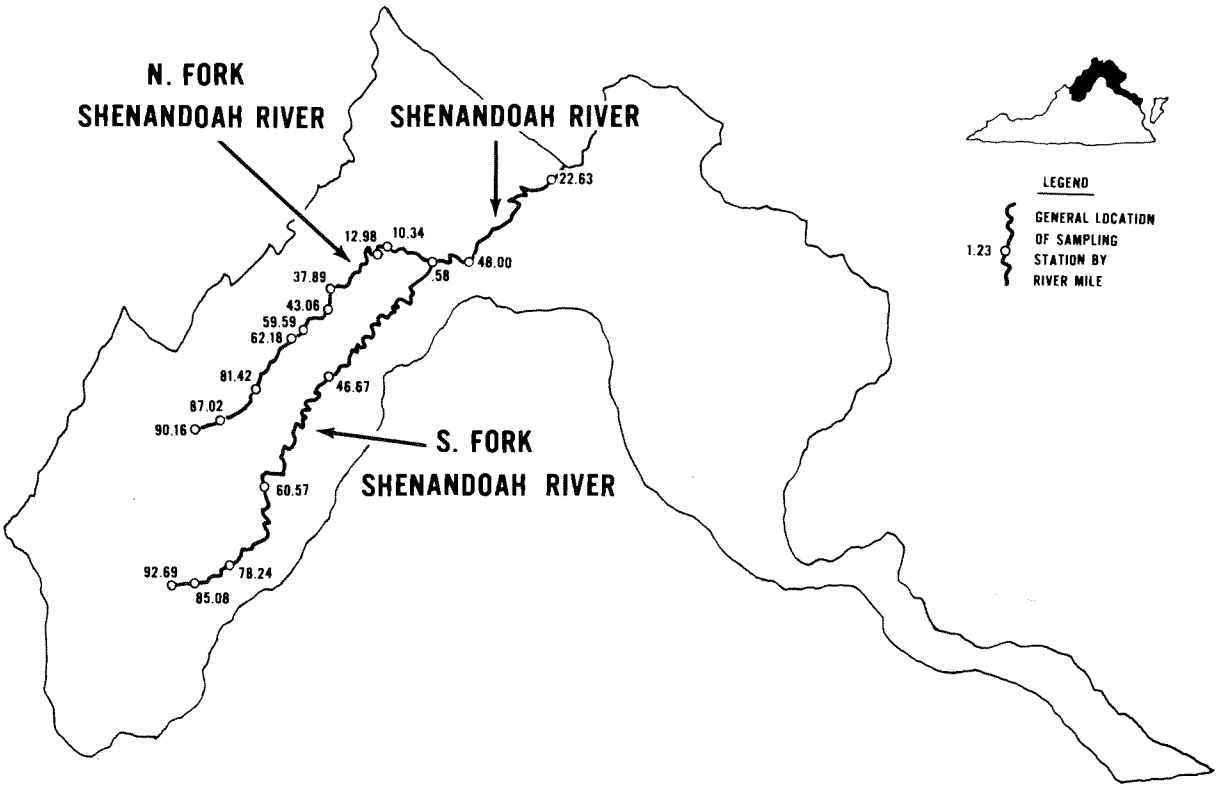
The number of fish kills reported to SWCB has risen since 1970, but fish kill collections and enforcement actions remain low. In light of the considerable amount of time and resources required to process and investigate fish kill complaints, SWCB should establish a program more compatible with current manpower levels.

Potomac-Shenandoah Basin

The Potomac-Shenandoah River Basin is located in Northern Virginia and 14% of the State's population resides within its boundaries. Three rivers were analyzed by JLARC: (1) North Fork Shenandoah (river miles 10.34 to 90.16); (2) South Fork Shenandoah (.58 to 92.69); Shenandoah River (22.63 to 48.00).

Figure 8

POTOMAC-SHENANDOAH RIVER BASIN



Source: SWCB Sampling Station Location Map.

With the exception of a few spotty violations, the river segments described above appear to be meeting applicable DO and fecal coliform standards. The evidence suggests that no serious effluent discharge problems currently exist that cannot be remedied by the 1977 and 1983 goals. From the sampling data reviewed by JLARC, it was impossible to determine whether water quality had improved or deteriorated.

James River Basin

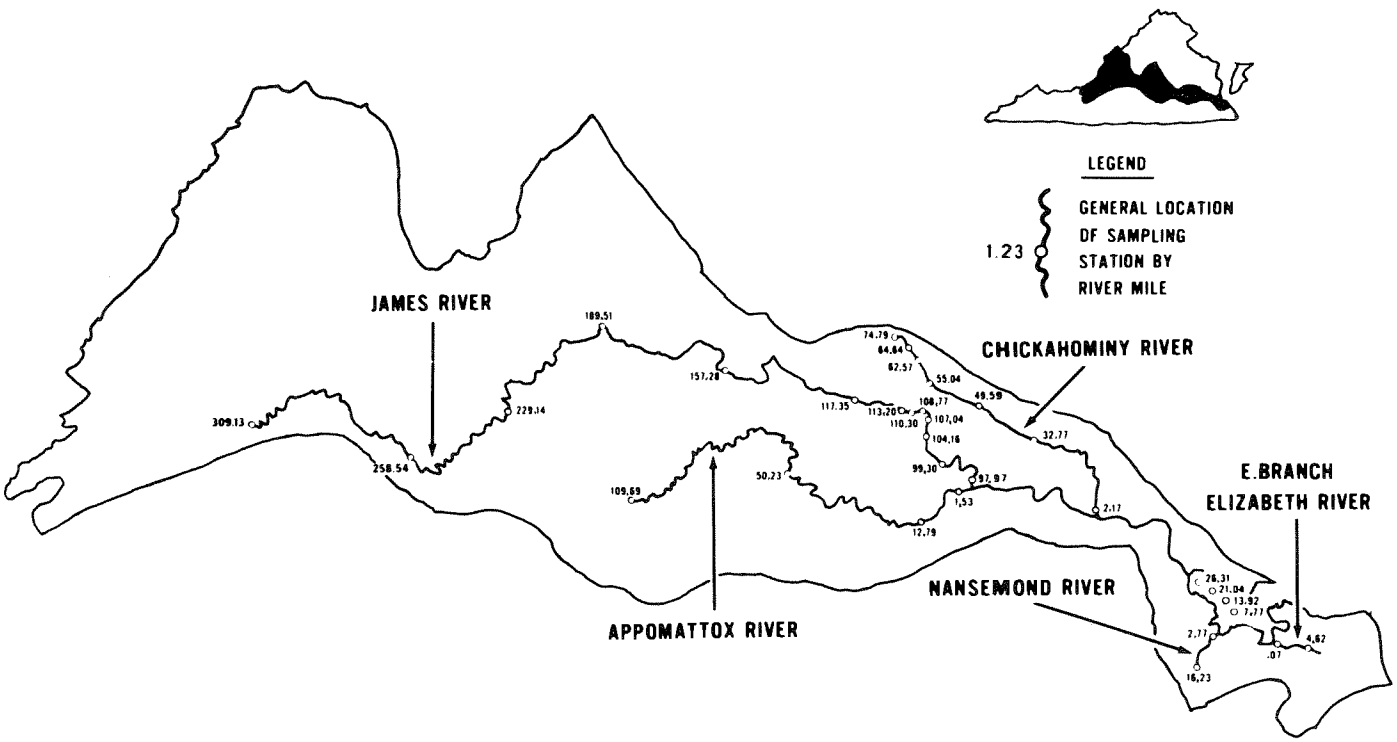
The James River Basin contains one-fourth of the total land area in the State and almost half of the Commonwealth's population resides within the basin. According to SWCB, "there are presently many water quality problems, some very severe, along the James River and its tributaries. Most of these problems occur near areas with a high density of residential and industrial development, such as

the cities of Richmond, Hopewell, and Hampton/Norfolk/Newport News, and are associated with point-source municipal and industrial discharges."[9] In its analysis of the James River, SWCB concludes that with the exception of certain problem areas in the James River Basin, water quality is quite good. Trends of improving water quality have appeared for both dissolved oxygen and fecal coliform.[10]

In the James River Basin, JLARC analyzed data for five rivers: (1) Appomattox River (river miles 1.53 to 12.79), (2) Chickahominy River (2.17 to 74.79), (3) E. Branch Elizabeth River (.07 to 4.62), (4) James River (7.77 to 309.13), and (5) Nansemond River (2.77 to 16.23).

Figure 9

JAMES RIVER BASIN



Source: SWCB Sampling Station Location Map.

Appomattox River. For the segment examined by JLARC, SWCB states that the river meets applicable water quality standards and is "in good condition." JLARC found this to be generally correct except for sporadic fecal coliform violations at river miles 12.79 and 109.69 during the summer months. For the period 1970 to 1975, violations of the dissolved oxygen standard were not detected.

Chickahominy River. According to SWCB:

> The Chickahominy River from river mile 61.7 to 0.0 (segment 26) contains a large acreage of swampland and also the Chickahominy Reservoir. This segment has special standards that apply to

wastewater discharges into the Chickahominy River to protect it from degradation and the State Water Control Board has been very vigilant in enforcing these standards. *The Chickahominy River thus meets the applicable water quality standards and in general is in excellent condition.*[11] (Emphasis added)

Based on the dissolved oxygen data reviewed by JLARC this statement does not appear to be entirely true. SWCB data suggest that the dissolved oxygen levels of the Chickahominy River may be declining (Appendix II). One possible reason for this occurrence could be the natural decomposition process associated with swampland in the Chickahominy sub-basin. There were no serious fecal coliform violations observed between 1971 and 1975.

E. Branch Elizabeth River. The Elizabeth River is surrounded by heavy industrial development. Consequently, SWCB doubts whether this body of water can be restored to meet the 1983 goal.[12] JLARC found dissolved oxygen levels to be low and fecal coliform standards excessive, at times. (The Virginia Chemicals Company is a major source of high oxygen demands and has been recently cited by EPA for violating its discharge limits.) It is possible that this highly industrialized river segment may not meet the 1983 goal unless controls are placed on development along the East Branch.

James River. An SWCB evaluation of the James River revealed that, overall, dissolved oxygen showed a trend toward improvement, especially in the Richmond area after the city's construction of a secondary treatment plant. However, below Richmond the primary wastewater treatment plant at Hopewell tends to deplete the amount of oxygen in the river. (The concentrations of Kepone in the lower James River were discharged by the Hopewell plant and have severely affected water quality.) This plant is scheduled to be phased out in the near future and replaced with a regional plant. Data suggest that dissolved oxygen levels have improved below the Richmond plant (river miles 97.77, 99.30, 107.04) and, overall dissolved oxygen levels appear to be stable between river miles 7.77 and 309.13.

SWCB contends that fecal coliform levels have decreased significantly in recent years (1972-74) as compared to earlier years (1967-71) in the Richmond area.[13] Again, Richmond's secondary plant is attributed for this decrease. A review of fecal coliform sampling data for the periods analyzed by SWCB revealed that only five months of fecal coliform data were available for the base period analysis 1967-71 at stations 104.16 and 107.04. SWCB compared this base period data with fecal coliform observations available for the period 1972-74 and concluded that there was a significant improvement in fecal coliform levels adjacent to the Richmond plant. Moreover, based on this conclusion, SWCB contends that there was a trend of improving water quality for fecal coliform for the entire James River. Statistically, SWCB cannot state conclusively that there was a trend of improving fecal coliform levels.

Nansemond River. SWCB did not perform a water quality analysis of the Nansemond River. JLARC selected two stations for analysis located at river miles 2.77 and 16.23. Serious violations of dissolved oxygen and fecal coliform standards were detected at river mile 16.23. The most serious polluter on this river segment is the Suffolk sewerage treatment plant (The City of Suffolk has been a consistent violator of pollution standards).

Basin Summary. Of the river segments and stations examined by JLARC, the sampling data tends to support the SWCB conclusion that severe water quality problems exist in the river basin, some of which may not be corrected by the 1983 goal. However, SWCB cannot definitely state that water quality is improving in the James River basin. SWCB should review its sampling data for the Chickahominy and James rivers. Furthermore, the impact of the recent Kepone discharge into the lower James River should also be assessed in light of the 1983 water quality goal.

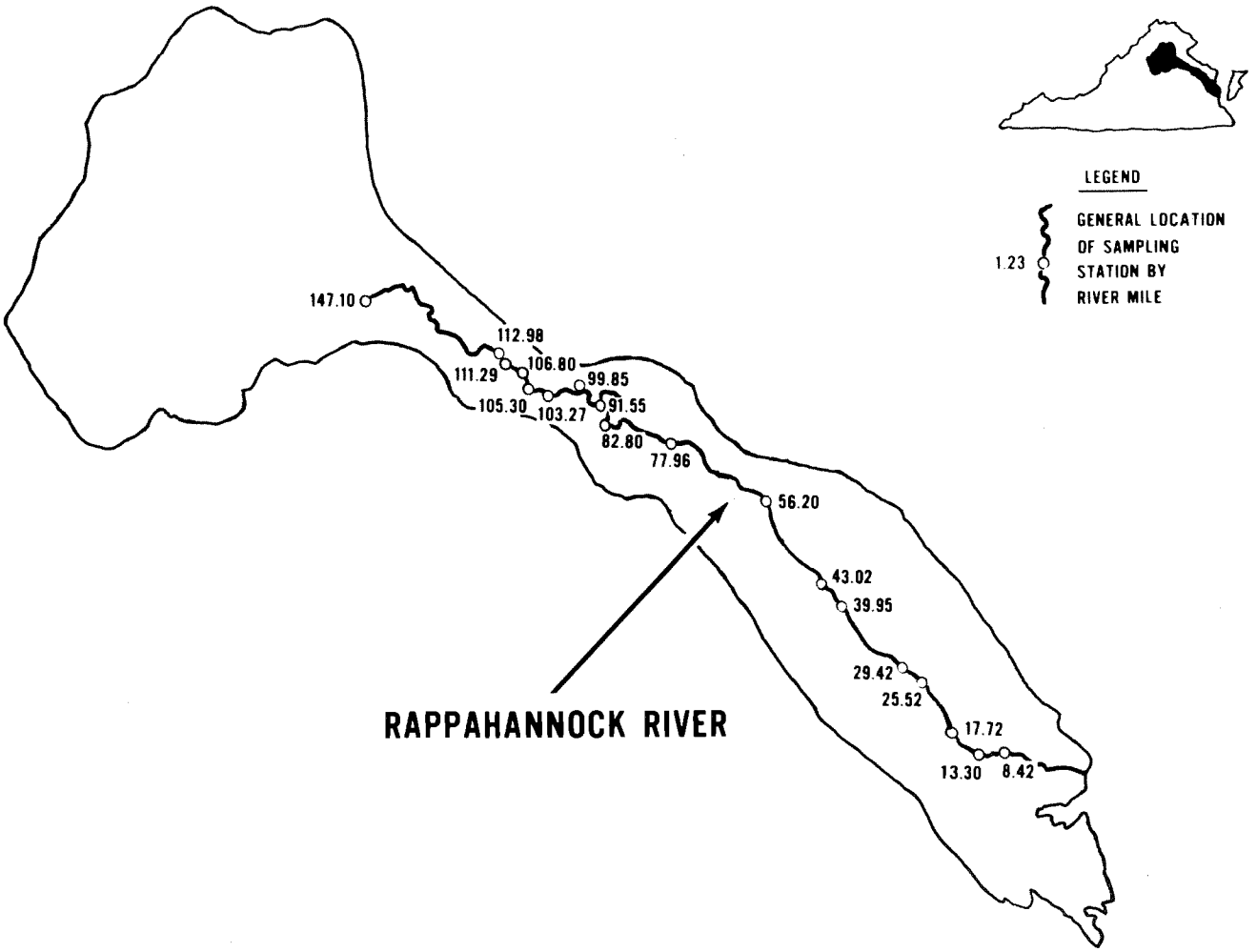
Rappahannock River Basin

The Rappahannock River Basin is largely rural in character, with the exception of the City of Fredericksburg. Approximately two percent of the State's population lives within the basin's 2,715 square miles.

JLARC obtained dissolved oxygen and fecal coliform data for 18 stations located between river miles 8.42 to 147.10 on the Rappahannock River.

Figure 10

RAPPAHANNOCK RIVER BASIN



Source: SWCB Sampling Station Location Map.

Rappahannock River. Beginning in the headwaters, the SWCB describes this segment of the Rappahannock River as "good quality," except for periodic fecal coliform violations caused by the Town of Orange treatment plant.[14] JLARC found this to be generally true since no violations of dissolved oxygen occurred during the study period, but fecal coliform standards were violated three times at station 147.10 in 1975.

The tidal portion of the Rappahannock River begins between river miles 106.8 to 99.85. SWCB states that "degradation of this segment can be attributed to the area's two major dischargers, City of Fredericksburg STP (sewerage treatment plant) and the American Viscose Division of FMC."[15] (The City of Fredericksburg is a frequent violator of pollution standards.) This results in serious depletions of dissolved oxygen during periods of low flow. JLARC found that 1975 dissolved oxygen levels improved over 1974 at stations 99.85, 103.27, 105.30, and 106.80.

Between river miles 99.8 to the mouth, the river is described by SWCB as being "very good" with the exception of a small segment.[16] This statement is not consistent with JLARC's findings. Eight of the eleven stations between river miles 8.42 to 91.55, showed a tendency toward declining dissolved oxygen levels during the period 1970-75 (Appendix II). However, for the entire six-year period, there were only four readings below the minimum reference level of 4.0 mg/l.

Basin Summary. SWCB dissolved oxygen data suggest that below the City of Fredericksburg, the Rappahannock River is exhibiting signs of declining levels of water quality during the summer months. According to SWCB several major projects are planned, or in the construction phase, to remedy this pollution problem by 1983. SWCB should carefully monitor the condition of this river and take necessary corrective action to assure that applicable water quality standards for recreation and shellfishing purposes are maintained.

Roanoke River Basin

The Roanoke River Basin encompasses 6,284 square miles with a population of 556,000. Major urban areas include the Roanoke-Salem-Vinton metropolitan area, Bedford, Danville, Martinsville-Henry County, and South Boston.

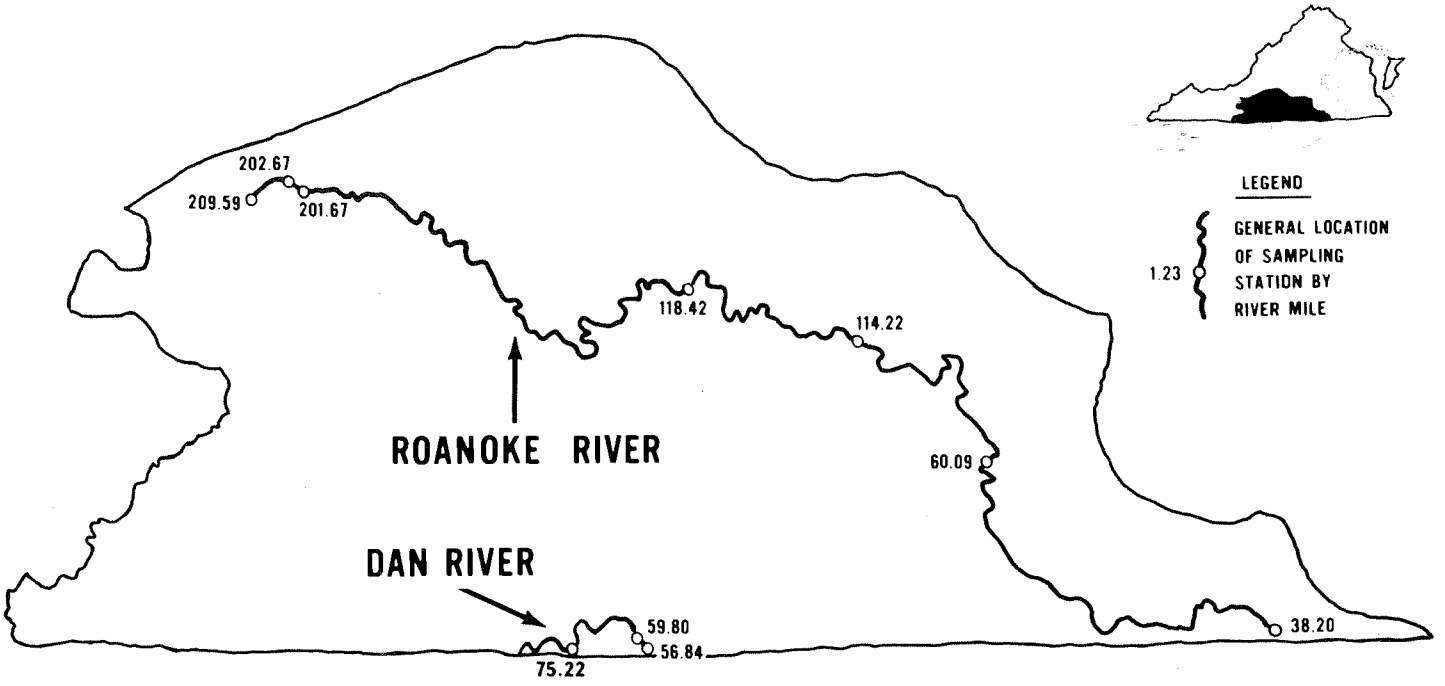
JLARC reviewed the water quality conditions of two rivers: (1) Dan River (river miles 56.84 to 100.00) and (2) Roanoke River (38.20 to 209.59). (Refer to Figure II)

Dan River. SWCB states that "the quality of the Dan River as it enters Virginia from North Carolina is only fair. Fecal coliform bacteria counts are often very high (sometimes exceeding 6000/100 ml.)."[17] JLARC found this to be an accurate description of water quality between river miles 56.84 to 100.00. However, since 1971 there appears to have been an improvement in fecal coliform levels on this river segment. JLARC did not detect any serious dissolved oxygen violations at stations 56.84, 59.80, 75.22, or 100.00 for the period 1970-75.

Roanoke River. According to SWCB the quality of water in the headwaters is generally good with the exception of some high fecal coliform counts. In the Salem and Roanoke areas, the quality begins to deteriorate because of major

Figure 11

ROANOKE RIVER BASIN



Source: SWCB Sampling Station Location Map.

discharges and urban run-off. Many of the pollution problems are to be remedied with the completion of a new advanced regional treatment plant in 1976.

JLARC found dissolved oxygen levels between river miles 38.20 to 209.59 to be stable or improving. Fecal coliform levels have also declined in the last two years at stations 118.42, 201.67, 202.67, and 209.59. Violations still occur at station 114.22, however.

Basin Summary. It appears that the construction of the Roanoke and Danville regional treatment plants will have positive effects on water quality. The evidence suggests that dissolved oxygen and fecal coliform levels will be met by 1983 in the Roanoke River Basin.

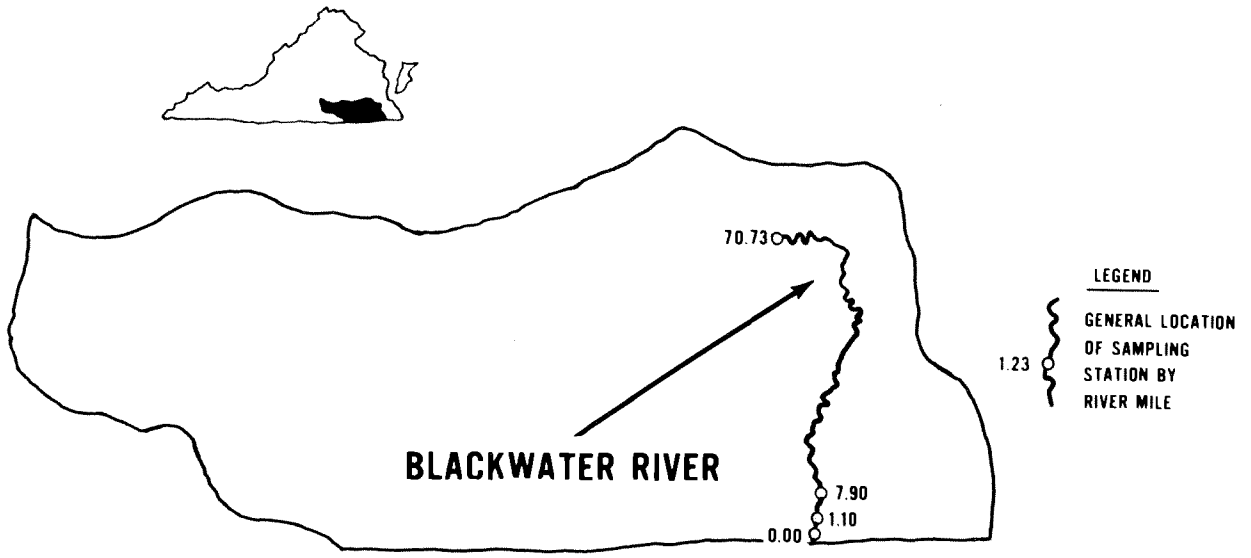
Chowan River Basin

The Chowan River Basin is located in the southeastern part of Virginia, and covers 4,061 square miles of total drainage area. An estimated 235,000 people live in the basin.

JLARC examined the quality of the Blackwater River between river miles 0.00 to 70.73. (Figure 12)

Figure 12

CHOWAN RIVER BASIN



Source: SWCB Sampling Station Location Map.

Blackwater River. According to SWCB, major pollution problems on this river include high fecal coliforms caused by the Franklin sewerage treatment plant and failing septic tank systems, and low dissolved oxygen levels resulting from Union Camp discharges and swampland. SWCB states that the swamp problem is a natural phenomena which cannot be corrected by implementation of pollution controls.[18]

Sampling data reviewed by JLARC tended to confirm SWCB findings. Since 1970 there were 34 readings below the acceptable dissolved oxygen standard (4.0 mg/l) at stations 0.00, 1.10, 7.90, and 70.73. Fecal coliform levels exceeded the standard of 2000/100 ml. eleven times, or about 20% of the samples taken between 1971-75. It is doubtful whether all segments of the Blackwater River can attain the 1983 goal established by Congress.

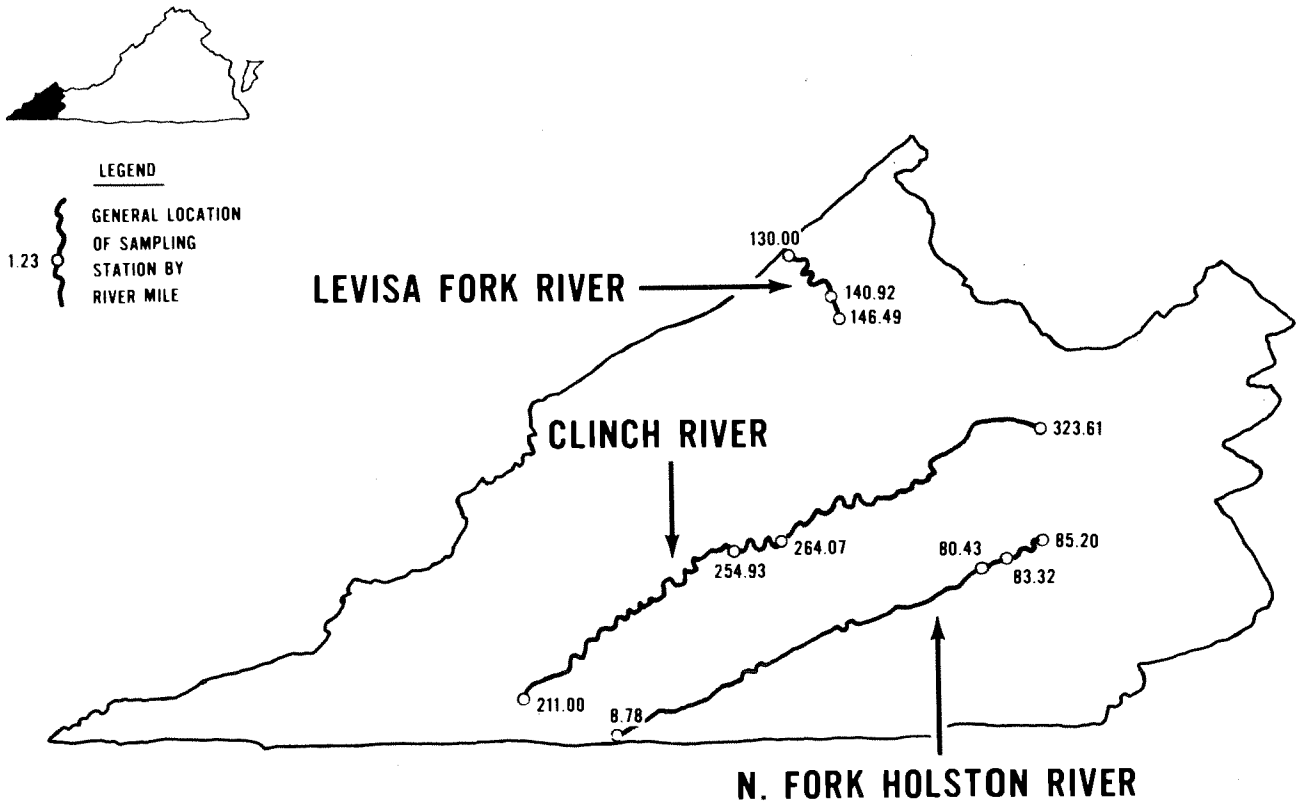
Tennessee-Big Sandy River Basins

For administrative purposes, SWCB considers the Tennessee and Big Sandy River Basins as one basin. That portion of the Big Sandy River Basin in Virginia has a total drainage area of 1,009 square miles and a population of 59,000. The Tennessee River Basin contains 3,131 square miles with an estimated population of 215,000.

JLARC selected rivers in each of the basins for analysis: (1) Levisa Fork (river miles 130.00 to 146.49) in the Big Sandy Basin, and (2) Clinch (211.00 to 323.61), and the North Fork Holston (8.78 to 85.20) Rivers in the Tennessee Basin.

Figure 13

TENNESSEE-BIG SANDY RIVER BASIN



Source: SWCB Sampling Station Location Map.

Levisa Fork. SWCB reports that the Levisa Fork experiences fecal coliform contamination, but dissolved oxygen levels are above applicable standards. The major source of fecal coliform contamination originates from "unsewered population clusters or concentrations adjacent to receiving streams."[19]

Based on the JLARC evaluation of three sampling stations between river miles 130.00 to 146.49, the number of fecal coliform violations during the period 1971-75 was extremely high. Over 50% of the monthly samples taken during this period of time exceeded the fecal coliform standard considered acceptable (2000/100 ml.), it is clear that this segment definitely constitutes a potential health hazard to residents living near the river.

Clinch River. SWCB states that dissolved oxygen is not a problem, but fecal coliform levels exceed acceptable standards.[20] Again, high fecal coliform levels are attributed to raw and partially-treated wastes.

The section of the river examined by JLARC between river miles 211.00 to 323.61 was not identified in the SWCB 305(b) report segment gazetteer. At each of the four stations evaluated by JLARC (211.00, 254.93, 264.07, and 323.61) more than 20% of the fecal coliform samples exceeded the standard (2000/100 ml.). Dissolved oxygen is well above acceptable limits. Evidence suggests that this section of the Clinch River can also be considered a potential health hazard.

North Fork Holston River. The North Fork Holston River is contaminated by mercury and fecal coliform organisms, but dissolved oxygen levels are in compliance with standards, according to SWCB. Because of the mercury contamination SWCB projects that this river will not meet the 1983 national goal.[21]

JLARC found dissolved oxygen levels to be stable or improving. However, 61 fecal coliform infractions occurred at stations 8.78, 80.43, 83.32, and 85.20 over the period 1971-75.

Basin Summary. Although dissolved oxygen standards are being met, the number of fecal coliform bacteria at each of the three rivers examined by JLARC consistently violated the standard (not to equal or exceed 2000/100 ml.). The North Fork Holston River will not meet the 1983 national goal because of mercury contamination. Many segments of the rivers examined should be considered a potential health hazard.

York River Basin

The York River Basin drains 2,661 square miles and has a population of approximately 117,000 people.

Four rivers were examined in this basin: (1) South Anna (river miles 44.05 to 96.83), (2) Pamunkey (.98 to 56.87), (3) Mattaponi (1.34), and (4) York (1.38 to 28.10). (Refer to Figure 14)

South Anna. SWCB describes the waters of the South Anna River as being "generally good."[22] At river miles 44.05 and 96.83, JLARC did not find any violations of dissolved oxygen standards over the past six years. There were several violations of fecal coliform standards prior to 1974, but none thereafter. Water quality on this river appears to be good.

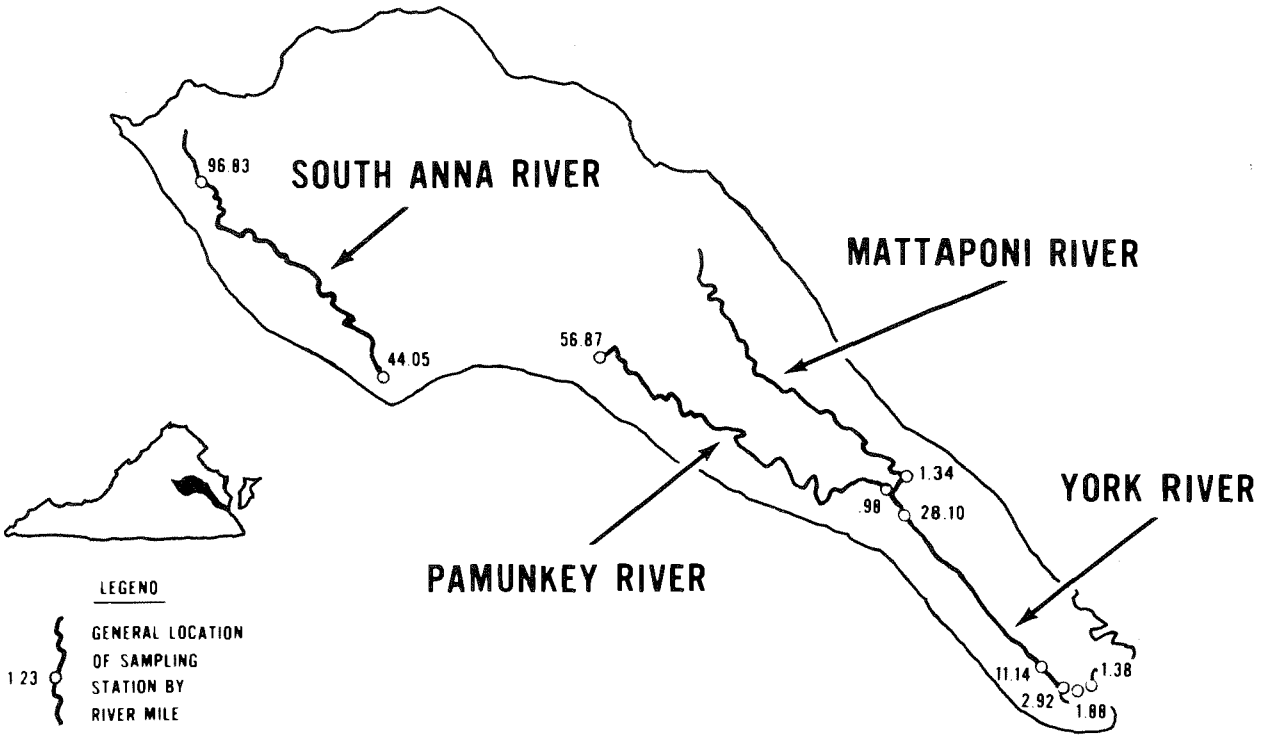
Pamunkey. According to SWCB, parts of the Pamunkey, especially near West Point, are a general problem area because of urban run-off, organic swamp drainage and discharge from West Point sewage treatment plant.[23] At times, this causes high coliform counts and low dissolved oxygen levels. This problem is supposed to be corrected when a new wastewater treatment plant is built at West Point.

At river mile .98, JLARC found depressed dissolved oxygen levels. Between 1970-75 the dissolved oxygen standard (4.0 mg/l) was violated six times. Fecal coliform bacteria were generally below the established limit of 2000/100 ml.

Mattaponi. The Mattaponi is also affected by pollutants entering the water in the West Point area. SWCB says the amount of dissolved oxygen in the water decreases when this occurs. At river mile 1.34, JLARC detected one

Figure 14

YORK RIVER BASIN



Source: SWCB Sampling Station Location Map.

violation of the dissolved oxygen standard in the last six years. There were no fecal coliform violations.

York. SWCB reports that the "upper reaches of the York River experience high bacteriological counts."[24] Near the lower reaches of the York River "small sewerage treatment plants and the installation of many marinas have resulted in condemnation of oyster beds."[25]

Of the five stations examined by JLARC, stations 1.38, 11.14, and 28.10 exhibited tendencies toward decreasing levels of dissolved oxygen. But, only 12% of the observed values at these stations violated the standard (4.0 mg/l) during a six year period. Fecal coliform bacteria were generally below the maximum limit allowed at every station.

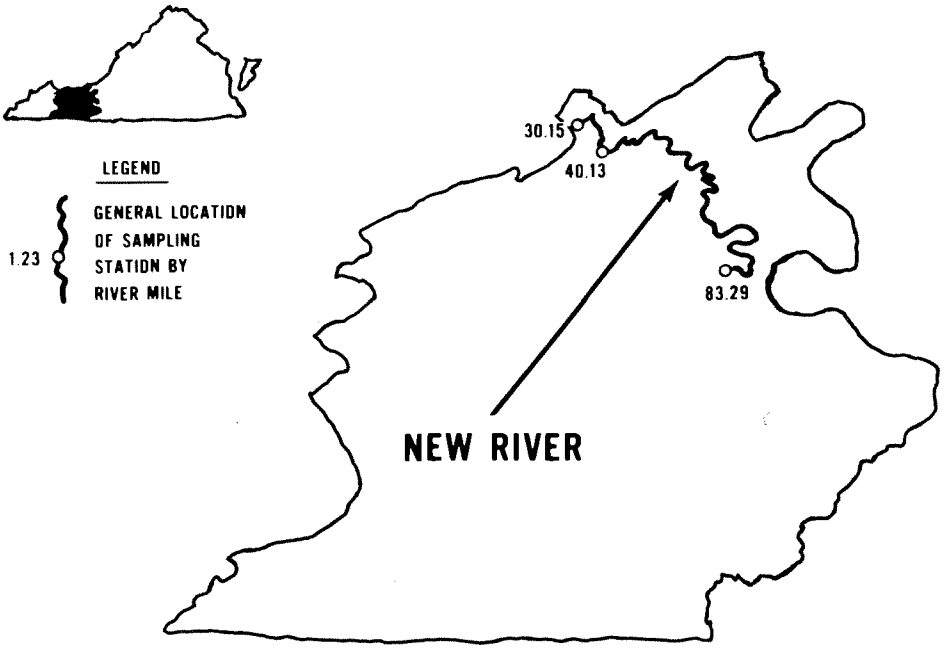
Basin Summary. For the most part, fecal coliform bacteria were not found to be a consistent problem on the four rivers examined, except in the West Point area. Dissolved oxygen levels, although above the applicable standard, appear to be declining on certain segments of the York River. Major pollution sources, the West Point treatment plant and the Chesapeake Paper Corporation, are scheduled to improve their treatment facilities and reduce the amount of wastes discharged by 1977.

New River

The New River Basin has a drainage area of 3,070 square miles. An estimated 180,000 persons reside in the basin. JLARC evaluated water quality at stations 30.15, 40.13, and 83.29.

Figure 15

NEW RIVER BASIN



Source: SWCB Sampling Station Location Map.

New River. SWCB finds excessive fecal coliform levels the principal pollution problem on the New River. A concern of SWCB is that the sources of the fecal coliform problems have yet to be identified. However, SWCB projects that this river segment will meet the 1983 goal.

All of the stations examined by JLARC showed signs of declining levels of fecal coliform bacteria, especially station 83.29. For the three stations examined by JLARC, it appears that fecal coliform levels have significantly decreased during the past five years.

SWCB has not described declining levels of dissolved oxygen as being a pollution problem on the New River. JLARC found that at each of the three stations observed values of dissolved oxygen were well above the acceptable standard and there were no violations since 1970. However, at station 30.15 it appears that the level of dissolved oxygen has steadily declined from 10.0 mg/l. in 1970 to 9.5 mg/l. in 1975. This decline is most likely attributable to industrial and municipal dischargers located near this sampling station. SWCB says improvements to these facilities will be made in order to meet the 1983 goal.

Basin Summary. Based on available sampling data it appears that fecal coliform levels have declined at stations 30.15, 40.13, and 83.29. Overall, the amount of dissolved oxygen in the water remains high, but station 30.15 has undergone some degradation since 1970. SWCB says that actions are being taken to remedy the pollution problems on the New River, and that all segments will meet the 1983 goal.

Fish Kills

In the words of one SWCB official fish kills can be viewed as a "drastic symptom of something wrong with water quality." The Bureau of Surveillance and Field Studies, and the six regional offices are responsible for handling citizen complaints and investigating reported incidents of fish kills. A polluter that has caused a fish kill is assessed by the Board the total costs incurred of investigating the killing of the fish and of replacing the fish destroyed. If no settlement is reached within a reasonable time period, the Board may initiate civil proceedings against the polluter.

The number of fish kills has nearly doubled since 1970. SWCB officials attribute this increase primarily to a growing public awareness of the fish kill reporting program, not to declining levels of water quality. Corresponding to the findings of the water quality evaluation most fish kills occur in the more populated and industrialized sections of the State, especially in the Lower James River Basin (Figure 16). Table 10 shows the total number of pollution-caused fish kills investigated by SWCB since 1970. About one-fifth of the fish kills

Table 10

POLLUTION-CAUSED FISH KILLS AND COLLECTIONS

	1970	1971	1972	1973	1974	1975
Agricultural	3	2	1	2	3	-
Industrial	12	5	4	6	5	8
Municipal	4	1	2	2	4	2
Transportation	3	1	4	-	7	4
Construction	2	2	1	1	4	2
Enrichment	14	12	12	34	15	40
Other	7	7	11	28	63	78
Unknown	44	31	32	59	28	34
Total	89	61	67	132	129	168
Fish Kill Collections[a]	6	4	3	4	3	6

[a]Assessing the total cost to the polluter of the SWCB staff investigation and replacement of the killed fish.

Source: State Water Control Board.

are caused by direct pollution and a large number are of an unknown origin. Surprisingly, since 1970, there have been 646 fish kills and only 26 collections. JLARC found one instance where a manufacturer was responsible for two fish kills within a year but no legal action was taken by SWCB to remedy the

Figure 16

GENERAL LOCATION OF FISH KILLS BY MAJOR RIVER BASIN 1970-75

1 POTOMAC-SHENANDOAH

2 JAMES

3 RAPPAHANNOCK

4 ROANOKE

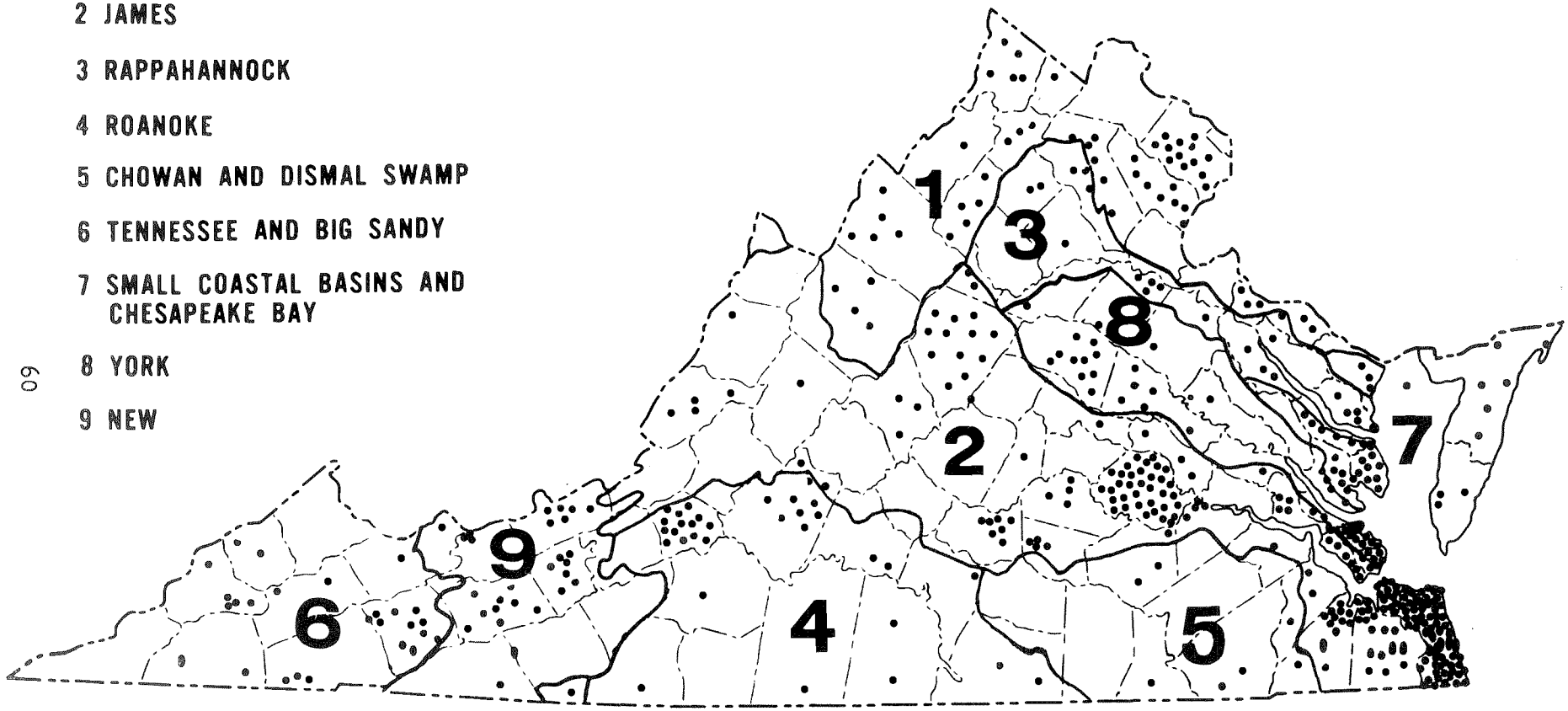
5 CHOWAN AND DISMAL SWAMP

6 TENNESSEE AND BIG SANDY

7 SMALL COASTAL BASINS AND CHESAPEAKE BAY

8 YORK

9 NEW



Note: Only those fish kills which could be located by city, county, or town are shown on the map.

Source: Fish kill data provided by SWCB

pollution problem. A staff member of the Bureau of Enforcement was not aware that the fish kill violations occurred. SWCB officials claim there are several reasons for the small number of fish kill collections: (1) lack of manpower and training, (2) late laboratory results, (3) inadequate coordination of fish kill data within the agency, and (4) poorly documented fish kill evidence at the regional level. It appears that a great deal of staff time is expended investigating fish kills, but relatively few cases result in actual fish kill collections. SWCB should assess its policy toward conducting fish kill investigations and develop a program which is compatible with available staff resources.

PLANNING

Planning is essential to ensure that all program responsibilities of SWCB maintain a coordinated sense of direction and unity of purpose, consistent with established water quality goals and objectives. PL92-500 requires SWCB to prepare (1) an agency program plan, and (2) basin and regional water quality management plans. SWCB has committed substantial staff and financial resources toward the preparation of federally required water quality plans. However, the sequence of planning events is out of phase with the construction grant program and, most of the planning studies mandated by PL92-500 have not been adopted by the Board. Moreover, there are insufficient funds to maintain and continually revise completed plans.

Program Planning

The focus of the State water quality management effort is preparation of an annual work program required by EPA. It includes a State strategy statement and a program plan describing program structure, program outputs, and project plans. The work program is oriented toward two phases: Phase I is directed at attaining the interim 1977 objectives of PL92-500, and Phase II, the 1983 goals.

- To achieve the Act's 1977 objectives, the initial management effort must focus on point source controls, such as permits and construction grant awards. To support these activities, planning must prepare waste load analyses in water quality segments, and provide the management information to assist in coordinating and directing various program efforts.

- Longer range management, Phase II, will address additional and often more complex problems, including nonpoint source control. (See Chapter III)

EPA, in its 1974 *Water Quality Strategy Paper*, emphasized that the State program plan need not correspond to the national strategy, but should be reflective of individual water resource problems and program initiatives. The State strategy statement and program plan are based largely on information supplied by water quality plans.

The SWCB submitted its first internal program work plan to EPA in 1973. Subsequently, two additional plans have been prepared, each somewhat more refined than the previous plan. The 1975-76 strategy is set forth in the *Virginia State*

Water Strategy Guidance Statements, as well as in the internal program work plan, and agency budget document. Because of the SWCB's water resource management planning responsibility, the strategy statement includes priorities other than water quality related. The first two priority areas, however, are common to both EPA and SWCB for 1975-76:

1. Construction grants
2. NPDES permit issuance and compliance
3. Water planning
4. Monitoring and field studies
5. Facilities operations and maintenance
6. Groundwater management
7. Flood management
8. Nonpoint source program
9. Agency administrative programs

The 1975 SWCB work program for water quality includes the State strategy, goals and objectives, program structure, program outputs, project index, and project plans. Each project is described with a short project narrative, work tasks and responsibilities, project milestones, outputs and resource requirements. An EPA mid-year evaluation of the 1976 SWCB work program found that most projects were on schedule, with the exception of the construction grant, permit issuance, and water planning programs. EPA claims that SWCB's expectations of program outputs in these three priority areas were too high and should be adjusted accordingly. A JLARC review of regional project status reports for the months of July and September, 1975, revealed no serious problems being encountered by the regions in accomplishing assigned tasks and responsibilities. However, several regional directors stated that some project deadlines were unrealistic and could not be met.

SWCB's program planning process appears to be an effective management tool for assessing the extent of water quality problems and for developing a plan for addressing existing or potential problems.

Water Quality Management Planning

Planning conducted at the basin and regional levels is the primary source of information used in preparing the annual State program plan. The SWCB is authorized by State statute:

> To establish policies and programs for effective area-wide or basin-wide water quality control and management. The Board may develop comprehensive pollution abatement and water quality control plans on an area-wide basis.[26]

Since 1972 the Board has received $4.6 million in federal and State funds for the preparation of water quality management plans. In 1972 the General Assembly appropriated $1.8 million for the development of regional water quality plans, accounting for nearly two-thirds of the fiscal year 1972-73 State planning funds (Table 11). Another $6 million is currently being spent by EPA to support area-wide planning programs in Virginia.

Table 11

WATER QUALITY MANAGEMENT PLANNING FUNDS

Fiscal Year	Federal Share	State Share
1972-73	$663,480	$2,752,400
1973-74	232,518	885,100
1974-75	79,376	--
1975-76	--	--
Total	$975,374	$3,637,500

Source: State Water Control Board.

There are several types of planning currently being conducted or coordinated by the Board:

Metropolitan/Regional Plans. In January, 1971, EPA issued guidelines requiring the preparation of regional and basin pollution abatement plans. In response to this requirement the 1972 General Assembly authorized the preparation of 22 metropolitan/regional (M/R) plans, one for each planning district in Virginia (Appendix II).

Metropolitan/regional plans delineate sewer service areas, existing wastewater treatment facilities, and present the most economically feasible regional system, consistent with an overall strategy defined in a basin plan. EPA guidelines envisioned the creation of an intergovernmental arrangement to implement the regional water quality management plan. The Division of State Planning and Community Affairs and SWCB were jointly responsible for administering and monitoring the expenditure of these funds by the planning district commissions. All but one of the plans were prepared by consultants employed by the planning district commissions or SWCB. EPA guidelines called for the completion of the plans by July 1, 1973. However, before SWCB could complete the M/R plans, Congress enacted PL92-500 in October, 1972, requiring preparation of areawide and basin water quality management plans. Instead of terminating the M/R planning program, SWCB continued to develop M/R plans as an information base for the newly mandated basin water quality plans.

Because of local disagreement over plan proposals, M/R studies remain incomplete for three planning districts: (1) Northern Neck, (2) Crater, and (3) Middle Peninsula. The administrative head of the construction grants program claims that the M/R planning effort enabled the State to respond expeditiously to EPA's 1973 statewide wastewater needs survey and to obtain an additional $15 million for municipal facility construction.

PL92-500 Plans. Congress incorporated a variety of planning provisions into the Federal Water Pollution Control Act. Each planning provision of the act has its own special focus: (1) Section 208 on areawide water quality planning; (2) Section 303(e) on basin water quality planning; and (3) Section 201 on facilities construction. Under the act's timetable, initial basin plans were to have been completed, and areawide plans near completion by July, 1975. Congress intended Section 208 to be the key planning provision because it was to coordinate and integrate all other planning, construction, and discharge permit provisions of the

act. The following discussion briefly examines areawide, basin, and facility planning in Virginia.

208 Plans. The intent of 208 planning is to encourage preparation of areawide wastewater treatment management plans by designated areawide planning agencies composed of local officials. In Virginia, there are seven 208 planning areas. (A discussion of 208 planning is presented in Chapter III.) A 208 plan deals with point and non-point sources of pollution, identifies means of control, establishes construction priorities, determines management agencies, and develops financial mechanisms for implementing the plan. All construction grants and permits are supposed to be in conformance with the plan. Only one 208 study has been completed in Virginia.

Basin Plans. Due to EPA's initial emphasis on Section 303(e), river basin planning has been stressed at the state level. Essential features of the basin water quality management plan are identification of river segment boundaries; identification of water quality standards, water quality analysis; and waste load allocation to assist in permit issuance. Virginia is responsible for preparing nine basin water quality management plans. In July, 1976, SWCB forwarded draft copies of eight basin reports to EPA for review. However, these studies are still considered to be preliminary because the Board has yet to hold public hearings on the plans. The first public hearing is scheduled in September on the Roanoke basin plan. All other hearings are scheduled between October and December, 1976. In essence, the Board has not adopted formally any of the basin plans.

201 Facilities Planning. Section 201 of PL92-500 requires local governments to prepare facility plans, demonstrating the need for a proposed pollution abatement project. A local government cannot receive a federal construction grant award until an approved facilities plan is prepared. Facilities planning examines alternatives for wastewater treatment, including size, location, phasing of facilities, and interception sewers. The plan also contains engineering data, cost estimates, a cost effectiveness analysis, and an environmental impact assessment. PL92-500 contains specific requirements for integrating facility plans with areawide and basin plans. Congress intended that the construction grant program be closely tied to 208 planning. In fact, no sewage treatment grant is supposed to be made unless in conformity with such an areawide plan. Grant applications must also be certified by the SWCB as "entitled to priority" over other projects in the State, in accordance with basin plans. A large number of facilities plans and construction grants have already been prepared and approved by EPA and SWCB without the use of completed 208 and basin plans.

Problems with Planning

The confusing array of water quality management plans has left local officials bewildered. In the words of one local elected official,

> I feel there are so many planning programs in process, completed, or now being instituted, the average citizen and government officials have no idea what is going on. Sometime, somewhere, and soon, an overall explanation must be made, together with a justification of expenditures and results anticipated.

In Planning District 20 (Southeastern), for example, four types of water planning are currently being conducted--M/R planning, 208 planning, river basin planning, and a U. S. Army Corps of Engineers water supply study.

The water quality management planning process is complex and out of sequence, most of which can be blamed on EPA. In a recent report released by the National Commission on Water Quality it was concluded that water quality planning has not proceeded according to the intent of PL92-500 for two reasons: (1) "the diffuse and uncoordinated planning requirements of the Act and (2) the delay, by EPA, in implementing Section 208, the areawide planning provision."

> As a consequence, the discernible planning patterns emerging from State and federal interpretations of the Act are characterized by disjointed and often unrelated activities. The key elements of the planning process--facility planning and areawide waste treatment planning--are seriously out of synchronization. The 1974 Water Quality Strategy Paper indicated that construction grants, permits and non-point source controls should be consistent with, and serve the purposes of, the relevant plans. Instead, relevant plans are dictated by grants and permits. This process may be reversed in time for the next series of five-year permits, but that is by no means assured....As a result, for five to six years following enactment of PL92-500, construction grant and NPDES activities will have proceeded without having to comply with prescribed State, regional and local plans. Instead of constructed and permitted treatment facilities located and controlled according to local plans for future growth, the facilities will, to a considerable extent, dictate the pattern of the area's long-range development.[27]

This statement seems to apply to Virginia's planning program as well. Over $300 million has been awarded by EPA (as of June, 1976) for the construction of public wastewater treatment projects in Virginia, but not a single 208 plan was completed. Furthermore, basin plans have only recently been submitted to EPA for approval. In the SWCB response to the JLARC preliminary draft report on *Water Resources Management in Virginia*, it is stated that "major portions of construction programs moved forward in parallel with the water quality planning process, with the planning process serving largely to fill some of the voids rather than to serve as the basic foundation."[28] Furthermore, past decisions* to commit large sums of public funds to Northern Virginia and Roanoke provided Virginia with a head start in water quality planning. Since water quality management planning has not been regarded by the Board as providing a "basic foundation" for construction projects in Virginia, this type of planning could have received less emphasis during the past four years, allowing for the parallel development of water resource management plans. The high priority accorded water quality management planning has resulted in a serious discontinuity in the State's water resource planning effort. This

*In 1969 and 1970, the Enforcement Conferences on the Potomac River called for the construction of wastewater treatment facilities in Arlington, Alexandria, and Fairfax County. The U. S. Secretary of Interior supported the recommendations of this conference. About the same time, pollution studies were also conducted by the SWCB and Federal Water Pollution Control Administration on Smith Mountain Lake indicating a need to build an advanced wastewater treatment plant in Roanoke. According to SWCB, these decisions had a significant influence on the funding of projects for several years and continue to be an important factor in allocation of federal grants.

could have been avoided if the Board had taken a prudent approach in the development of water quality plans and water resource plans.

There have been occasions when SWCB staff have exercised inadequate control over planning projects. One such instance occurred in preparing the Lower James River Basin Comprehensive Water Quality Management Study completed abruptly in May, 1973, after three years of work and over $1 million in cost. Due to a misunderstanding over the original scope of the planning study, intergovernmental relations between SWCB and local governments in the planning area have been strained. Representatives of Tidewater and Richmond area local governments were led to believe that the planning study was to be concerned with water resource management--water quality and water quantity. However, funds provided by EPA for the project were to be used for water quality management planning only. The findings of the plan were contested by the City of Richmond. The city contends that the data and model used to generate wasteload allocations were incorrect and inaccurate indicators of the flow of the James River.

A concern of JLARC is the frequent use of consulting engineers to prepare water quality management plans. Since plans have to be updated periodically, who will provide the necessary funds and manpower to revise the regional and basin water quality plans? This question has been addressed in the Board's document *Long Range Planning Goals* and recommends that a work program be developed to allocate federal and State funds toward continuous updating of these plans. SWCB estimates that another $250,000 to $300,000 will be needed annually to perform this function, primarily for consultant services. JLARC fails to see the need for such a large expenditure since the Board has over 30 staff members assigned to planning activities. Because of plan updating requirements, a greater effort should be made on strengthening the planning capabilities of the SWCB regional offices or planning district commissions. Less emphasis should be placed on consultants to prepare plans.

Conclusion

Since 1972 SWCB has devoted substantial financial and staff resources to water quality management planning. The Legislature's support of the metropolitan/regional planning program has been a good investment since these plans have largely served as the basis for evaluating construction grant applications for federal and State financial assistance. However, the effectiveness of the entire water quality planning program required by PL92-500 is debatable because of its uncoordinated and disjointed nature. By mid-1976, EPA had obligated over $300 million to Virginia for the construction of wastewater treatment facilities, but most of the 208 and river basin plans had not been completed or formally adopted by the Board. Other states, such as West Virginia and Pennsylvania, are behind Virginia in completing water quality management plans, but EPA continues to obligate construction funds to these states. In essence, construction grant activities have proceeded without prescribed basin and areawide regional plans. The high priority assigned to water quality planning in recent years by SWCB, at the expense of other legislatively mandated water resource planning responsibilities, does not appear to be an efficient and effective use of public resources.

SWCB has exercised loose control over planning projects and relied heavily on consultants to prepare water quality plans. The SWCB should rely on its regional offices, or planning district commissions, to perform this valuable function.

PERMITTING AND ENFORCING

The permit system is a key element of the water pollution control program. Water quality and discharge standards are controlled by issuing permits to dischargers. These permits are issued under the National Pollutant Discharge Elimination System (NPDES) and State Water Control Law which regulate discharges into navigable waters from all point sources of pollution, including industries, municipal treatment plants, and agricultural feedlots. Failure to comply with permit conditions is a violation of federal and State law.

In addition to administering the federal NPDES permit system, the Board issues "no-discharge certificates" under the Water Control Law. An owner who generates wastewaters and then holds the wastewaters for further reuse or an owner who uses land irrigation as a means of disposing of wastewater are required to obtain a no-discharge certificate from SWCB.

There are four questions pertinent to the administration of the permit program in Virginia: (1) What is a permit based on? (2) How is the NPDES program administered? (3) Are industries and municipalities complying with permit conditions? (4) Is the SWCB effectively enforcing the permit program?

Basis for Permits

Under PL92-500 Congress radically changed the traditional approach to water quality standard-setting by placing more significance on the quality of discharge as opposed to the quality of the receiving stream. Consequently, attention was focused on establishing standards for municipal and industrial discharges.

A discharge standard is a maximum allowable rate of discharge, concentration or amount of a pollutant which may be released from a point source into a body of water. EPA was authorized by Congress to establish precise and uniform discharge limitation standards to apply to industries and municipalities nationwide. However, EPA has had a difficult time developing discharge standards. Due one year after enactment of PL92-500 (October 18, 1973), the first discharge standards were not released until January 31, 1974, and the process is still behind schedule.

Industries are required to install by July 1, 1977 the "best practicable control technology currently available" and by 1983 installation of the "best available treatment economically achievable." The latter refers to levels of treatment attained by the most effective pollution abatement equipment found in a particular industry--as identified by EPA. Any new sources constructed after EPA proposes discharge standards for a particular industrial category will be required to consider modifications in the production processes to meet certain standards of performance.

Municipal sources of pollution must also meet certain discharge standards, but somewhat less stringent than those placed on industry. By July 1, 1977, all waste treatement works must attain a minimum of secondary treatment (removal of up to 90% of the organic matter in sewage) and by 1983 all publicly owned plants must achieve "best practicable waste treatment technology."

SWCB Permit Administration

Beginning in April, 1973, EPA and SWCB jointly administered and issued NPDES permits to municipal and industrial dischargers. EPA would not delegate authority for permit administration until the State Water Control Law was amended imposing stricter civil penalties for violations of federal and State water pollution control laws. The State law was amended by the 1975 General Assembly to conform with EPA enforcement regulations. As a result of this action, in March, 1975, EPA granted SWCB the authority to administer the NPDES permit program. Responsibility for administering the permit program is now shared by EPA and SWCB, with the former retaining veto power over permits issued by the State.

Administrative responsibilities of SWCB under the federally mandated NPDES permit program are to:

- Issue permits
- Modify or revoke permits
- Control disposal of pollutants into wells
- Inspect, monitor, and enter the premises of all dischargers
- Require reports from permit holders and municipal treatment works
- State violations of permits through civil and criminal penalties

Permits are valid for up to five years and can include abatement measures required to meet the discharge limitations established for 1977 and 1983, the new source performance standards, toxic effluent standards, and any more stringent limitations based upon water quality standards. A key feature of the permit is a schedule of compliance which prescribes an enforceable sequence of actions or operations leading to compliance with a discharge limitation. Such a schedule might establish dates for design, engineering, construction or process modifications. These dates, no more than nine months apart, are used for measuring progress toward compliance with the discharge limitations. Failure to comply with the deadlines, included in the schedule of compliance, constitutes a violation of the permit processing and compliance monitoring.

The Board has an elaborate scheme for processing and tracking permits. Over the past year or so SWCB has devoted a considerable amount of time and effort to permit processing and compliance monitoring.

Permits that have been processed and approved represent nearly all of the total pounds of pollutants discharged into rivers and streams by industries and municipalities, about 90% for industries and 95% for municipalities. Thus far, no adjudicatory hearings have been held on permit applications in Virginia (Table 12).

According to SWCB officials, it would be an impossible task to detect all point sources of pollution and issue permits to all polluters in the State. Therefore, the Board has developed a system of priorities for issuing permits:

Table 12

TOTAL NUMBER OF NPDES PERMITS
APPROVED OR BEING PROCESSED

	Total Industrial		Total Municipal	
	Major	Minor	Major	Minor
Applications Received	91	877	50	803
Permits Drafted	91	777	50	785
Permits to Public Notice	91	756	46	743
Public Hearings	0	1	1	6
Permits Issued	91	566	43[a]	711
Permits Revised	27	131	8	25
Adjudicatory Hearings	0	0	0	0

[a]The seven major permits which have not been issued are for sewage treatment plants that are under construction and have no discharge at the present time.

Source: State Water Control Board, August, 1976.

(1) sources from new establishments, (2) existing sources with problems, (3) general geographic problem areas (health hazard areas), and (4) all others (about 7,000 smaller discharges including septic tank systems). SWCB officials state that, aside from the first priority, dischargers operating without permits contribute an insignificant amount of pollutants to State waters. However, small dischargers operating without permits have had significant adverse effects on water quality. For example,

- In June, 1975, a mirror-plating company located in Southwest Virginia discharged silver and copper into a receiving stream, killing 28,000 fish. The plant was operating without an NPDES permit. SWCB is attempting to recover damages from the company.

No matter how small the discharge, SWCB should make every effort to identify and to issue permits to dischargers that pose a significant danger to public health and the environment.

Noncompliance with Permits

Noncompliance with abatement schedules and discharge limitations (regulation of wastes discharged from municipal or industrial wastewater plants) may be widespread in Virginia. Approximately one-third of the 90 major municipal and industrial permit holders tracked by SWCB violated their abatement schedule or effluent limitations during the period January, 1975 to January, 1976.

Noncompliance with Abatement Schedules. The SWCB reports for November 1, 1975, through January 31, 1976 that about 150 of the 1,171 industrial and municipal permit holders had not adhered to their abatement schedules or had not submitted required progress reports.[29] The percentage of non-complying permits is

slightly more than 10%. A large number of violations involved municipalities which failed to submit construction plans to SWCB or EPA on time. According to SWCB, an estimated 148 municipal dischargers will not meet the 1977 deadline because of insufficient federal construction funds.

Municipal Noncompliance with Effluent Limits. In January, 1972, the Bureau of Applied Technology established a manually operated permit tracking program to monitor the effluent performance of municipal dischargers. Under the tracking program dischargers are required to submit monthly plant performance reports which indicate the quality and quantity of plant effluents. There are occasions when major dischargers do not submit plant performance reports, but SWCB says that this is not a widespread occurrence. According to the SWCB, "the tracking program has made the spotting of violators relatively easy, so that remedial action can be initiated."

At the time of JLARC's analysis, the SWCB tracked 39 major municipal plants discharging 81% of the State's total sewage flow (currently SWCB tracks 41 plants). Pollutants monitored include suspended solids and biochemical oxygen demand (BOD--the amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter in an effluent). SWCB staff describe the tracking analysis as a "good indicator" of progress being made by significant dischargers in removing pollutants from wastewater. They believe the tracking program provides a good statewide overview of municipal plant performance. A JLARC review of the SWCB 1975 summary report for municipal treatment plants revealed that of the 39 major municipal plants tracked, 18 committed BOD quantity violations (Appendix II). Six of the 18 plants consistently violated BOD quantity limits--HRSD-James River, Charlottesville-Moores Creek, Fredericksburg, Harrisonburg, Suffolk, and Winchester.[30]

Industrial Noncompliance with Effluent Limits. Analysis of industrial plant performance was not initiated until July, 1975. Prior to this date industries were operating under State issued certificates which contained no effluent limitations as required by PL92-500. Presently, 51 major industries responsible for 95% of the sewage in this category are tracked. A JLARC review of a report prepared by the Bureau of Applied Technology for 51 major industrial plants revealed that 15 committed a permit violation during the period July to December, 1975. General descriptions of four of the violations follow:[31]

- A small food processing company consistently violated its BOD, total suspended solids, fecal coliform, chlorine residual, dissolved oxygen, and oil and grease limits.

- A large chemical plant violated its zinc and ammonia limits. A spokesman for the plant indicated that an increased flow rate had raised zinc poundage levels, but concentrations have remained the same.

- A food processing company had problems meeting its BOD and suspended solids limits since August, 1975.

- An oil refinery experienced high grease and oil content in its effluent during December.

Noncompliance Conclusion. Although the permit tracking system appears to be detecting effluent violations among the largest industrial and municipal

sewage dischargers, there are over 1,000 permit holders who are not as closely monitored by SWCB, and another 7,000 small dischargers that are still to be identified and issued a permit. If the percentage of violators among the 90 major municipal and industrial plants is a reliable indicator of permit violations, overall, it is possible that a substantial number of municipal and industrial dischargers are violating federal and State water pollution control laws in Virginia.

The present manually maintained permit tracking system is cumbersome and inefficient. As July, 1977 approaches SWCB will need to give priority attention to monitoring adherence to permit conditions in order to take appropriate enforcement actions against violators. SWCB has been slow in developing a general computer-based information system to retrieve desired information on municipal and industrial dischargers, such as when abatement actions are due and whether discharges are achieving effluent limitations. Every effort should be made to implement this system as quickly as possible.

Monitoring Wastewater Treatment Plants

Monitoring of treatment plants is carried out by the regional offices under the direction of the Bureau of Surveillance and Field Studies (BSFS) and Bureau of Applied Technology (BATS) to ensure that dischargers are adhering to compliance schedules and effluent limitations. The routine monitoring program includes: (1) a wastewater survey of each major discharger, at least once a year; (2) physical plant inspections of major dischargers; (3) spot sampling; and (4) laboratory inspections.

Wastewater surveys of major dischargers are conducted by the regional offices annually. Unfortunately, minor plants are surveyed only once every five years. Samples of a plant's wastewater are collected over a 24-hour period and sent to Consolidated Laboratory Services for analysis. In addition to the BSFS wastewater surveys, regional personnel conduct physical plant inspections of each

Table 13

MONITORING OF TREATMENT PLANTS
(March to November 1975)

	Industrial		Municipal	
	Major	Minor	Major	Minor
Engineering Inspections	86	234	162	439
Effluent Sampling and Analysis Inspections[a]	33	35	24	57

[a] In addition to the above sampling and analysis figures, which represent surveys lasting for 4 hours or longer, there were 1131 spot samples taken from discharger effluents.

Source: Letter, Director, Bureau of Applied Technology, SWCB, January 13, 1976.

major municipal and industrial plant at least six times a year. Physical inspections include a review of plant operations, plant safety, and operator qualifications, identical to the sanitary surveys conducted by Bureau of Sanitary Engineering, Department of Health (Refer to Chapter I). BSFS personnel feel that coordination of plant inspections and wastewater surveys could be improved at the SWCB central office and regional levels.

Spot samples of a plant's effluent are collected and compared against the NPDES permit standards. Approximately 100 plants are sampled per month. Regional staff collect spot samples in accordance with guidelines and procedures established by BSFS. Major wastewater treatment plants are supposed to be sampled once every six months and minor plants at least once a year, but this varies from region to region. For example, the Northern Virginia office samples major plants once a month. After a sample is collected it is sent to Consolidated Laboratory Services for analysis, which usually takes three weeks or more, according to BSFS staff. Results of the analysis are then sent to the SWCB central office, copied, and the copy forwarded to the regional office. Spot sampling data are recorded in a book at the SWCB central office. Recorded data are not analyzed by the central office staff. Moreover, SWCB does not maintain trend data on discharges. The central office relies almost totally on the regional offices to perform analyses of spot sampling data. Presently all prior spot sampling data are waiting to be key punched for automated data processing, but a system has not yet been devised for analyzing the data.

BSFS staff has stated that some regions use spot sampling data more extensively than others. Also, coordination of spot sampling data between staff members varies among the six regions. There have been occasions when regional staff of the Bureau of Applied Technology did not make adequate use of spot sample violations detected by employees of the Bureau of Surveillance and Field Studies. In the words of one BSFS central office staff member, "the delineation of responsibility between the Bureaus and regions has never been clearly spelled out. It is difficult for central office staff to make demands of the regions on certain sampling matters."

Violations detected by spot sampling are not always accurate, especially those involving BOD and suspended solids. A spot sample is viewed as a preliminary indicator of possible permit violations. Once a permit violation is detected, additional measures are taken to ascertain the validity and extent of the infraction. The number of spot samples violating established effluent limitations is not compiled by the central office or regional offices. It seems that SWCB could make better use of these samples by maintaining trend data files on problem discharges.

Laboratory Inspections. As part of the compliance monitoring program, the SWCB, with the assistance of Consolidated Laboratory Services, conducts inspections of laboratories supporting municipal and industrial sewage treatment plants. The purpose of this activity is to assess the reliability of effluent monitoring data submitted by municipal and industrial dischargers. Activities performed include evaluation of plant facilities, plant operation, operator knowledge and ability, sampling, and any other activities that are considered important for the production of valid data.

SWCB staff believes that most laboratories are adequate and some of the larger laboratories, such as Fairfax, are excellent. At the present time, the

SWCB does not possess the necessary statutory authority to regulate and certify plant laboratories. Since SWCB already has broad authority in the water pollution control area, it seems that this responsibility should be formally given to the Board.

Lack of Enforcement

The federal EPA has broad enforcement powers under PL92-500, but Congress intended that the greater portion of enforcement action be exercised by the states. Enforcement actions are usually brought against an operator when there is noncompliance with abatement schedules, reporting requirements, and effluent limitations. The permit, in effect, is an enforceable contract between the state and the discharger. Under this system, enforcement is easier because a failure to meet the established effluent standards, rather than showing that a polluter's discharges caused a violation of water quality standards, is sufficient grounds to initiate enforcement proceedings. The SWCB has been slow in taking legal actions against recurring permit violators.

Enforcement Procedures. Generally, the first step in resolving a permit violation is made by the regional office through a telephone call or personal visit. If this does not generate a positive response from the violator, a formal letter is prepared by the regional director and sent to the violator explaining the nature of the problem and what has to be done to correct it. After 30 days, and if no reply is made, the regional director prepares a letter for the Director of the Bureau of Enforcement of SWCB. The offender is given another 30 days in which to comply, along with a warning that the Board may be forced to hold a public hearing on his violation. If the owner still refuses to comply, the Board holds a public hearing and may issue a special order directing the violator to correct the pollution problem. The owner is subject to criminal or civil penalties if he refuses to comply with a special order. "At each stage of the process the owner has to make a decision--comply or ignore it. As you go up the ladder the decision gets harder to make."[32] Based on prior experience, staff of the Bureau of Enforcement believe that the violator becomes more concerned as the public hearing date approaches.

In lieu of a public hearing, during the past several months the Board has been experimenting with a "consent order," a written statement prepared by Board staff explaining the nature of the violation and what the owner has to do to correct the problem. The violator must sign the order admitting his wrong-doing and indicate his intent to comply with the SWCB staff recommendations. According to SWCB staff, the main advantage of a consent order is economic; it avoids the cost of preparing a public hearing record. Also, Board staff say the owner is not subjected to adverse publicity. The Board's legal advisors have said that the consent order will carry as much weight in court as a special order issued by the Board.

Lack of Enforcement. As previously pointed out, there have been a number of violations of municipal and industrial permits recorded by SWCB. But, as indicated by Table 14, the Board is reluctant to issue special orders or initiate legal proceedings. The principal means of enforcement has been through voluntary compliance--telephone calls, enforcement letters, and personal contact. Generally speaking, the Board prefers to work with offenders rather than initiating administrative or legal proceedings against them. As long as an owner makes sufficient

progress in remedying the pollution problem the Bureau of Enforcement considers him in compliance. This cooperative approach to enforcement may be appropriate where violations are accidental and limited in severity. However, legal actions ought to be initiated where recurring and serious violations exist, especially if the violations pose a threat to public health and the environment. For example, of the permit violations reviewed by JLARC, one municipality and three industries violated permit limits nearly every month. A manufacturing plant failed to submit

Table 14

ENFORCEMENT ACTIONS TAKEN AGAINST NPDES VIOLATORS[a]
(March through November, 1975)

	Industrial		Municipal	
	Major	Minor	Major	Minor
Enforcement Letters	58	115	46	136
Plant Visits/Meetings	59	152	22	86
Enforcement Hearings	0	2	1	0
Special Orders	0	1	1	0
Civil or Criminal Penalties[b]	0	0	0	0
Injunctions	0	0	0	0

[a] In addition to the above, it is estimated that 600-700 telephone calls were made to permittees relative to obtaining compliance with their permits.
[b] SWCB has recently filed criminal charges against the former owners of the Kepone manufacturing plant and civil charges against a poultry processing plant.

Source: Memorandum, Director, Bureau of Enforcement, SWCB, January 15, 1976.

sewage plant performance reports to SWCB and to meet effluent limitations. Reports were not submitted for the months of August and December, 1975. For the three months in which reports were submitted by the company, consistent violations of discharge standards occurred for lead, nickel, and copper.[33] SWCB did not initiate enforcement proceedings against any of the treatment plant owners. Instead, the U. S. Environmental Protection Agency issued special notices in March, 1976 warning SWCB that failure to take action against these violators would lead to federal enforcement of the permits. SWCB has since prepared consent orders for these violators to sign, obligating them to meet permit requirements or be subject to civil or criminal penalties.

The SWCB cooperative enforcement approach is illustrated by its handling of the Kepone pollution problem in Hopewell, Virginia. The Board did not initiate administrative or legal proceedings to terminate the source of the toxic pesticide. Instead, Board staff concentrated on obtaining information on the toxicity of the material, repairing the Hopewell sewerage treatment facility and reducing the levels of Kepone discharged at the manufacturing plant. Although Board staff discovered Kepone at the wastewater treatment facility and manufacturing plant in early October, 1974, no official enforcement actions were taken by SWCB against the violators. During the ten months following this discovery, Board staff continued to work with the violators while concentrations of Kepone were being discharged into the Hopewell wastewater treatment plant and contaminating the lower James River.

EPA/SWCB Dispute. In its fiscal year 1976 evaluation report of SWCB, the Region III office of EPA stated that "The enforcement strategy is not completely satisfactory. Specifically there is no indication that court action is considered to be an integral part of the strategy--the criteria used to institute litigation against known or suspected polluters needs to be spelled out."[34] Moreover, as part of its authority to review State permit programs, EPA conducted an audit of the SWCB enforcement program in December, 1975. A major conclusion of the audit report was that the enforcement philosophies of EPA and SWCB were not compatible. EPA says that it advocates an "adversary enforcement role," while SWCB believes voluntary compliance is the best approach to resolving permit violations. EPA insists that voluntary compliance is time consuming and, at times, ineffective; SWCB should selectively initiate legal proceedings against violators as a preventive measure. An indication of EPA's dissatisfaction with the SWCB enforcement program is the recent special notices which were issued by EPA charging permit violations against two cities and four industries in Virginia. These notices were based on citizen complaints. The notices warned SWCB that if it did not take action on the violations within 30 days the EPA could undertake enforcement action of its own. Since the notices were issued, SWCB staff have taken administrative actions against the violators, primarily through consent orders.

The handling of one of the special notices issued by EPA can serve as an example of agency coordination and communication problems on enforcement matters. The director of the SWCB regional office was quoted by a local newspaper as saying that the industry charged with the violation was operating "a satisfactory program." Although the company is violating long term limits "we feel like it is not a chronic emergency problem." The reason for the special notice being issued, he explained, was "we (SWCB) just don't tell them (EPA) everything we do."[35] Officials of the SWCB Bureau of Enforcement, however, have admitted that the company did commit permit violations which should be corrected. A consent order was being prepared by the Bureau of Enforcement. Apparently, there is a need for better communication on enforcement matters between EPA and SWCB. Furthermore, coordination of enforcement actions between the SWCB central and regional offices requires considerable improvement.

Another conflict between EPA and SWCB centers on the enforcement authority to issue permits for discharges of wastewater from water filtration plants (plants that supply drinking water discharge such pollutants as suspended solids and chemicals). EPA contends that the SWCB cannot issue NPDES permits because of a restraining section of the State Water Control Law. Section 62.1-44.15.1 of the *Code of Virginia* requires federal and State financing of pollution abatement equipment at water filtration plants before the Board can require or enforce such treatment. EPA was considering taking over the permit authority on 22 water filtration plants in Virginia. However, the Executive Secretary of the Board assured EPA that the State law did not apply. The SWCB's legal counsel has interpreted the law as meaning federal and State financial assistance must be *available* in order for the Board to require the installation of pollution abatement equipment at water filtration plants. Since federal funds may not be used for such pollution abatement projects, and since there are no available State funds, the act does not apply. In any event, if the act were applicable, federal law would pre-empt the State Water Control Law in this particular area, indicating the dominance of the federal government in Virginia's water pollution control affairs.

Enforcement Conclusion. In light of the continuous and serious violations committed by some municipal and industrial permit holders, SWCB's aversion to legal action is inappropriate. Furthermore, there is always the possibility that improper administration of the State's enforcement program could result in EPA assuming partial or total control of Virginia's permit program. Every effort should be made by SWCB to carry out the intent of federal and State pollution enforcement laws, especially in those instances when offenders endanger human health and the environment.

Meeting the 1977 and 1983 Goals

There are two questions that should be asked about the impact of NPDES permit program as it relates to the 1977 and 1983 goals: (1) Will municipalities meet the 1977 secondary treatment and 1983 "best practicable control technology" deadlines? and (2) Will industries meet the 1977 goal of "best practicable control technology" and 1983 goal of "best available treatment economically achieveable?" In answer to the first question SWCB anticipates that 148 dischargers will not meet the 1977 goal of secondary treatment. Therefore, permit abatement schedules will have to be modified or reissued. The Board filed suit against EPA seeking relief from the July, 1977 deadline. However, a summary judgment was granted in favor of EPA. The Board maintains that there are insufficient funds to complete construction on the necessary public plants to meet the July, 1977 deadline. In a recent report of the General Accounting Office it was stated that:

> EPA and the States do not plan to take enforcement action against municipalities which fail to achieve by July 1, 1977, secondary or advanced treatment levels, where required, because of a lack of Federal funds. An EPA policy statement in December 1973 stated, in part, that although the law did not make municipal compliance directly contingent on the availability of Federal funds, it was widely recognized that the increase of the Federal share to 75 percent of construction costs made it highly unrealistic in many cases to force municipalities to finance waste water treatment facilities without Federal funds.
>
> However, if EPA fails to take enforcement actions, citizens or citizen groups can take legal action against the discharger or against EPA for failure to take action. Municipalities are subject to fines up to $10,000 a day if in violation of permit conditions. Willful or negligent violations could bring a fine up to $25,000 a day and 1 year in prison for the first offense and up to $50,000 a day and 2 years in prison for subsequent violations.[36]

EPA has strongly supported and recommended legislation to Congress authorizing a case-by-case extension from the July 1, 1977 deadline. Case-by-case extensions would be granted on the basis of non-availability of federal funds only.

With regard to industry, permit data indicates that nearly all industrial dischargers issued permits to date are following their abatement schedules. According to SWCB staff, roughly 5% to 10% of this group will not meet the "best practicable technology" requirement. A few industries are already proceeding to meet the 1983 deadline ahead of schedule. Industry believes that the costs involved in attaining the 1983 goal outweigh the benefits. Of late, the effluent

limitation approach has generated much controversy, particularly among industries that use large amounts of water and must spend large amounts of money to meet effluent limitations. Industries feel that many effluent standards included in the NPDES permit are arbitrarily set by EPA and too costly to achieve. EPA has 250 law suits currently pending in court on the issue of effluent standards. Several national corporations with plants located in Virginia are involved in this litigation.

Conclusion

Although SWCB has made substantial progress toward implementing the NPDES permit system, several major problems exist. Compliance monitoring is generally inefficient and could be greatly improved if current NPDES reporting systems were automated and better coordinated. Noncompliance with permits may be widespread in Virginia. About one-third of the major municipal and industrial dischargers committed permit violations during 1975. Some of the dischargers were consistent violators of the law. However, SWCB did not initiate any legal proceedings during this time period. In order to have a more effective enforcement program SWCB should place greater reliance on court actions to resolve serious or recurring permit violations that pose a significant threat to public health and the environment.

According to SWCB, 148 municipal dischargers will not meet the 1977 goal primarily because of the lack of construction funds to install abatement equipment. However, most industries are following their 1977 abatement schedules.

GRANT ADMINISTRATION

Municipal wastewater treatment plants have traditionally been major polluters of the water. The SWCB is authorized to administer programs of financial assistance for planning, constructing, operating, and maintaining water quality control facilities for localities. The Board has been administering grants for construction of municipal waste treatment facilities since 1956, when the Federal Water Pollution Control Act was enacted. Subsequent amendments to the act, culminating in the passage of PL92-500, have vastly expanded the scope of the federal government in financing wastewater treatment facilities. In a report of a subcommittee of the Committee on Public Works and Transportation, U. S. House of Representatives, it was stated that "among environmentalists, State and municipal officials, and the mass media, the eyebrow raiser in the 1972 Act was the price tag. The large amount of money authorized suggested a relatively high priority for cleaning up the nation's waters." The 1972 amendments authorized EPA to allocate $18 billion to states--$5 billion, $6 billion, and $7 billon for fiscal years 1973, 1974, and 1975, respectively--to finance 75% of the cost to construct publicly owned waste treatment facilities. In November, 1972 and January, 1974, former President Nixon directed EPA to allocate only $2 billion, $3 billion, and $4 billion for fiscal years 1973, 1974, and 1975, for a total of $9 billion. The remaining $9 billion was impounded by the President. Impoundment of these funds seriously hampered the achievement of the 1977 and 1983 goals of the act. In February, 1975, the Supreme Court ruled that the $9 billion was to be released and allocated to the states. Virginia's share of the $18 billion is about $496 million.

In 1970 the General Assembly began appropriating State funds for local construction projects to meet federal grant matching requirements. In addition to these funds, the 1974 General Assembly established an "extraordinary hardship program" for those communities finding it impossible to match federal grants, appropriating $1.5 million for fiscal year 1974-75.

Since 1970, $46 million in State funds have been appropriated and spent for water quality construction projects. However, because of the unexpected shortage in State revenues, and the enactment of PL92-500 which does not require State matching funds, State participation in supplementing federal construction grants to local communities was terminated during the 1974-76 biennium. The 1976-78 budget does not continue these supplemental funds and the "extraordinary hardship program" received minimal funding ($50,000). In essence, the federal government and localities are now shouldering the financial burden for building wastewater treatment facilities in Virginia to meet the 1977 and 1983 goals.

Grant Procedures

The construction grant program is highly complex involving a number of steps before an applicant can become eligible for grant assistance from EPA.

Needs Survey. One of the first steps taken by EPA and SWCB to determine future water quality facility construction needs in Virginia was to conduct "needs surveys" of local communities, obtaining "preliminary detailed estimates" of the cost of construction of all needed publicly owned treatment works. These surveys were carried out in 1973 and 1974 by the 22 planning district commissions. As indicated in Table 15, an estimated $2.2 billion is needed to construct category I through V projects, about $1.7 billion more than Virginia will receive under the current federal allottment. The largest single estimate is for treatment and/or control of stormwaters--about $19 billion. This latter figure seems to correlate with JLARC's survey of local officials, which indicated stormwater drainage as a major problem in the Commonwealth. Category V, combined sewer overflows, is a problem in older communities which have combined sanitary/storm sewers. Alexandria, Lynchburg, and Richmond have the most serious problems and have been recommended for grant assistance to study alternative ways to control overflows. JLARC believes that the needs survey is probably inflated.

Table 15

1974 WATER QUALITY FACILITY CONSTRUCTION NEEDS IN VIRGINIA
(millions of dollars)

I.	Secondary Treatment	$ 478
II.	More Stringent Treatment	384
III.	Infiltration Inflow Correction/Major Sewer Rehabilitation	343
IV.	New Collectors/New Interceptors	769
V.	Combined Sewer Overflows	207
VI.	Treatment and/or Control of Stormwaters	19,586
	Total	$21,767

Source: Adapted from State Water Control Board 1974 Needs Survey.

For example, in the area of treatment and control of stormwaters *one* urbanizing county estimated that it would cost over $5 billion to correct its problem--over one-fourth of the State's total estimated need. SWCB personnel believe that the figures may have been inflated two years ago when the surveys were prepared, but because of rising construction and equipment costs the costs are a reliable indicator of future municipal wastewater treatment facility needs, especially for categories I through V.

Priority Setting. No treatment project can be funded unless SWCB certifies it as having priority over other pollution control projects. In determining which projects are to be funded SWCB must consider such factors as the: (1) severity of pollution problems, (2) population affected, (3) need for preservation of high-quality waters, and (4) national priorities as determined by EPA. A JLARC review of the SWCB fiscal year 1977 priority list revealed that top priority projects were located in areas of the State experiencing pollution problems.

In an effort to reduce the amount of subjectivity used to rank proposed projects, the Board in October, 1974 created a task force to revise the Board's rating system. In August, 1975, the task force presented its proposal to the SWCB. After conducting four public hearings across the State and after making minor revisions to the original proposal, the Board adopted the Sewerage Facility Construction Grants Priority System in January, 1976. The system is complex and comprehensive. EPA has approved the priority rating system.

While holding public hearings on the proposed rating formula one of the overriding concerns of local officials was what affect the rating scheme would have on funding sewer lines and collector systems, a primary concern of fast growing localities. Because of limited federal money to construct wastewater control projects and the secondary treatment requirement of PL92-500, the priority ranking system places greater emphasis on the construction of public treatment plants.

Another major concern voiced by pollution control proponents is that EPA guidelines actually reward local governments and states for a lack of concern and action in the past, and penalize those communities which have already spent millions of dollars of local funds and small amounts of federal funds for facilities construction prior to the enactment of PL92-500. This is particularly true for fast growing counties in Virginia with large concentrations of population. Opponents of the present rating scheme feel that EPA is subsidizing growth in these jurisdictions.

Step Funding Process. Under PL92-500 funding for construction of treatment facilities occurs in three successive stages, rather than all at once. An applicant must file a separate application for each stage of the process. The EPA provides a maximum 75% grant for each stage: (1) preparation of a facility plan, (2) preparation of construction drawings and specifications, and (3) construction of the project. Although an applicant receives funds for preparing a facility plan, there is no assurance that funds will be provided for the remaining two stages. Step 1 projects having a high priority this year can be ranked lower, or even removed from the list, the ensuing year. However, projects receiving a step 2 or 3 grant retain their position on the list until completed. All projects on the State's priority list will not receive financial assistance due to the shortage of federal and State construction funds.

The SWCB is responsible for certifying projects for the priority list. Once the projects are approved by the Board, the staff is directed to discuss with prospective applicants, the nature and scope of the proposed project and procedures for application submittal. Applications are reviewed and approved by the SWCB, Division of Construction Grants and forwarded to the EPA regional office in Philadelphia. It should be noted that the EPA regional office reviews the application and determines whether the project should be funded. EPA then awards the grant to the project applicant.

The three-step construction process is required by law and normally takes three to six years. Local officials are generally dissatisfied with the paperwork and time involved in processing grant requests. Board staff are sympathetic with the needs of local officials but are helpless in this situation since Congress and EPA are responsible for designing the present construction grant process. Several bills are currently pending in Congress to substantially reform the construction grant program, one of which is the Cleveland-Wright bill. This legislation would authorize the EPA administrator to assign certain construction grant responsibilities to qualified State agencies. SWCB staff have said that if this bill is passed, or one similar, Virginia would not have any difficulty assuming this added responsibility provided, however, that Congress provides funds for administering the program.

A weakness of the construction grant program is the lack of on-site inspections by EPA or SWCB while projects are being constructed. If SWCB assumes greater control over the grant program, manpower should be devoted to conducting on-site inspections of construction projects. The inspections could be carried out by the SWCB regional office staff.

Project Funding

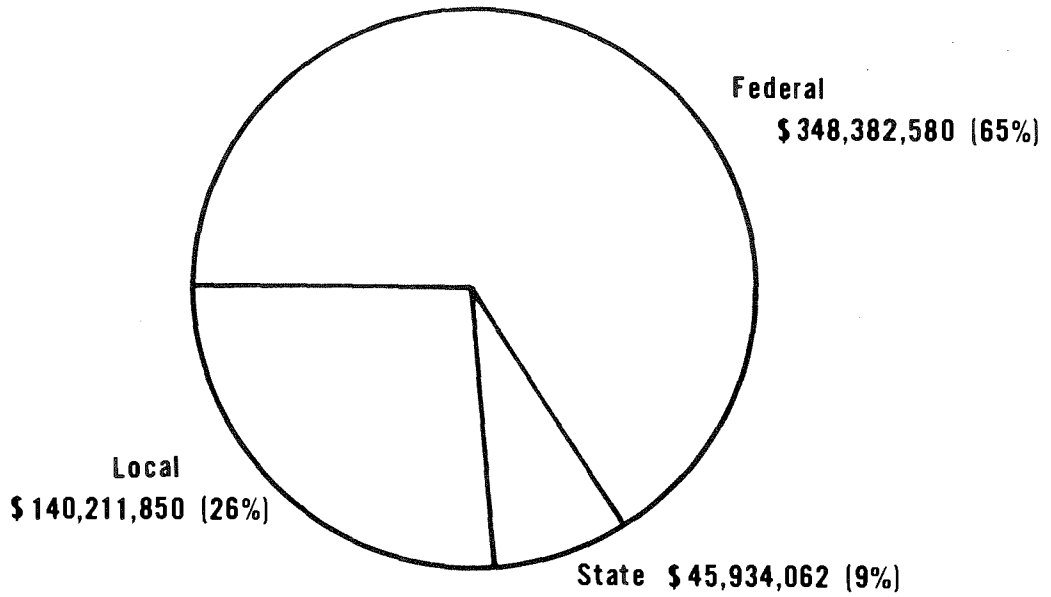
Obtaining financial assistance for localities to construct waste treatment facilities has been a top priority of the Board since the enactment of PL92-500. An October, 1975 issue of the *Environment Reporter* rated Virginia in the top 12 states in performance with respect to obligating funds to localities and expenditure of these funds for projects. As of March 31, 1976, of the $496 million allotted to Virginia by EPA under PL92-500, 61% had been obligated and 22% expended. The small percentage of money expended, thus far, indicates that the impact of most projects on improving water quality will not be felt until after the 1977 interim goal. In fact, SWCB officials say that none of the State's major projects supported entirely by PL92-500 funds have been completed.

1965-75 Funding Patterns. JLARC analysis of project funding between January, 1965 to October, 1975 revealed that 65% of the project funds was provided by the federal government, about $348 million. Local governments contributed $140 million and State support amounted to $46 million. The importance of federal funds in abating water pollution in Virginia is abundantly clear (Figure 17).

A closer look at project assistance during this ten-year period indicates that the Potomac-Shenandoah river basin was by far the largest recipient of project assistance, with most of the funds being awarded for projects serving Fairfax County and Alexandria (Figure 18). The basin accounts for 26% of the State's population (1970 U. S. Census) but has received 53% of the federal and State funds obligated between 1965-75. Thus far, total per capita expenditure for

Figure 17

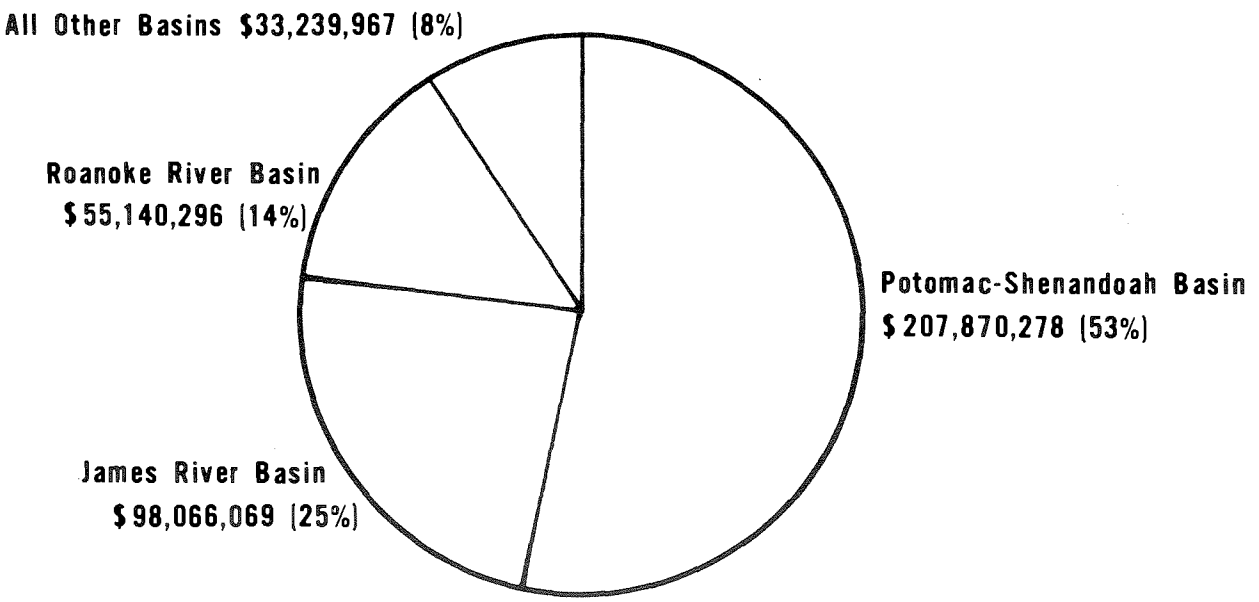
DISTRIBUTION OF FEDERAL, STATE, AND LOCAL PROJECT FUNDS
(January 1965 to October 1975)



Source: State Water Control Board

Figure 18

DISTRIBUTION OF FEDERAL AND STATE PROJECT FUNDS BY RIVER BASIN
(January 1965 to October 1975)



Source: State Water Control Board

pollution control projects in the Potomac-Shenandoah Basin has been $220, far greater than any other basin in the State. Although having 35% of the State's population, the James River Basin was allotted 25% of the available federal and State pollution control funds. Local governments in the Tidewater area are disturbed over Northern Virginia receiving the bulk of pollution control money in past years. There are two factors contributing to this disproportionate funding pattern: (1) the 1969 and 1970 Enforcement Conferences on the Potomac River committed the SWCB to solving the immediate pollution problems in Northern Virginia; and (2) plans and specifications were not readily available in Tidewater to justify construction of pollution abatement facilities.

The JLARC review of water quality and permit data indicated extensive water pollution problems and effluent violations in the Tidewater area. In the near future SWCB should make every effort to provide Tidewater area local governments with sufficient construction funds for resolving water pollution problems.

Public and Private Costs. The costs associated with pollution control are high, as evidenced by the $535 million in public funds already allocated toward water quality construction projects since 1965. When translated into per capita expenditures, this amounts to approximately $115 per Virginia resident. This does not include operation or maintenance costs. It has also been estimated by SWCB that Virginia industry will spend $100 million to meet the 1977 discharge standards. Once all funds under PL92-500 are expended, over $1 billion will be spent on water pollution control projects in the State.

Future Funding Requirements. When Congress enacted PL92-500, funds were authorized for fiscal years 1973, 1974, and 1975. No funds were appropriated for fiscal year 1976 or beyond. EPA has requested that $42 billion be appropriated for the period 1977-83 to continue the construction program. The President and the Office of Management and Budget have not looked favorably on this request. Also, Congress has not taken any action as yet to appropriate money for fiscal year 1977. However, a committee of the U. S. House of Representatives has recommended appropriations for fiscal years 1977, 1978, and 1979. Virginia would receive about $130 million in each of these years. In the U. S. Senate an appropriation for fiscal year 1977 is being considered, which would provide Virginia with $184 million. In either case, this will not provide Virginia with sufficient funds to support projects listed on the fiscal year 1977 priority list. Total requirements amount to slightly more than $245 million. SWCB officials are planning to amend the priority list to be compatible with anticipated federal funds. Beyond 1976, SWCB estimates that $823 million will be needed for projects to meet the 1983 goal.

Operator Certification and Training

The need for trained operators to run sophisticated plants has been recognized at both State and federal levels. A study conducted for EPA in 1972 estimated that for each dollar invested in training, $91 was returned in terms of protecting equipment loss. Thus, it becomes imperative that SWCB and sewage treatment plant owners train operators to protect the large public expenditure for new treatment plants as well as to promote optimum plant efficiency.

Furthermore, PL92-500 holds the operator liable for improper operation of the plant or for failure to report malfunctions. Fines for such a violation

may range from $2,500 to $25,000 per day or imprisonment for one year or both for the first offense, and a second offense can yield a fine of up to $50,000 per day or imprisonment for two years or both.

Certification. The need for better trained wastewater operators has led to the implementation of an operator certification program in Virginia. The 1971 General Assembly enacted a law requiring every treatment plant to have at least one certified operator by January, 1973. Certification of operators is performed by the Virginia Department of Professional and Occupational Registration, Board for Certification of Operators of Water and Wastewater Works. The certification program has encountered a number of problems. The standardization desired by certification has not been achieved because not all operators have to meet the same training standards. There are two primary classifications of certified operators: (1) *unlimited* includes those operators that have passed a written examination administered by the Board for Certification of Operators of Water and Wastewater Works; (2) *limited* includes those operators that have not taken an examination, but are certified to operate plants. In the latter case, the General Assembly provided a retroactive clause which allowed operators in charge of a wastewater works on January 1, 1971 to be granted a "limited certificate." SWCB estimates that there are, at a minimum, 600 operators holding limited certificates in Virginia and about 400 unlimited operators. According to SWCB training staff, limited operators do not actively participate in training programs to gain advanced knowledge of treatment processes. It seems that limited operators should be granted a specified period of time in which to pass the operator examination and become certified as unlimited operators. Mandatory training would be beneficial to the operators, owners of treatment plants, and the Commonwealth.

According to a recent SWCB survey of local wastewater treatment operators, owners of wastewater plants have abused the requirement that each plant have at least one certified operator. In the words of one respondent:

> Many people have certificates who don't work at the treatment facility or have very little to do with its operation. This is particularly true of industrial plants who have people they bring in for the exam, pass it, and return back to their non-operational job. In the past Board members have said that they can do nothing about this unless they have a written complaint. This puts the burden on the operator (who might complain) and may result in some form of reprisal by his employer.

In order to alleviate this problem, perhaps the wastewater certification program could require a certified operator to be present on the premises at all times. This requirement could be restricted to wastewater treatment plants of a certain capacity.

Another major finding of the SWCB survey of operators is that over half of all wastewater treatment operators, especially limited operators, spend less than 20 hours per week actually performing wastewater duties. Other duties performed by operators include water plant operator, meter reader, and general maintenance man. Some operators have as many as four additional duties to carry out. Multiple use of operators' time for duties other than maintenance and operation of wastewater treatment facilities could adversely affect plant performance and water quality.

The enforcement of the certification program is also questionable. A respondent to the SWCB operator survey stated that:

> Most employees think it (certification) is a big joke. A lot of places don't even think that they have to have a certified operator at all. I would like to see the State check on this more than they do. Certification can't be any good if it is not enforced. In a small plant, the sole operator could quit and most plants would go on working without one.

A possible reason for the lack of enforcement is the confusion over which State agency should be responsible for ensuring that wastewater treatment plants have certified operators. Since the Department of Professional and Occupational Registration has a small staff and does not maintain day-to-day contact with owners and operators of wastewater treatment facilities, it cannot adequately enforce certification requirements. The SWCB is responsible for issuing NPDES permits to the plants and inspecting wastewater treatment plants. Thus, it seems that SWCB could assist the Department in enforcing the operator certification requirements. SWCB staff have estimated that there are roughly 150 industrial and municipal plants operating without a licensed operator. Under Virginia law, any owner or operator doing so is guilty of a misdemeanor offense.

Training Programs. The SWCB has provided training to sewage treatment plant operators since 1970 when federal funds were first made available for this purpose. Since that time, SWCB has spent $500,000 in federal funds training 2,117 participants. One-week training programs, encompassing all elements of sewage treatment, are held at numerous locations across the State throughout the year.

In addition, SWCB and the State Department of Health provide short courses in wastewater treatment at Virginia Polytechnic Institute one week each summer. A participant must attend the school three summers to complete 100 hours of training. In addition, the Health Department conducts a training program at Virginia Military Institute.

The newest component of Virginia's wastewater operator training program is a centralized training center. Virginia is the second state in the nation to obtain funds for such a center. EPA awarded SWCB $250,000 with no State matching funds required. To maximize benefits from these funds, the training center is located at J. Sargeant Reynolds Community College and most of the grant award was used to purchase equipment. The center serves as a bench scale model sewage treatment plant, and raw sewage is provided through a connection with the City of Richmond's sewage interceptor system. Courses are offered in one-week modules and will be provided for use by other community colleges in the Fall of 1976. The initiation of this training center is especially significant in terms of future training needs. Federal training funds are decreasing, and the center will provide continous training of operators through programs established at various community colleges across the State. In addition to the VPI and community college training programs, SWCB has two staff members providing on-the-job training to employees of sewage treatment plants.

A weakness observed by JLARC in the SWCB training program is the low priority provided operator training within the present organizational structure. SWCB training personnel are located in the Division of Training and Special Services, Bureau of Applied Technology. The former director of the training division

has been named acting director of the municipal NPDES permitting division. As such, a great deal of the training director's time has been devoted to NPDES permit activities, about 90%. Other employees of the training division are frequently assigned to processing NPDES permit applications. Since operator training is important to the protection of the public's multi-million dollar investment in sophisticated wastewater treatment facilities, SWCB should establish a clearly identifiable operator training program with a specified number of staff assigned full-time to this important activity.

Conclusion

The SWCB has made significant progress in developing an efficient program for administering construction grant applications. During the period January, 1965 to October, 1975, SWCB processed nearly $400 million in local grant requests for federal and State financial assistance. When local funds are added to this figure, the per capita expenditure for pollution abatement projects in Virginia amounts to approximately $115. By July 1, 1977, as much as $1 billion could be spent by the public and private sectors to clean up the waters of the Commonwealth. Although there has already been a substantial investment in constructing wastewater facilities, more funds are needed. The shortage of construction grant funds may result in 148 municipal projects not being able to meet the July 1, 1977 deadline. Another $823 million is needed to meet the 1983 goal, according to SWCB estimates.

Over the years a substantial amount of federal and State assistance has been provided Northern Virginia communities for the construction of wastewater facilities, even though serious pollution problems plagued other sections of the State as well. The SWCB should recognize the complex water pollution problems in the Tidewater area and provide adequate funds for their abatement.

The large public investment in sophisticated wastewater treatment plants requires well-trained operators to protect equipment and to promote plant efficiency. Virginia's program for training and certifying plant operators has numerous deficiencies which require immediate attention.

PROGRAM ADMINISTRATION

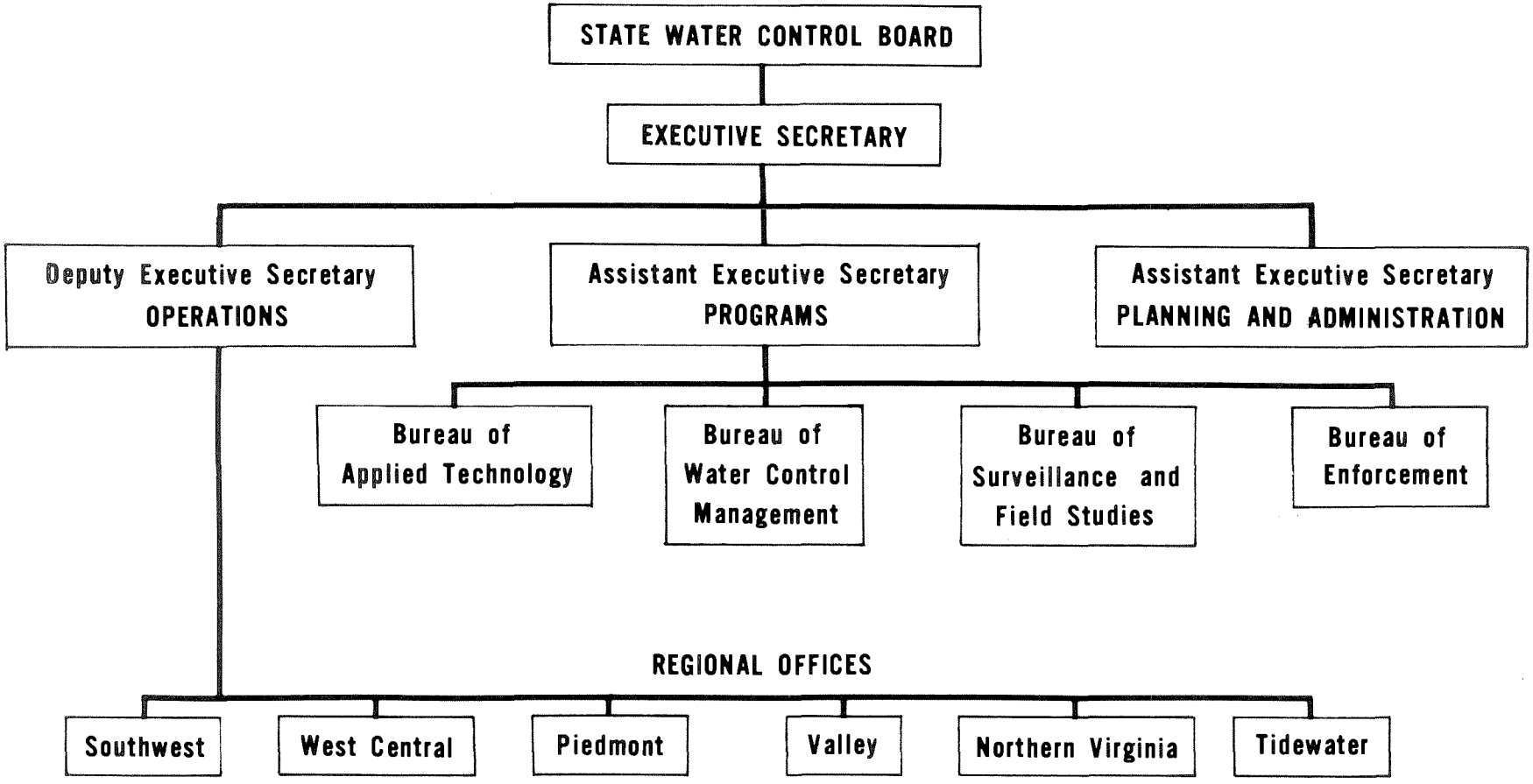
Administration of the SWCB water pollution control program consists of the efficient and effective utilization of manpower and financial resources to achieve organizational goals and objectives. This section generally reviews the SWCB organization, information reporting systems, and efforts at program evaluation.

SWCB Organization

In 1972 SWCB initiated a major reorganization of its central office staff and regional offices (Figure 19). Six administrative regions were established across the State, conforming to planning district boundaries. The major purpose of decentralizing Board operations was to respond to local needs on a "person-to-person basis." According to the 1973 SWCB annual report, "Each regional office, under the management of a regional director, has begun to function

Figure 19

SWCB ORGANIZATION CHART---1975



Source: State Water Control Board

as a miniature SWCB, carrying out agency programs through direct contact with local programs." Statements made by local officials to JLARC staff indicate that regionalization of Board operations has been successful in facilitating improved communications between local governments and SWCB staff.

However, a limitation inherent in the present SWCB organizational structure is the conflict between bureau directors and regional directors. In a 1973 operational analyses of the SWCB it was stated that:

> The regional directors generally view the Bureaus as "consultants;" whereas, the Bureau directors view the regional directors as intermediaries between the Bureau director and his program staff located in the regions. The regional directors expect that the Bureau's management control will be limited to the passing down of program objectives to be accomplished in their respective regions; in fact, a number of the Bureau directors plan to impose more specific work plans (tasks, timetables and outputs) as well as program objectives upon each region.
>
> Most of Bureau directors believe that certain of the regional staff will be more or less dedicated to their program. Accordingly, they may impose particular work assignments on these staff members through the regional director, and may even initiate temporary shifts of these program-dedicated staff among regions where necessary. Conversely, some regional directors believe that they will make all regional staff assignments within their respective regions at their discretion, and they might even initiate program action around problems peculiar to their regions (Shellfish Program and Soil Erosion Problem) without the prior approval of or consultation with the Bureaus.

SWCB staff claim that the conflict between the bureaus and regions is not as serious as it once was, but problems still exist. Regional directors cannot fully accept the bureaus being totally responsible for policy and program development, while the regions are primarily limited to program implementation responsibilities. Some regional directors have attempted to operate somewhat more independently of the central office. JLARC visits to regional offices revealed differences in office management practices. One regional office was recently described by EPA officials as having poor record-keeping practices on enforcement matters.

The lack of uniformity among regional offices and the organizational tension between the bureaus and regions can partially be attributed to the present SWCB organization structure. The Deputy Executive Secretary of Operations is responsible for direct supervision of the regional offices, while the bureaus are supervised by the Assistant Executive Secretary for Programs. It seems SWCB organizational efficiency and effectiveness could be improved if the bureaus and regions were supervised by the same administrator.

Information Reporting Systems

Accurate, relevant, and timely information is a prerequisite to effective program management. SWCB is dependent on a combination of sources (most are manually maintained) for this type of information: (1) water quality sampling stations, (2) groundwater quality monitoring stations, (3) municipal and industrial

self-monitoring reports, (4) compliance monitoring reports, (5) laboratory inspection reports, (6) stream surveys, (7) biological monitoring, (8) fish kill and oil spill reports, (9) water flow monitoring, and (10) STORET. (This latter source is an automated data system maintained by EPA in Rockville, Maryland. The system retains Virginia water quality sampling data for future SWCB analysis.)

SWCB staff have access to a wide assortment of water quality information, but it is debatable whether all this information is needed in its present form, or properly analyzed for that matter. As noted earlier, the water quality sampling, fish kill, and permit monitoring systems could withstand some major revisions. Furthermore, coordination of information supplied by the present reporting systems could be improved. One SWCB staff member, described information sharing between bureaus as "maintaining your own information."

SWCB should place a high priority on automating its water quality data reporting systems into an integrated agency management information system. Moreover, the Board should clearly identify key management indicators to permit its information reporting systems to provide necessary data in the most usable format for review by top management. (These indicators could replace the somewhat lengthy and time consuming monthly staff activities report.) This system could be used to provide evaluative data for efficient, effective and economical water quality program management.

Program Evaluation

Since 1973, SWCB has engaged consultant services to assist in establishing a framework for program management. Goals and objectives have been identified, priorities have been established, and program plans consistent with established priorities have been developed annually since 1974. As part of the program planning effort, a system of monthly reporting by the regional offices has been instituted. The final phase in the development of this SWCB management system is evaluation of agency programs to determine whether goals and objectives are being efficiently and effectively met. During 1975, a consultant was awarded a contract for $13,000 to develop a program evaluation methodology, and an additional $14,000 to implement the methodology in a prototype demonstration. The methodology was completed in August, 1975.

SWCB's operator training program was selected in late 1975 to be the prototype for the program evaluation. SWCB has encountered major problems in implementing this part of the evaluation including: (1) lack of adequate support from top management for the project, (2) poor communication between the consultant and SWCB staff, and (3) lack of a principal project evaluator to direct and carry out the evaluation. These problems have delayed completion of other phases of the evaluation project as well. An agency evaluation policy and procedure document was due September 30, 1975, but because of delays encountered in the operating training evaluation, a final draft has not been completed. A fiscal year 1976 evaluation plan was to be finalized in October, 1975, but it has yet to be initiated.

Inadequate control over the prototype project casts doubt on the future effectiveness of SWCB program evaluation efforts. A SWCB staff report on the prototype demonstration recommends "that any *critical* study of a Board program be undertaken by outside consultants having specific expertise in evaluation of the

particular program area. Such a study would, of course, be a much more objective appraisal than the self-appraisal from in-house sources having direct program involvement." It seems that outside consultants are not needed to provide SWCB with an ongoing internal evaluation capability. More importantly, there must be a firm commitment on the part of the Board and top management to perform an evaluation of SWCB programs. In order to accomplish this in the most meaningful manner, the Assistant Executive Secretary of Planning and Administration should be directly responsible for recommending and managing internal program evaluation projects. Staff ought to be specifically assigned to this secretary to perform this function. Bureaus and regions could participate in certain phases of the evaluation, but would not be responsible for final data analysis and report preparation.

CONCLUSION

The State Water Control Board has experienced a rapid rate of growth in recent years primarily in response to the added responsibilities imposed by the enactment of PL92-500, the Federal Water Pollution Control Act Amendments of 1972. The magnitude of the tasks involved in implementing the provisions of PL92-500 were grossly underestimated by Congress and the Environmental Protection Agency. Not surprisingly, the 1977 and 1983 water quality goals will not be met because of unrealistic deadlines, delays in obligating construction funds to states and insufficient funds to construct all necessary pollution abatement projects. A JLARC review of water quality data for selected rivers and streams in Virginia revealed that the quality of the State's waters is generally good, except for pollution problems in the Tidewater and Richmond areas and in Southwest Virginia. The SWCB prediction that by 1983 only 96 stream miles will be unsuitable for aquatic life and swimming is probably overly optimistic.

During the period 1970 to 1975 the Board has had to exert a considerable amount of leadership, and coercion, in convincing local governments to build new water pollution abatement facilities. Often times, Board decisions have not coincided with the interests of local elected bodies, resulting in bitter disputes and bad feelings. Even with these intergovernmental problems SWCB has expeditiously qualified the State and localities for federal construction funds. The Board should be commended for this effort. But, by mid-1976 all of the construction funds originally allotted to Virginia under PL92-500 will be committed to local abatement projects.

SWCB's aggressive pursuit of municipalities in the early 1970's to comply with federal and State water pollution abatement laws has now given way to a more cooperative approach towards local government as well as industry. That phase of the water control program directed at qualifying the State and municipalities for PL92-500 construction funds is coming to an end. The period of program development and change has reached a peak, and SWCB must now direct its efforts toward more efficient and effective program management. It does not appear that SWCB is adequately prepared to take on this new role. Water quality management planning is out of phase with the construction grant program and there are no funds available to continually revise water quality plans. Furthermore, water quality management plans will be completed for each of the major river basins without proper integration and consideration of overall water resource management plans. There is widespread noncompliance with permit conditions among industrial and municipal dischargers. Moreover, some permit holders consistently

violate permit conditions, but SWCB does not initiate legal proceedings against the violators. Monitoring and surveillance data are not properly utilized to accurately measure the effectiveness of SWCB programs in improving the quality of the State's waters. There are deficiencies in the administration of the water quality program in the areas of organizational management, information reporting, and program evaluation. Lastly, millions of dollars have been committed to local construction projects, but SWCB is financially unable to conduct on-site inspections of projects and legally constrained to enforce the operator certification program.

Turnover of Board membership within the past year has not been conducive to providing continuous and consistent program leadership in the water quality and water resource management area. It is hoped that the composition of the present Board will remain stable in order to provide the staff with this leadership.

By 1977, $1 billion will have been spent in Virginia on water pollution abatement projects. It is now the responsibility of SWCB to protect this investment and guard against any violations of the law that endanger public health and the natural environment. The Board must be vigilant and continue the momentum initiated by PL92-500, and effectively manage the quality of the State's waters within the context of a broader based water resource policy and plan, taking into consideration the need to balance water quality concerns against social and economic development needs.

NONPOINT SOURCES OF POLLUTION

Water pollution control programs have traditionally been directed at controlling wastes discharged by municipal and industrial wastewater treatment plants. However, increased attention is now being focused on regulating nonpoint sources of pollution--sediment, pesticides, oil spills, and wastes flushed off city streets--in order to meet the 1983 water quality goal of "swimmable and fishable" waters. Sediment and other pollutants entering the waterways with surface runoff cannot be easily traced and are best controlled by soil, water, and land management practices. The U. S. Environmental Protection Agency has assigned top priority to the control of nonpoint pollution sources during the period 1977-1983. This chapter examines the extent of the problem in Virginia, and State and federal efforts to control nonpoint sources.

Because recognition of the need to control nonpoint sources is new, few studies are available assessing the extent of the problem statewide. However, the SWCB has conducted studies for specific geographic areas of the State. These studies tend to indicate that nonpoint sources may not be a significant cause of water pollution in Virginia. But, before definitive conclusions can be reached, the SWCB believes that additional study is needed to determine the effects of agricultural and urban runoff. Over the next two years, water quality management planning studies are intended to collect this information.

No single State agency or program addresses nonpoint sources directly. Instead, the control of nonpoint pollutants is assigned to several different agencies including the Soil and Water Conservation Commission and the Division of Forestry and Mined Land Reclamation of the Department of Conservation and Economic Development. The State Water Control Board should be responsible for coordinating, reviewing, and evaluating all nonpoint source related programs as they impact on water quality.

III. NONPOINT SOURCES OF POLLUTION

The State Water Control Board and the U. S. Environmental Protection Agency have traditionally oriented their program efforts toward the control of pollutants discharged by municipal and industrial sewage treatment plants. However, beginning in 1977 increased attention will be placed on controlling other water pollutants--those which do not flow from a single municipal or industrial discharge. These pollutants are commonly referred to as nonpoint sources of pollution and include sediment, pesticides, coal mine acid drainage, and wastes flushed off city streets. EPA has assigned the control of these sources of pollution a top priority during the period 1977 to 1983.

Recently the Administrator of EPA stated that "nonpoint sources are responsible for more than half of the nation's water quality problems."[1] Thus far, preliminary studies conducted by the State Water Control Board seem to indicate that the problem is of a limited nature in Virginia. However, SWCB believes that additional study is needed to determine the extent of pollution problems caused by run-off from urban areas and agricultural lands. Within the next two years much of this information will be made available through the 208 areawide planning process. It has been estimated that the cost of controls could be as high as $19.7 billion if facilities have to be built to treat urban stormwater flows.[2] One alternative to building expensive treatment facilities is improved land management practices, but localities view this alternative as a possible encroachment on traditional local land-use planning responsibilities. Regardless of local attitudes, future State efforts to achieve desired levels of water quality in rivers and streams will have to consider ways of controlling sources of pollution originating on the land. This chapter provides information on the current status of federal and State efforts to control nonpoint sources.

Legislative Intent

In Virginia, legislation focuses on retention of the potential pollutant on the land; the end result of which should be preservation of water quality. No comprehensive State legislation for controlling nonpoint sources exists, instead various State laws address component parts of the overall problem.

- *Agriculture.* In 1938, the General Assembly adopted the Soil Conservation Districts Law which eventually led to the creation of what is now called the Virginia Soil and Water Conservation Commission (SWCC). The SWCC, the federal Soil Conservation Service (SCS), and the local districts provide technical assistance to farmers to improve the management of agricultural lands. Also, the Virginia Department of Agriculture and Commerce regulates the use of pesticides.

- *Developing Urban Areas.* Concern over problems associated with sediment culminated in 1973 with the enactment of the Erosion and Sediment Control Act. This law required that every locality have a program approved by the SWCC by January 1, 1976 for the control of erosion from new construction.

- *Forestry.* Title 10, Chapter 4 of the *Code of Virginia* assigns the care, management and preservation of the forest reserves of the State

to the Director of the Division of Conservation and Economic Development. Section 62.1-194 makes the throwing of logging debris into streams and waterways a misdemeanor offense.

- *Mining.* Sections 45.1-181 and 45.1-201 of the *Code of Virginia* require operators who desire to surface mine coal and other minerals to obtain a permit from the Division of Mined Land Reclamation. These laws require the posting of bond to ensure compliance with plans for operation and reclamation. Sections 45.1-216 through 220 provide for the State to enter into agreements with mine owners for the purpose of reclaiming land previously abandoned, commonly referred to as orphaned lands.

- *Urban and Industrial Litter.* The 1976 General Assembly enacted the Litter Control Act to accomplish effective litter control through a State developed and coordinated plan of education, control, prevention and elimination.

In addition to this legislation, the SWCB administers programs for controlling animal wastes, wastes from vessels, and oil spills.

Federal involvement in nonpoint source pollution control has mainly occurred through section 208 of the Federal Water Pollution Control Act Amendments of 1972. This section requires the development of a continuing planning process to identify and control nonpoint sources of pollution originating from agriculture, forestry, mining, and urban runoff.

Program Organization and Expenditures

Program responsibilities are divided among different State agencies with no legislation assigning coordination and control authority to any one agency. However, in March, 1976, the Secretary of Commerce and Resources established a committee to coordinate the nonpoint source activities of State agencies. The SWCC is designated the lead agency for the committee.

SWCC has responsibility for the control of erosion on agricultural, developing, and marine lands. SWCC carries out its assistance to farmers through 40 soil and water conservation districts which cover all areas of the State with the exception of eleven cities and one county (See map, Appendix III). SCS provides staff and technical assistance to these districts. The Department of Agriculture and Commerce has responsibility for control over the use of pesticides and the Virginia Institute of Marine Science (VIMS) conducts research involving marine erosion.

The Department of Conservation and Economic Development encourages control over forestlands (Division of Forestry) and maintains regulatory control over surface mining (Division of Mined Land Reclamation). Soil and water conservation districts also play a role in disseminating information to forest landowners. Federal agencies providing technical and financial assistance to forestry and mining interests are the U. S. Departments of Agriculture and Interior respectively.

The SWCB defines its mission as that of "oversight and coordination sufficient to ensure that control programs are consistent with water quality plans" to meet the 1983 goals.[3] The stated strategy of the SWCB is to gradually increase

its nonpoint source program effort as more becomes known about the problem. The Board plans to rely heavily on the cooperation and assistance of other State and local agencies. Memoranda of understanding have already been developed with the SWCC, State Department of Highways and Transportation, and Division of Forestry.

At the federal level, EPA is responsible for developing procedures and guidelines for the control of nonpoint sources. EPA has indicated that the control of nonpoint sources will be the responsibility of State and local governments, primarily through water quality management and land-use planning.

Program Expenditures. Since control of nonpoint source pollution is a vaguely defined area of State involvement, expenditures are not readily identifiable. JLARC estimates that State support for nonpoint source related programs amounted to approximately $1.5 million during fiscal year 1974-75.

State agencies have indicated that expenditures will increase during the current fiscal year and especially during fiscal year 1977. The General Assembly doubled the SWCC's appropriation for its Erosion and Sediment Control Program for fiscal year 1977. It is also anticipated that the SWCB will be devoting more staff time to the control of nonpoint sources in the near future.

EXTENT OF THE PROBLEM

It is generally agreed that nonpoint sources of pollution are a major problem. However, in a recent report prepared by the State Water Control Board, Virginia's nonpoint source problem was described as "varied, complex and poorly understood" and one about which there is little data on its extent or cost for its control.[4]

Where information does exist it has generally been on a watershed or project basis where there has been a need to study a particular aspect of the nonpoint source pollution problem. For example, extensive studies have been conducted for the Occoquan Reservoir, New River, South Fork Rivanna Reservoir, Upper Roanoke River, and South River. In 1971, the Task Force on Erosion and Sediment Control of the Governor's Council on the Environment, assembled available erosion information into one report. Highlights of the Task Force report, as well as SWCB statements show a surprising picture about erosion:

- The task force estimated that sedimentation in the rivers and streams from agricultural land is approximately 7 million tons per year.[5]
- Developing urban areas appeared to be the greatest source of erosion in the State.
- The erosion rate of the urban lands in the James River Basin was estimated to be 16 tons/acre/year compared to forestland erosion of .66 tons/acre/year.
- SCS estimated that Lake Barcroft in urbanizing Fairfax County received sediment between 1938 and 1957 of 235,000 tons per square mile in the area converted from undeveloped to residential. As of 1966, area residents had spent $300,000 dredging and removing sediment.[6]

- Highway construction is a major source of sediment. Data from a study of a small 4.5 square mile Scott River watershed in Northern Virginia revealed a rate of removal of soil by erosion of 126 tons per acre or 80,000 tons per square mile.

- There are 29 counties and 3 major cities which experience or have the potential for shoreline erosion (erosion along tidal rivers and estuaries as well as on the coast). Studies by the Virginia Institute of Marine Science have shown erosion rates to be as great as forty-four feet per year on some of the barrier islands.

- Strip mining is a substantial source of sedimentation and acid drainage in Southwest Virginia, however, there are no precise or specific measurements as to the amounts contributed by either the mining of coal or other minerals.[7]

- Very little silt and sediment were contributed by crushed stone operations, but the production of stone and gravel could be a significant contributor without adequate sediment basins, for example, to catch the silt.

- With very few exceptions little information is available to determine the impact of urban runoff/combined sewer overflow on water quality.[8]

The 1971 Report of the Task Force on Erosion and Sedimentation Control is the most recent attempt to describe the nonpoint source pollution problem in the State.

STATE CONTROL OF NONPOINT SOURCES

State involvement in land conservation programs is relatively new and in those situations where controls have been applied, it has been for reasons other than protection of water quality (i.e., preventing erosion on agricultural lands to stop the loss of valuable top soil). Efforts are generally fragmented with five State agencies involved in different aspects of nonpoint source control. Unlike point sources of pollution which are under the direct control of SWCB, there is no single State agency with legislated responsibility for coordinating and controlling nonpoint source programs which impact on water quality. Little research has been done in Virginia on the effects of nonpoint source pollutants on streams and even less has been done in the area of control and treatment of these pollutants. However, the following land conservation-oriented programs, if implemented properly, can significantly reduce the amount of nonpoint pollution in the Commonwealth's waters.

Agriculture

The Soil and Water Conservation Commission (SWCC) has been the State agency charged with conserving agricultural lands for over 30 years. The 40 locally established soil and water conservation districts and the federal Soil Conservation Service (SCS) assist SWCC in providing technical services to farmers in implementing proper land management practices to conserve soil. SWCC also

promotes the development of small watershed flood control projects as a basis for comprehensive watershed management. The conservation program is strictly voluntary and State officials have indicated that the present level of participation is less than desirable. Improperly managed agricultural land results in the loss of fertile top soil which can cause violations of quality standards.

Soil Surveys. The SCS and Virginia Polytechnic Institute and State University Extension Service are involved in conducting local soil surveys. These surveys provide valuable information regarding the type and composition of soils found across the State. Soil information is useful in determining susceptibility of land to erosion and suitability of soil for various uses such as agriculture and urban development.

JLARC in its survey of local administrators asked whether a completed soil survey would be helpful in administering land conservation programs. Of 191 respondents, 73% indicated that it would. As of July, 1975, only 18 counties had up-to-date published soil surveys; 11 had complete soil surveys which were not published; 15 counties had surveys underway; and 24 counties had requested soil surveys (See map, Appendix III). Although soil surveys were initiated in the late 1890's, less than half of the State has been surveyed. SWCC was appropriated funds by the 1972 General Assembly to accelerate soil mapping and to assign priorities for such surveys to assure completion of the project by 1990. The availability of soil surveys is essential for effective control of erosion and sedimentation. Federal, State, and local agencies should be encouraged to complete the soil surveys before 1990.

Pesticide Control. The Department of Agriculture and Commerce has the responsibility for regulating the use of pesticides classified as restricted by the Administrator of EPA. Section 3.1-249 of the *Code* requires that "applicators" be certified as to their competence before they are permitted to use restricted pesticides. Concern over the Kepone problem led the 1976 General Assembly to enact comprehensive legislation requiring registration with the Department of Agriculture and Commerce of toxic substances manufactured and/or distributed in the State.

Animal Wastes. The SWCB issues "no discharge certificates" to animal feedlots to minimize the wastes carried into streams. No discharge certificates prohibit the direct discharge of wastes into a water body by requiring that waste areas be protected from rainfall and that land be used as part of waste disposal and treatment. This is a State operated permit program although EPA has recently developed federal guidelines requiring regulation of feedlots of a certain size.

Developing Urban Areas (Erosion and Sediment Control Act)

Concern over erosion problems in developing urban areas led the 1973 General Assembly to enact the Erosion and Sediment Control Act. SWCC was given the responsibility of developing guidelines, providing assistance to localities, and approving local plans for controlling erosion. SWCC's guidelines became effective July 1, 1974. Counties, cities, and towns within an established soil and water conservation district were given one year from the effective date to adopt local erosion and sediment control programs. If any county or city within a district had not adopted an approved program by July 1, 1975, the soil and water conservation district had one additional year in which to develop and adopt

a program for the locality. Counties and cities not within an organized soil and water conservation district had until January 1, 1976 to adopt a program. The legislation required that conservation standards and an ordinance be approved within twelve months after local adoption of the program. SWCC has encouraged the adoption of the program, conservation standards, and ordinance simultaneously.

SWCC reports that as of February, 1976, 76 counties, 25 cities, and 45 towns were operating under approved programs. This represents 45% of the localities in the State. In early March 1976, SWCC mailed letters to those localities which were delinquent. Towns appear to be the slowest in adopting erosion and sediment control programs and will probably ask for inclusion under a county's plan. SWCC officials believe that most local programs will be ready for approval by mid-1976.

JLARC's survey of administrators indicated that most localities relied on soil and water conservation districts or the SWCC for assistance in preparing ordinances and solving erosion problems. The SWCC has had its authority broadened since the enactment of the Erosion and Sediment Control Act, but the agency remains largely agriculturally oriented. Only one staff member has had experience with urban erosion problems. With the substantial increase in SWCC's fiscal year 1977 appropriation for implementing the Erosion and Sediment Control Act, it is hoped that the three extra staff positions will be filled by persons experienced in urban erosion problems.

Exemptions. The Erosion and Sediment Control Act, while providing much needed regulation of non-agricultural land, exempts from control many erosion causing activities which remove vegetative cover from the ground. Such exemptions include surface and deep mining, installation of public utility lines, agricultural activities, septic tank lines and fields, railway facilities construction, home gardens and landscaping, and single-family residences not constructed as part of a subdivision development.

In its survey, JLARC asked local administrators if the Erosion and Sediment Control Act covered the most critical erosion problems in their jurisdiction. Eighty-two percent of the counties, 97% of the cities and 88% of the towns responded that their most *critical* problems were covered. However, many of these respondents indicated that several of the exemptions would prevent adequate control of all erosion problems. Of the 114 localities which responded that there would be some obstacles to their complete control of erosion, approximately one-third indicated the exemption of construction of single-family residences as the principal reason. Fifty-three of the 114 respondents were counties; 18 indicated that the agricultural exemption would prevent adequate control of erosion. Eighteen counties also believed that State agencies should not be exempt from local controls especially the Department of Highways and Transportation.

These responses tend to indicate that local governments are generally satisfied with the provisions of the Erosion and Sediment Control Act. However, the number of localities indicating that the single-family exemption will hamper effective erosion control merits the attention of SWCC.

Enforcement. A lack of manpower to enforce the law appears to be a problem. Forty-one percent of the 114 respondents indicated it as an obstacle to effective control. Approximately 80% of the respondents indicated that two or

less persons conducted on-site inspections to enforce the act. To compound the problem, virtually all of the responding localities indicated that the inspectors had other duties to perform. Of the 63 responding administrators, 62% indicated that the average number of hours spent per week per inspector was two hours or less.

JLARC discussions with SWCC officials indicate that the lack of manpower stems largely from the localities' unwillingness rather than inability to allocate funds to evaluate developers' plans and to enforce local erosion ordinances. Some localities believe that strict enforcement of erosion control ordinances will bring a halt to development. In the words of one county supervisor, "This (enforcement of the act) could drive all of the building and progress in (the) county out forever."[9] With the small number of inspectors and the limited number of hours spent on enforcement of local erosion ordinances, the future effectiveness of local erosion control efforts is questionable.

Approximately 90% of the 114 responding localities indicated that penalties for failure to comply with the act were adequate. However, these same respondents indicated that few actions have been taken against developers for failure to comply with a local erosion control ordinance. The small number of actions taken thus far may be the result of the short time erosion control ordinances have been in effect, developers being very conscientious, or because the localities are not adequately enforcing erosion control ordinances. This question will need to be addressed by SWCC after the localities have had sufficient time to implement erosion control programs.

While localities and SWCC have the principal responsiblity for erosion and sediment control activities, SWCB has indicated in its *Long Range Planning Goals* that it will assume responsibility for enforcement of the abatement of sediment pollution if and when the local governments fail in their efforts to properly control the source of sediments.[10]

Training. The newness of the erosion and sediment control requirements implies a need for training individuals involved in implementing local ordinances. Overwhelmingly, local administrators believed that training was needed but had not been provided. Of the 114 respondents 85% indicated that administrators of erosion control programs, inspectors, developers, and engineers needed training; however, only 25% of these individuals had received training. SWCC, SCS, VPI&SU, and the community colleges have been involved in sponsoring training programs. These organizations are working with a consultant to develop a training program which will eventually be offered by the community colleges.

The Erosion and Sediment Control Act is Virginia's primary vehicle for the control of nonpoint pollution from developing urban areas. Since not all areas of the State have enacted ordinances, and since many ordinances have been in effect for only a short period of time, it is not yet possible to determine whether the Erosion and Sediment Control Act will be effective. JLARC's survey found that while localities generally believed the act covered the most critical erosion problems, several exemptions could make erosion control at the local level more difficult. The localities also appear to be devoting few staff resources to enforcement. While administrators believe training is needed, it has not been provided. These findings, although not conclusive, indicate that certain aspects of the erosion and sediment control program may have to be strengthened to ensure effective control of erosion in developing urban areas.

Shore Erosion

The 1972 General Assembly assigned SWCC responsibility for coordinating the State's shore erosion control efforts. Almost three years after assignment of this new responsibility, SWCC became involved in its first project on Tangier Island. According to SWCC, Tangier Island has the gravest erosion problem of any area of the State. From 1850 to 1942, the rate of erosion was 18 feet per year; 1942 to 1967 it increased to 20 feet per year; and from 1967 to 1975 erosion was estimated to be 25 feet per year. The airport runway on the island is sinking, and, much of it is already under water. The Division of Aeronautics of the State Corporation Commission (SCC) will recieve $250,000 from the Federal Aeronautics Administration and $100,000 from the State to repair and extend the runway. The problem with the island is that its high point is seven feet above sea level and the flood level is eight feet above sea level. The airport was constructed by the town and county with the stipulation that if the localities ever gave it up, the Division of Aeronautics, SCC, would assume control. The State must now bear the costs of repairing and maintaining the airport. A task force composed of representatives from various State agencies has recently proposed three options to stop or slow the erosion on the half of the island south of Tangier Channel: (1) construction of a seawall, (2) construction of a groin field (series of structures perpendicular to the shore), and (3) experimentation with an open mesh of expended automobile tires to form a mat that covers the shoreface. An 800 foot seawall was started in January, 1976 by the Virginia Division of Aeronautics to protect the airport. The task force felt the option of constructing a seawall across an additional 8,200 feet would provide the greatest protection; however, the cost could be as high as $2.8 million. The task force, realizing that appropriations for the seawall would not be readily available, recommended experimentation with the use of automobile tires.

VIMS has nominated Tangier Island to be one of the projects undertaken by the Corps under the federally funded Shoreline Erosion Control Demonstration Act of 1974. If Tangier Island is selected, much of the needed funding would come from the federal government.

Virginia Beach. Another shore erosion problem area is located in Southeastern Virginia. Since 1953, a beach replenishment program has operated at Virginia Beach. The program does not stop the erosion process, but replaces the sand lost due to tidal action. The General Assembly authorized the City of Virginia Beach to establish a permanent commission, The Virginia Beach Erosion Commission (VBEC), to be in charge of beach maintenance programs.

In July, 1953, the City of Virginia Beach completed its first replenishment project on a reimbursable basis, at a cost of $705,300 of which the federal share was $229,600. Although the city assumed responsibility for continued beach replenishment, little was done for eight years. By 1961, 150,000 cubic yards of the 1.3 million cubic yards of sand placed during the 1953 beach restoration project had been lost. In March, 1962, $2,223,000 in federal emergency funds were used to repair storm damages to the beach and dunes system and to repair and replace portions of the bulkhead (a retaining wall along the waterfront).

In 1962, the Corps initiated a 25 year restoration project for Virginia Beach. The federal government contributes 50% of the funding with the City of Virginia Beach providing the remaining 50%. The State contributes $50,000 annually which is used as part of the local 50% match. During the period 1962 to

1975 the federal government contributed appoximately $1.3 million, while the city and State provided $630,000 each.

The State has contributed approximately $1 million to Virginia Beach for beach replenishment projects over the years. Virginia's contribution to VBEC is paid quarterly through the Department of Conservation and Economic Development; however, no control over replenishment activities is exercised by the State. Since SWCC has been statutorily assigned the responsibility of coordinating shore erosion projects, it would seem more appropriate that this agency be given the responsibility of funding and monitoring VBEC shore erosion activities.

Virginia Beach is an important recreational and tourist area of the State and there is agreement that the benefits far outweigh the cost of the replenishment program. The Corps of Engineers has plans for a new $25 to $35 million project, the Virginia Beach Erosion and Hurricane Protection Project, which will involve raising the beach five feet and construction of a series of bulkheads. This project will make the beach less susceptible to damage from hurricanes and major storms. However, the beach replenishment program will still be necessary since the volume of sand required to maintain the higher level will double.

When recreational development conflicts with the natural processes of erosion and replenishment, changes in land form can occur. While the recreational value of coastal lands is high, the associated costs are also. Approximately $5.7 million has been spent since 1950 to replenish what nature has eroded at Virginia Beach with no permanent solution to the problem in sight. Despite the large public investment, if restoration efforts were discontinued, the beach would simply disappear. Such an action would result in tremendous economic hardships and in lost recreational opportunities to thousands of Virginians.

Forestry

There are 15.8 million acres of commercial forestland in the State which yield approximately $52 million of timber each year. The contribution of forestry to Virginia's economics is estimated to be $1 billion per year. A well-managed forest is the most resistant to erosion and absorbs rainfall with little runoff. Serious erosion occurs when forestlands are disturbed through the logging process.

The State's involvement in controlling erosion on forestry lands has been directed towards reforestation. There is no legislation for controlling erosion caused by forestry activities; however, the Division of Forestry, Department of Conservation and Economic Development, has recognized that controls over forestry practices are forthcoming. In its *Water Quality and Forestry Practices Handbook*, the Division states:

> Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, requires the control of nonpoint sources of water pollution from forestry activities in meeting the goals of the Act. This Act, whose goal is to achieve clean or quality water by 1985, will have a great impact on forest management and harvesting activities in Virginia and throughout the Nation.

In the absence of law, the Division's goal is to minimize the effects of forestry practices on the State's streams through effective management. The Division and State Water Control Board have developed a memorandum of understanding to work toward the attainment of this goal.

The Division of Forestry seeks to encourage effective forest management through State and federal incentive programs. The federally supported Agricultural Conservation Program has provided financial assistance for stabilization of logging roads since the 1950's. Since 1974, the Federal Incentive Program has operated in 52 of the State's counties. The 1971 State's Reforestation of Timberlands Program also provides incentives for good forestry management. In 1975, 48,000 acres of Virginia's commercial forestland operated under incentive programs. These programs provide financial assistance to forest landowners to offset the cost of site preparation which is generally about $80 per acre. The guidelines of these programs specify practices which will lessen the erosion problems caused when the ground is disturbed.

While sediment from well-managed forest operations is not a major nonpoint source problem in Virginia, poor management practices can have a tremendous impact on water quality. The State and federal incentive programs have been instrumental in encouraging good management practices, however, participation in these programs is voluntary.

Mining

The Division of Mined Land Reclamation (MLR), Department of Conservation and Economic Development, controls nonpoint pollution from mining operations from two sources: (1) surface coal mining; and (2) surface mining of minerals other than coal (i.e., sand and gravel operations). Coal mining is regulated through the Big Stone Gap office and the mining of minerals other than coal is regulated by the Lynchburg office. Prior to obtaining a permit, operators are required to provide these offices with detailed plans for the operation and reclamation of the lands. During 1975, 321 new permits were issued for the surface mining of coal and 19 permits for the surface mining of other minerals. Including prospecting permits and renewed permits there were 900 active surface coal mining permits and 280 mineral permits as of December 31, 1975.

Surface Mining. Mining legislation requires that a bond be posted by an operator before a permit is issued to ensure that the operator will comply with MLR regulations. If an MLR inspector determines that an operator has failed to comply with permit conditions, the bond is forfeited and the operator is not issued another permit without a review by the Board of Conservation and Economic Development. The entire bond is retained by MLR until reclamation of the affected acres has been achieved. This may be anywhere from one to two years, depending on the size of the project. At the end of this period, any portion of the bond remaining is returned to the operator. During 1967 to 1974, there were twenty bond forfeitures of coal mining permits involving 250 acres of land, costing $45,550.19 to reclaim. Prior to 1972, the bond rate per acre was only $50. In 1973, legislation was passed to make the bond rate a flexible scale of $200 to $1,000 per acre with a minimum bond of $2,500. An insufficient amount of revenue was produced to cover the cost of reclamation in eight of the twenty bond forfeitures, and the State utilized funds from permit fees and industry in the amount of $4500 to complete these reclamations. In 1974, the Department of Conservation

and Economic Development increased the required bond for surface coal mining to $800 per acre with a minimum bond of $2500.

In 1975, there were sixteen bond forfeitures of surface coal mining permits and four bond forfeitures of other mineral permits. As of January, 1976, the State had spent $225 reclaiming lands covered by one of the four bond forfeitures; the other sixteen reclamations are still pending. A representative of the Division of Mined Land Reclamation has stated that in the future special funds will no longer be used for the reclamation of lands. Reclamation will only extend to the limit of the operator's bond. It seems inappropriate to leave lands partially reclaimed when operators, through the filing of plans and the posting of bonds, have provided assurances that lands will be properly reclaimed. If the cost of reclamation exceeds the amount of the bond, the operator should be responsible for the additional cost.

JLARC was told by a representative of the State Water Control Board southwest regional office that there was still a lot that needed to be done to control nonpoint sources from surface mining, but he attributed the problems to the newness of the program and its limited manpower. The surface coal division of MLR had 11 inspectors prior to 1974, but there has been an increase since then to 21 inspectors. While this number is greater than it was in 1973, coal mining operations nearly doubled during 1974 and 1975 when the energy crises placed a greater emphasis on coal as a fuel. Each inspector is now responsible for 50 mines. MLR officials believe that a mining operation ought to be inspected once every two to three weeks; however, inspectors are visiting each surface mine about once every 45 days. A 1974 VALC study recommended that no more than 20 to 25 active strip mines be under the control of one inspector. Two bills introduced during the 1976 session of the General Assembly recommended increasing the number of mining inspectors, but the bills were not enacted.

The control of erosion from surface coal mines represents the State's clearest effort toward controlling nonpoint sources of pollution. The regulations provide more stringent controls than any other legislation regulating nonpoint sources. However, a recent report by the National Environmental Policy Center criticized Virginia's program because public hearings are not mandated in the permit approval process and there are no control standards for spoil (material removed to expose the coal seam) on the downslope.

While the surface coal mining division has grown, the Lynchburg office has only two inspectors to cover 280 mining operations of minerals other than coal. Agency officials have stated that inspections of these operations can occur only on a complaint basis. A VALC study presented to the 1976 General Assembly reported that MLR had two field inspectors handling 67 active mining operations of minerals other than coal scattered over Planning Districts 16, 17, and 18 (14 counties) and Planning Districts 20, 21, 22 (6 counties and 8 cities in the Tidewater area), but that no personnel were assigned to the other 16 planning districts that have an estimated 213 active permitted operations. The report added that these operations cannot be inspected on a regular basis. Moreover, the report estimates there are 90 operations which have not been issued permits. While the legislation states that a person operating without a permit is guilty of a misdemeanor offense, none of the violators have been prosecuted. MLR officials state that local Commonwealth Attorneys have been reluctant to prosecute offenders and personnel shortages prohibit MLR from being able to contact delinquent operators. However, these same offenders obtained safety

licenses from the State Department of Labor and Industry, Division of Mines and Quarries (DMQ). In the past, the Division of Mines and Quarries has not coordinated its licensing functions with the Division of Mined Land Reclamation and State Water Control Board. Recently, the DMQ began providing a copy of each license to the Division of Mined Land Reclamation. Such a review procedure should also be developed with the State Water Control Board.

Orphaned Lands. The General Assembly has recognized the problems associated with lands which have been surface mined but not reclaimed. Generally, there are three reasons for land not being reclaimed: (1) mining occurred prior to the enactment of present surface mining legislation; (2) operators had mined illegally without a permit; or (3) operators simply abandoned the mined land. Legislation was enacted in 1972 to reclaim "orphaned lands." Orphaned lands lack adequate vegetative cover and are subject to erosion from rain and wind, thus posing a substantial threat to water quality. A survey conducted jointly with the Tennessee Valley Authority (TVA) was completed in early 1974 and found that while 25,000 acres had been orphaned there had been construction of roads, houses, and other improvements, on some of the lands leaving approximately 18,000 acres in need of repair. Since no funds have been appropriated for orphaned land reclamation, MLR has reclaimed only 210 acres of these orphaned lands during the last two years at a cost of $74,000. These funds were obtained from industry permit fees.

The legislation provided that the State could accept funds and gifts to reclaim lands. MLR received $650,000 from the TVA on April 1, 1976, to support the first six months of a five-year project for reclaiming approximately 18,000 acres of abandoned strip mines and haul roads in six Southwest Virginia counties. Buchanan County will be the only county not included. TVA has been requesting funds from the federal Office of Management and the Budget (OMB) for ten years for a demonstration project to reclaim orphaned lands in four states. Total funding for the five-year period for projects in Virginia, Kentucky, Tenessee, and Alabama will amount to $22.8 million.

MLR will be totally responsible for the administration of the TVA funds. Reclamation efforts will include preparing sites for shrubs and tree seedlings, earth moving to direct the flow of water and toxic wastes, constructing silt traps and settling basins, sowing grass for ground cover, and planting trees and shrubs to stabilize the soil. Work will begin in the summer on water control structures, and grading will be done to prepare the land for planting seedlings in the fall.[11]

Deep Mines. Control of nonpoint source pollution from Virginia's 700 deep mines is not as strict as for surface mines. The greatest sources of nonpoint pollution from deep mines are the haul roads where erosion and spillage occur and the preparation plants where refuse is piled. Officials of SWCB and MLR have stated that water quality controls are needed.

The control of nonpoint sources of pollution originating from the deep mining of coal or other minerals comes about through the NPDES permit system. SWCB has issued 55 permits to mining operations, for deep mine water elimination, surface mine sediment ponds, and preparation and refuse plants. SWCB plans to issue an additional 120 permits. SWCB has experienced difficulty in locating all mining operations and has requested the Department of Labor and Industry, DMQ, to

assist in the issuance of discharge permits. The SWCB southwest regional office has two inspectors that monitor deep mine operations.

A 1973 study by the Virginia Department of Labor and Industry of mine waste piles did not reveal any serious problems of water passing over embankments and carrying solids into streams. However, some embankments have created water quality problems. SWCB has received an EPA grant to clean up wastes originating from three turn-of-the-century deep sulfur mines on Contrary Creek in Louisa County. The discarded portion from the mined materials (tailings) were piled on the surface and have been causing water quality problems for over 50 years. The pyrite in mine tailings when exposed to air and water breaks down into sulfuric acid which then flows into the creek. The acid, in turn, leaches out heavy metals from the soils which eventually also find their way into the creek. At present, the creek is essentially dead; no plants grow along its banks and no aquatic life exists within. Contrary Creek is one of the river segments in Virginia which will not meet the 1983 water quality standards. In addition, SWCB feels that continued accumulation of acid could threaten Lake Anna. For these reasons, the SWCB is seeking to restore the creek and banks in this three-year project. Twenty-six acres of mine wastes will be restored and adjacent portions of the stream bed will be reconstructed. Mine tailings will be graded and sewage sludge will be applied to neutralize the acidic soil and to encourage growth. The SWCB has increased its monitoring efforts of Contrary Creek and Lake Anna to determine if improvements in water quality do occur. The SWCB indicated that other projects of this nature in other states had been successful. The project is being financed by $250,000 in federal funds and over $150,000 in State monies.[12]

Urban and Industrial Pollution

There is no program for controlling nonpoint sources originating from urban and industrial activities even though this source may be a major cause of water pollution in urban areas.

The Litter Control Act passed by the 1976 General Assembly is aimed at controlling litter of packages and containers. While this legislation provides a first step, it does not address the heart of the urban run-off problem which includes waste materials washed into city storm sewers by rains and then carried directly to water bodies. Thirteen localities in Virginia including Roanoke, Alexandria, Lynchburg, Richmond, Hopewell, and Newport News have combined sanitary and storm sewers. During heavy rains the storm sewers contribute more water than the sewage treatment plant can handle and the plant is bypassed. This means that not only is urban trash introduced into the streams but raw sewage is also deposited. A 1974 survey of needs for municipal wastewater treatment facilities conducted by SWCB estimated the cost of correcting combined sewer overflows in the 13 Virginia localities at $207 million ($184 million needed for Richmond and Alexandria).[13] EPA has recognized the problems associated with combined sewers and has awarded the City of Richmond $1.1 million to study the effects on water quality. EPA has also awarded the City of Lynchburg $463,000 to study its combined sewer problem.

Conclusion

The General Assembly has enacted several progressive statutes which establish programs for retaining potential nonpoint source pollutants on the land.

The fragmented nature of these programs and the numerous exemptions in the laws may hinder the future effectiveness of Virginia's nonpoint source control activities. There is a need for centralized coordination of nonpoint source control programs by the State Water Control Board to ensure the preservation and protection of the State's water quality. The Board and Secretary of Commerce and Resources have attempted to achieve this coordination through memoranda of understanding with State agencies directly involved in nonpoint source programs and the creation of a nonpoint source coordinating committee. This coordination could also be enhanced through the basin water resource planning activities of the Board. Moreover, SWCB could be authorized to cosign all surface and deep mining permits to ensure effective coordination of nonpoint source related programs impacting on water quality.

FEDERAL EFFORTS TO CONTROL NONPOINT SOURCES

A positive step towards recognition of the need for control of nonpoint source pollution is section 208 of the Federal Water Pollution Control Act Amendments of 1972. This section requires areawide waste treatment management plans in areas which as a result of urban-industrial concentrations or other factors, have significant water quality problems. An important part of these plans is the development of a planning process to identify and control nonpoint sources of pollution from agriculture, forestry, mining, and urban run-off.

While 208 planning will not be totally focused towards the control of nonpoint sources, it still provides the first statewide assessment of water quality problems caused by nonpoint sources. It also requires an identification and evaluation of all measures necessary to produce the desired level of control through application of the best management practices. Section 208 plans will not examine nonpoint sources in a vacuum, but will provide an assessment of water quality problems caused by both point and nonpoint sources and incorporate this information into water quality treatment plans for a 20-year period. The plans may specify needed structural and non-structural controls and may identify the management agency (or agencies) to implement the plan.

EPA was slow to begin funding 208 planning efforts primarily because of its reluctance to become involved in local land use controversies. Instead, EPA chose to emphasize point source control through the National Pollution Discharge Elimination System (NPDES) permit process and basin planning. It has been said that the EPA grossly misunderstood Congressional intent; that, as mentioned in the previous chapter, section 208 was clearly intended by Congress to be the focus of the overall water quality management process.

Once EPA implemented section 208 of the act, it intended 208 planning to be a contract between the federal government and the localities with no State involvement. Under the original EPA guidelines, the Governor had three options: (1) designate 208 areas, (2) remain silent and permit localities to designate themselves, or (3) designate areas of the State as not needing 208 plans which then prohibits implementation of 208 planning. Because Congressional intent required all areas be covered by a 208 plan, a federal court ruled in 1975 (Natural Resources Defense Council et al. vs Train, et al.) that states were responsible for ensuring that section 208 plans be prepared for all areas of a state, not

just those identified by the Governor. This decision provided the states a stronger management role in 208 planning than under EPA's original guidelines.

Area Designation

Under section 208, planning responsibilities can be delegated to a local government or planning district commission by the Governor, or governors, in the case of an interstate area such as the Washington, D. C. metropolitan area. Designations prior to July 1, 1976 are referred to as Phase I. All designations after this date will be considered Phase II.

Phase I. During fiscal year 1974-75 the Governor designated seven (five intra- and two inter-state) areas (See Appendix III) which "as a result of urban industrial concentrations or other factors had substantial water quality problems." This first phase of 208 planning is currently being conducted with 100% funding from EPA at a cost of approximately $6.5 million.

Originally, Phase I plans were to be completed within two years after designation. However, since EPA was slow in developing specific guidelines, up to a one year extension could be granted with no additional funds. Virginia was one of the first states to designate 208 planning areas and SWCB officials indicate this has caused a problem. Because development of plans began without clearly defined federal guidelines, the designated planning agencies have interpreted section 208 in different ways. An EPA official indicated that some 208 planning agencies were placing too much emphasis on point sources of pollution and facility construction needs, and not enough attention was being devoted to nonpoint source management. However, he stated that the new regulations did not change the intent of section 208 and that planning agencies should have been able to understand the requirements of the section from the original EPA guidelines.

As of June, 1976, the status of 208 planning projects in each of the Phase I designated areas was as follows:

- *The Fifth Planning District (Roanoke)* was designated in June, 1974, but planning did not begin until January, 1975. An $848,000 grant was received from EPA to prepare the plan. The plan was to be submitted to EPA by June 30, 1976, but the planning agency was authorized a two month provisional extension. EPA officials say that this may be the first completed 208 plan in the nation. Major problems encountered while preparing the study were selection of a consultant and the lack of cooperation among local governments.

- *Richmond-Crater* which includes Planning Districts 15 and 19, was designated in June, 1974. EPA originally awarded $949,690 for the project but an additional $404,000 may be provided. EPA has granted the maximum extension to June 25, 1977. Significant problems are primarily intergovernmental--the local governments cannot work together or with SWCB. The consortium plans to modify the basin plan, and establish new point source wasteload allocations. SWCB officials fear that if this is done there will not be sufficient time or funds to adequately address nonpoint source problems. SWCB has doubts whether the plan will be completed by the deadline.

- *Hampton Roads* (Planning Districts 20 and 21) was designated in June, 1974, but did not receive funds until early 1975. The planning agency has been granted a one-year extension to June 25, 1977. Funding for the planning study totals $2,534,978. Hampton Roads' major problem has been the establishment of a sampling program for nonpoint sources. The consultant responsible for this phase of the plan had his contract terminated in January, 1976 for nonperformance. SWCB estimates that Hampton Roads will lose approximately $500,000 but the Virginia Institute of Marine Science (their new consultant) will be able to carry out the required sampling. SWCB officials say the VIMS sampling program will be less expensive and closer to SWCB's estimate of what is needed.

- *Fredericksburg* (Planning District 15) was designated in January, 1975 and granted $350,000 beginning in April, 1975. The planning agency has until January, 1977 to submit its plan. No serious problems have been encountered.

- *Southwest* (Planning Districts 1 and 2) was designated in January 1975 and funded in June, 1975 at $649,920. The plan is due in January, 1977. Both planning districts are utilizing their professional staffs to prepare the plan which is oriented towards managing nonpoint source pollution from coal mines.

- *First Tennessee-Virginia Development Commission* (Bristol City and Beaver Creek Watershed) was designated as an interstate 208 agency in June, 1975 and awarded $903,000. Project start-up problems were encountered because of two key personnel resignations.

- *Washington Council of Governments* (includes Planning District 8) was designated as an interstate 208 agency in March, 1975 and funded in June, 1975 for $3,550,000. The agency has been granted an extension, to March 26, 1978. The major problem is the complexity of the area and having to work with two states and the District of Columbia.

Thus far, the main problems affecting 208 planning agencies appear to be initiating the planning process and intergovernmental cooperation. While several have experienced problems with hiring consultants and staff, all Virginia 208 agencies should have their plans certified well ahead of the November, 1978 deadline. Richmond-Crater appears to have problems with the scope of its planning effort. This could become more critical if local governments in the planning area disagree with the findings and recommendations of the completed plan.

Phase II. New EPA regulations reflecting the 1975 federal court decision authorize the Governor to designate additional 208 areas and direct that planning be conducted statewide. The Governor considered six additional areas for designation, but since none of these areas had severe water quality problems, SWCB was designated the planning agency. Planning activities will be contracted to the localities, soil and water conservation districts, or consultants with SWCB serving as the project coordinator. Virginia's minimum funding for Phase II planning will be $287,000; however, SWCB estimates $1.5 million will be needed to complete the plans. SWCB's first step will be to establish a management process for 208 planning, but no additional personnel will be employed. Phase II plans must be completed by November 1, 1978.

Approval and Coordination

Completed 208 plans (Phase I and II) must be certified by the Governor. The Governor has designated the SWCB to review the plans and make recommendations for certification. During JLARC's discussions with local 208 officials, concern was expressed over SWCB's authority to approve or disapprove 208 plans. As noted earlier, EPA's original view was that the states should not be involved in 208 planning; however, the federal court order modified this position. SWCB staff has maintained from the very outset the need to coordinate 208 plans, but the Board took the position that unless there was evidence that a 208 plan would not meet the guidelines SWCB would not interfere. The court order makes SWCB responsible for ensuring that all plans meet the federal guidelines. Thus, if a 208 plan is not satisfactory, the SWCB must require the planning agency to make necessary modifications in order to conform with EPA guidelines.

If nonpoint source pollution control is to be effective, SWCB should maintain control over the development and implementation of 208 plans. The 208 planning process, because of its enormous expense, should yield a product which benefits the Commonwealth's efforts to meet the 1983 water quality goal. The SWCB should work closely with local agencies to ensure the best plan possible. An unacceptable plan would not be in the best interest of the local 208 agencies or the State. SWCB should coordinate 208 planning activities as part of its overall comprehensive water resource management planning effort. Perhaps the river basin water resource plans could include a section on nonpoint sources, integrating the findings and recommendations of separate 208 plans into a uniform basin-wide policy toward controlling nonpoint pollutants.

While EPA has required states to develop appropriate nonpoint source management programs, section 208 does not specifically assign authority to any federal or state agency to enforce compliance with 208 plans.[14] However, EPA officials say that construction funds will not be provided localities unless they are included within a 208 planning area. Discussions with federal, State and local officials indicated that it was too early to speculate on EPA's future course of action if an area or state fails to implement portions of a 208 plan which relate to control of nonpoint sources of pollution.

CONCLUSION

Nonpoint source pollution has been recognized as a major threat to the nation's ability to meet the 1983 water quality goals. EPA has assigned top priority to the control of nonpoint source pollution during the period 1977 to 1983. Attention is now being focused on the development of plans to identify and to control nonpoint source pollutants.

Until now one primary problem in determining the extent of the nonpoint source pollution problem was the general lack of data. Area 208 plans should provide better assessments of the extent of the problem. The SWCB needs to work closely with 208 planning agencies to ensure that all of the separate plans mesh together to form a coordinated statewide plan for controlling nonpoint sources. This information could then be incorporated into the basin water resource plans.

Virginia's efforts to control nonpoint source pollution have been relatively recent and where controls have been instituted, they have been for reasons other than protection of water quality. Efforts are fragmented with five State agencies conducting nonpoint source related programs. The Secretary of Commerce and Resources has created a committee to coordinate the programs of these agencies. Since the State Water Control Board is responsible for coordinating the development of 208 plans, SWCB coordination of all State nonpoint source control programs as they impact on water quality would ensure the comprehensive overview needed to preserve and protect the State's water quality. The Board is attempting to develop this overview capability through memoranda of understanding with State agencies involved in nonpoint source programs.

There are gaps in present legislation for the control of nonpoint source pollution. No legislation exists for the control of pollutants originating from forestry operations or deep mines, and controls on agriculture are not mandatory. Coordination of marine erosion projects could be improved if the Soil and Water Conservation Commission administered State funds available to the Virginia Beach Erosion Commission, rather than the Department of Conservation and Economic Development.

It is too early to tell whether the Erosion and Sediment Control Act will be effective. JLARC's survey found that localities generally believe the act covers most critical erosion problems, but some exemptions (i.e., single family construction) could make erosion control less effective. The localities appear to be devoting little manpower to enforcement of local erosion control ordinances and administrators believe that training is needed. These problems may need to be addressed in the near future if the program is to be truly effective.

Controlling nonpoint sources of pollution will not be an overnight occurrence. It will require structural (larger treatment facilities to handle large volumes of storm water) and/or non-structural changes. The latter alternative is less expensive and can be achieved through improved land use planning and management practices. Local governments could utilize land use plans as a means of identifying nonpoint source problems and recommending means for their resolution.

FLOOD CONTROL

Protecting lives and property from floods is an important aspect of water resource management. Flood damages in the Commonwealth are estimated to be $40 to $50 million annually and local administrators report flooding to be their most serious water related problem. Flood management programs are designed to reduce the extent of damage, provide emergency assistance, and facilitate recovery of losses. Most programs are administered by the federal government and include: flood forecasting, construction of dams, levees and other protective structures, flood hazard information studies, disaster recovery funds, and flood insurance. The role of State agencies is primarily advisory and coordinative.

Although flooding is a common occurrence, the State lacks a comprehensive flood management program. Local governments have primary responsibility for flood protection and participation in federal programs, but almost two-thirds of the Commonwealth's political subdivisions do not regulate development in flood-prone lands, and few localities have effective emergency preparedness plans. In the interest of public safety, the State Water Control Board should be authorized to develop a comprehensive program that integrates federal, State, and local efforts to reduce flood losses and identifies appropriate structural measures (dams, floodwalls, levees) and regulatory options. As part of this program, the Board should be responsible for assisting in the establishment of minimum floodplain guidelines for local regulatory implementation.

The federal flood insurance program is a joint public and private undertaking to protect and prevent development in flood-prone areas. The program makes available federally-subsidized insurance to property owners to recover flood damages and makes it mandatory for communities to enact floodplain regulations. Failure of flood-prone communities to participate can result in loss of federal disaster assistance and denial of individual construction or mortgage loans from federally regulated lending institutions. The program's positive impact has been demonstrated by the fact that 70% of damages incurred during Hurricane Eloise in 1975 were insured compared with only 2% of the damages in Hurricane Camille in 1968. Because of the severe economic and personal losses that can result from flood disasters, the Commonwealth should have a significant interest in the program's effective implementation.

The 1976 General Assembly took a major step toward ensuring the safety of dams whose failure could cause major flooding. However, the Commonwealth's efforts to regulate dam safety may be hampered by the many exemptions in the legislation, including State Corporation Commission regulated dams and dams under 100 acre feet capacity. It may be necessary to clarify the authority of SWCB and SCC over the safety of power related and nonpower related dams and to include small dams in populated areas under the provisions of the law.

IV. FLOOD PREVENTION AND CONTROL

Virginia is subjected to many types of floods including: flash floods, river floods, and tidal floods. Local jurisdictions throughout the Commonwealth responded to the JLARC survey of administrators that flooding and the related problem of stormwater drainage are their most serious water related problems. Flood damages are estimated to cost $40 to $50 million annually.[1] An important part of water resource management then is to establish programs to control flood waters, reduce damages, provide emergency assistance and facilitate recovery of losses due to floods. The State has assumed an essentially advisory and coordinative role with a minimal commitment of personnel and funds. Local jurisdictions have been authorized by the General Assembly to participate financially in federal construction programs, construct engineering projects of their own and to regulate the use of flood-prone lands through comprehensive planning, zoning, and subdivision ordinances.

However, recent serious floods and changes in federal programs have necessitated reassessment of flood management in the State. Heavy damages were caused in 1969 by Hurricane Camille and again in 1972 by Tropical Storm Agnes. In addition, areas of the State were severely flooded in the spring and fall of 1975. This chapter examines the organization for flood management in Virginia, the extent of the flood problem, use of flood hazard information, structural flood control, emergency preparedness, disaster assistance and the flood insurance program.

Legislative Background

Flood prevention and control programs are largely the responsibility of local governments in Virginia in conjunction with the federal government. The State's role is generally defined and limited to project coordination and review, and administration of federal flood insurance and disaster assistance programs.

Federal Involvement. Federal involvement in flood control programs came about through extension of federal constitutional jurisdiction over navigable waters. The immediate impetus was the need for flood control structures in the Mississippi basin during the 1920's that were beyond the financial resources of the states and local jurisdictions involved. The Flood Control Act of 1936 established federal nationwide responsibility for flood control and assigned construction of engineering works on major water courses to the U. S. Army Corps of Engineers and the study of upstream watershed management to the Soil Conservation Service. The act also required that projects be justified on the basis of benefits exceeding costs. In 1954 the Watershed Protection and Flood Prevention Act (PL 566) authorized the Soil Conservation Service to also construct small dams in headwaters. Nevertheless, despite large expenditures for construction purposes, losses from floods continued to rise. By 1960 in an attempt to limit future damages the Corps was authorized to provide local jurisdictions with floodplain hazard information as the basis for local regulation of new development in flood-prone areas. Additional policy directions and programs resulted from a 1966 task force report, *A National Program for Managing Flood Losses*, which concluded that "flood damages are a direct consequence of floodplain investment actions both private and public."[2] Federal agencies are now required to evaluate non-structural alternatives for flood control (i.e., flood proofing,

evacuation) and to consider flood hazards in locating or funding new facilities (Executive Order No. 11296).

The National Flood Insurance Act of 1968 established a voluntary program which was expanded and made mandatory by the Flood Disaster Protection Act of 1973. The program makes available subsidized flood insurance and requires communities to regulate development on flood-prone land. Federal emergency and recovery assistance programs were revised by the 1970 Disaster Relief Act to stimulate State and local emergency planning.

State Role. Flood management is part of the broad responsibility of the State Water Control Board in "planning the development, conservation, and utilization of Virginia's water resources."[3] Analyses of flood problems is included in the two basin plans for the Potomac-Shenandoah basin and the New River basin. Except as otherwise provided by law, the Board is also empowered under Section 62.1-44.41 of the *Code* "to speak and act for the State in all relations with the federal government...concerning conservation or use of the State's water resources". Most of the agency's flood control responsibilities derive from this section. The SWCB has been designated by the Governor to review the construction program of the U. S. Army Corps of Engineers, to coordinate the flood information services of all federal agencies and to administer the national flood insurance program in the State. The water resource policy adopted by the Board in 1974 includes these responsibilities. In addition, SWCB advises the Governor who must approve or disapprove proposed federal flood control construction projects in the State. The Council on the Environment also contributes to the approval process by coordinating the review by all State environmental agencies of federal environmental impact statements on proposed water resource construction projects. The Council is authorized to coordinate all State communications with federal agencies.

Responsibility for projects in upstream, small watershed areas is the responsibility of the Virginia Soil and Water Conservation Commission in cooperation with the federal Soil Conservation Service. Authorization for emergency and disaster assistance is provided in the Emergency Services and Disaster Law of 1973 (Title 44, Chapter 3.2 of the *Code*) which provides for State planning and action with regard to natural and man-made disasters. This act is administered by the Office of Emergency Services.

Local. Governing bodies of cities, counties and towns become involved in flood control through State legislation enabling direct cooperation with federal agencies and local land use planning, regulatory zoning and subdivision ordinances with drainage and flood control provisions.[4] This authority has allowed local participation in the national flood insurance program which makes the availability of insurance to property owners contingent upon community regulation of flood-prone lands. State law has also permitted local jurisdictions to request structural flood control projects from the Corps of Engineers and to agree to sponsor, support financially, and maintain the projects after completion.[5] The Governor must be notified by the jurisdictions when projects are being considered so that he may prepare to comment on projects that might ultimately require his approval. Local jurisdictions are also authorized, "as a proper governmental function for a public purpose," to design, operate and construct flood control works,[6] and flood control has been declared a responsibility of the State's 40 soil and water conservation districts.[7] Although most flood related legislation is permissive, local governments are required to enforce the provisions of the Uniform Statewide Building Code for waterproofing of structures

located in the 100 year floodplain and of the 1973 Erosion and Sediment Control Law for ordinances to control agricultural and urban stormwater runoff and to reduce hazards from mud slides.

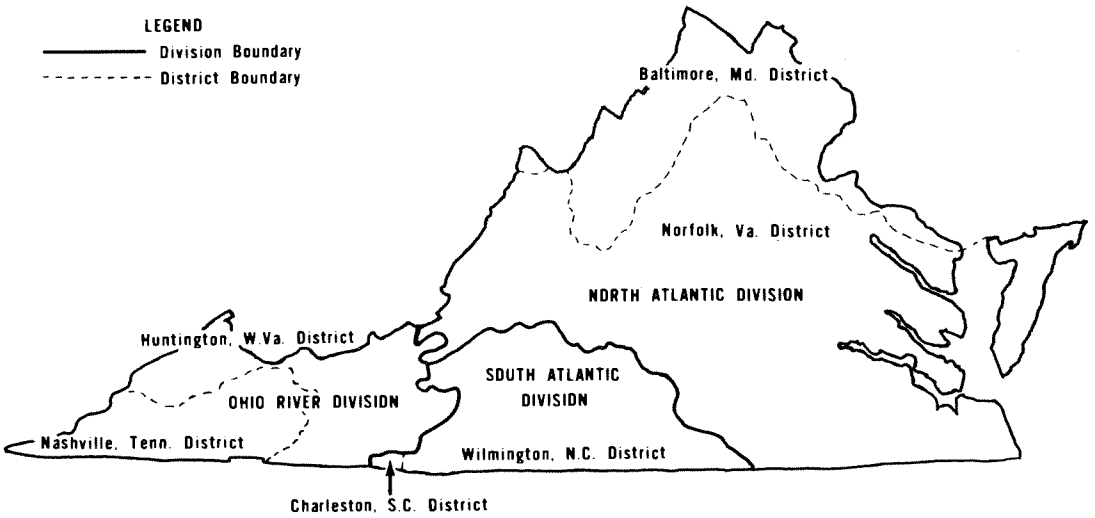
Organization

A distinguishing feature of the flood prevention and control program is its fragmented organizational structure, involving numerous federal, State, regional, and local organizations. Flood management is dominated by federal programs administered along interstate river basin or regional lines without a comprehensive view of statewide needs.

Federal. The Army Corps of Engineers is organized nationally, on the basis of river basins (that usually cross state lines) and does not focus on Virginia as a whole in any of its flood control functions. Virginia is the partial responsibility of five different Corps districts which in turn report to three divisions (See Figure 20)--greatly complicating coordination and inventory of Corps activities.

Figure 20

ORGANIZATION OF THE U.S. ARMY CORPS OF ENGINEERS IN VIRGINIA



Source: U. S. Army Corps of Engineers.

SCS is the only federal agency with a statewide organization headed by a federal administrator referred to as the State Conservationist. SCS has divided the State into 337 watersheds of less than 250,000 acres which corresponds to the acreage requirements of Public Law 566. (A watershed is all the land that drains into a particular river basin or stream.) There are area offices within the

State in Harrisonburg, Culpeper, Franklin, Marion, Chase City and Daleville and 90 field offices located in most counties.

The agency with primary responsibility for flood forecasting and warning systems is the National Weather Service. This is the only agency which can issue a flood warning or watch. Forecasts are prepared for portions of Virginia by River Forecast Centers in Harrisburg, Pennsylvania; Slidell, Louisiana; Cincinnati, Ohio; and, Atlanta, Georgia.

The Department of Housing and Urban Development (HUD) is responsible for programs to minimize potential damages and to aid in recovery from floods through its Federal Insurance Administration (FIA), Federal Disaster Assistance Administration (FDAA), and Community Development Administration. The Federal Insurance Administration is responsible for administration of the national flood insurance program. FIA has five persons based in Philadelphia to carry out the programs in the five states in the region. The Disaster Assistance Administration coordinates all federal emergency assistance and public recovery assistance funds with other federal agencies and with State officials when a Presidential Disaster is declared. The involvement of the Community Development Administration is minimal at present, but federal law has recently made flood projects eligible for community development grants. The towns of Scottsville and St. Paul have received funds under the program.

State. The State Water Control Board has multiple flood related responsibilities including: liason with the Corps of Engineers, advising the Governor on Corps construction projects, coordinating the flood hazard information studies of several agencies and administering the flood insurance program. It also determines the flood hazard to proposed construction and sewer sites, operates a stream gauge and monument system for data collection and warning purposes and participates with the Office of Emergency Services in flood forecasting during emergencies. Over the years the Board has directly participated in certain flood control projects, including the Four Mile Creek area (Alexandria and Arlington), Salem Church Dam, and flood protection of the Richmond sewage treatment plant. The SWCB, however, has attempted to carry out these responsibilities with a minimal allocation of personnel and funds. This can be ascribed in part to reliance on federal grants and the emphasis placed by the Board on water quality programs. The SWCB internal work program plan for fiscal year 1976 had eight staff positions assigned to flood management activities, six of which were federally supported. Funding for the six federally subsidized positions was terminated in March, 1976. One of the two State funded positions was eliminated because of the Governor's recent budget reduction. Flood management will now be the responsibility of one full-time hydrologist located in the Richmond office. This substantial personnel reduction will severely curtail the State's role since the entire work effort for flood management programs during fiscal year 1975 required an actual nine man years.

The Virginia Soil and Water Conservation Commission coordinates and financially supports the activities of the State's 40 soil and water conservation districts. It reviews and sets priorities for Soil Conservation Service (SCS) small watershed projects and works with SCS and local jurisdictions in developing work plans for areas that have been approved. The Commission has three survey party members who travel statewide for the purpose of collecting field data for project planning. Annual expenditures for 1971-75 averaged approximately $49,000 for salaries, travel, contractural services for project planning, and grants to

the Soil and Water Conservation districts for project maintenance and for securing and recording land easements.[8]

The State Office of Emergency Services is responsible for coordinating the State response, in cooperation with federal and local officials, to disasters. Most of its activities in recent years have been flood related. The agency has been responsible for developing a statewide emergency operations plan and for assisting in development of local plans and administering applications for federal disaster assistance. It works directly with local jurisdictions of over 5,000 population through regional offices in Pulaski, Waynesboro, Richmond and a suboffice in Newport News. Appropriations for operating expenses were $1,102,465 for fiscal year 1975-76.[9]

THE FLOOD PROBLEM

Accurate information on flood losses is essential in determining the total magnitude of the problem, identifying critical areas and providing the basis for evaluation of present and future flood control efforts. Such information is not readily available in Virginia since no one State agency is responsible for its collection and analysis. Reports by local offices of federal agencies are generally prepared to provide data on specific programs and/or geographical areas. Moreover, damage estimates are subject to inconsistencies based upon changes in agency reporting procedures, the cooperation of witnesses, the level of documentation, appraisal techniques and the distance in time from the disaster. Several national studies have criticized the inadequacy of available data but have concluded that there has been an unmistakeable rise in flood damages nationwide. To illustrate the impact of flooding in the Commonwealth, data concerning the extent of the flood problem have been assembled from multiple sources including the JLARC survey of local administrators.

Flooding in Virginia is not confined to particular regions, but is a statewide phenomenon (Map in Appendix IV). Portions of the State are subject to coastal and river flooding while mountain areas are subject to flash floods. The latter type of flood is difficult to forecast, occurs suddenly and often inflicts heavy damage. Local jurisdictions responding to JLARC's survey identified floods and stormwater management as their most serious water related problems. Of the 210 local administrators responding to the JLARC survey, 57% indicated flooding was a problem. Sixty-five percent considered stormwater drainage a problem. There is a fine line between flooding and stormwater drainage problems. Usually the term flood is used when a river or stream overflows its banks. Drainage refers to surface runoff or draining stagnant water from land. In urban areas, pavement, roofs and other impervious surfaces increase the magnitude and velocity of stormwater runoff which contributes to intensified stream flooding. Approximately half of the jurisdictions indicated that the type of land most frequently flooded is undeveloped, but this was followed closely by residential and farmland. Not surprisingly, cities indicated the highest incidence of flooding in residential, business and industrial areas.

Flood Losses. Flood losses in Virginia have been substantial over the years. Between January 1, 1975 and October 31, 1975, the State ranked fifth in the nation in total monetary property losses to private, commercial or industrial

property.[10] Concurrent costs are involved in flood fighting, disaster relief and the economic and social impact on neighboring areas or communities.

Since 1968 attention in Virginia has been focused on flood problems caused by several major disasters affecting large areas of the State (Table 16). Of the 86 emergency actions reported by the Office of Emergency Services during that period, 49% involved flooding. Hurricane Camille in 1969 affected 27 jurisdictions, primarily in the James River basin, causing 152 deaths and approximately $114,000,000 in damages. Hurricane Agnes in 1972 encompassed a larger area affecting 88 jurisdictions with 13 deaths and approximately $167,000,000 in damages.[11] These storms plus two others occurring in September and October of 1972 were of sufficient severity to warrant Presidential disaster declarations for Virginia. (Assistance coordinated through the Federal Disaster Assistance Administration becomes available after the Governor declares that the disaster is beyond the resources of the State and localities and the President issues a declaration.) Declarations were requested but denied for serious flooding in northeastern Virginia and in Wise County in 1975. Total damages for the four declared disasters were estimated at $309,500,000. Direct federal reimbursement was made only for loss of public property totalling $119,414,256.[12] Damages to private property were of a significantly higher magnitude than were damages to public property, but receive only indirect assistance through low interest loans and disaster insurance. For example, figures compiled by the Norfolk District Corps of Engineers for Alleghany County after Hurricane Agnes in 1973 indicate that 6% of damages were to public property while 61% were industrial and 23% were residential.[13]

Table 16

EXTENT OF FLOOD DAMAGE

Storm	Number of Jurisdictions Flooded	Extent of Damage: Severe and Widespread	Severe in Limited Area	Light or None
Hurricane Camille	87	13%	54%	33%
Hurricane Agnes	118	20	52	28
October, 1972	82	8	42	50
March, 1972	86	4	36	60
September, 1975	62	8	40	52

Source: JLARC Survey of Local Administrators, 1976.

Despite a natural tendency to emphasize the most recent floods, Virginia's flood problems are not new. Extensive data on flooding between 1936 and 1963 has been compiled by the Water Resources Research Center at VPI&SU in a *Flood Damage Abatement Study* published in 1971. Table 17 indicates that extensive floods affected the State in 1936, 1940, 1942 and 1955 and that lesser floods were an almost yearly occurrence.

Table 17

PROPERTY LOSS ESTIMATES DUE TO FLOODS IN VIRGINIA
(1936-1963)

Year	Property Loss (000)	Year	Property Loss (000)	Year	Property Loss (000)
1936	$5,300	1945	$1,540	1954	$ 63
1937	1,400	1946	---	1955	10,695
1938	460	1947	---	1956	---
1939	22	1948	---	1957	139
1940	4,000	1949	2,320	1958	---
1941	---	1950	1,203	1959	28
1942	4,100	1951	2	1960	211
1943	20	1952	---	1961	231
1944	2,000	1953	60	1962	---
				1963	5,937

Source: Adapted from bulletin 10, *Flood Damage Abatement Study for Virginia*, William R. Walker. Water Resources Research Center, Virginia Polytechnic Institute and State University. April 1971, p. 18.

Conclusion

There can be no doubt from available data that the flood problem in the State is continuous, widespread and serious. According to the State Water Control Board estimated average annual damage across the State adjusted to 1974 constant dollars amounts to $40 to $50 million. Nevertheless, damage estimates compiled by various federal and State agencies for the same flood may vary to the point of not being useful. The State lacks a uniform data collection and analysis system to allow continuous monitoring of flooding and to form the basis of statewide criteria for flood control. At the present time, the State Water Control Board gathers trend data on flow conditions through its river and stream gauging network but the data are not related to flood damages incurred. The Office of Emergency Services receives initial damage estimates during an emergency, but these tend to be "windshield" estimates that are not verified except in cases where federal disaster assistance necessitates pre and post-audits of public losses and expenditures by State and federal agencies. The State would benefit greatly if one agency were assigned the responsibility of collecting and analyzing flood damage data. This function could be logically assigned to the State Water Control Board because of its responsibility to collect other water related data.

FLOOD HAZARD INFORMATION AND REGULATION

The availability and use of accurate flood hazard information is an essential component of floodplain management. Local officials concerned with public safety in flood-prone areas, and planners and engineers charged with designing adequate storm sewers and drainage channels, need a basis for determining the probable size and depth of future floods and the land areas likely to

be inundated. Since 1969 there has been growing interest in regulating flood-prone lands. This has been stimulated in part by recent flooding, requirements of the federal flood insurance program and the flood proofing standards in the State's Uniform Building Code. Records of past floods are not sufficient because experts agree that few streams have experienced the most severe flood that can occur. The extent of flooding is influenced by stream flow and weather as well as by the existing and planned level of urban development. In urbanizing areas the U. S. Geological Survey has shown that changes in natural drainage systems (sewers and culverts) combined with increased storm runoff from impervious surfaces (roads, parking lots, and roofs) may increase flood peaks two to eight times above previous flood levels.[14] Flood flows are therefore affected by development within jurisdictions and by upstream development in other jurisdictions.

Availability of Flood Hazard Information. The Corps of Engineers, Soil Conservation Service, and U. S. Geological Survey perform extensive studies to determine the hazard to specific land areas by certain types of floods. Flood levels are defined in statistically probable terms; the most commonly used are the 100 year flood and standard project flood. The former is defined as having an average frequency of occurrence of once in 100 years or a one-percent chance of occurrence in any given year. The standard project flood represents a larger and reasonable upper limit of anticipated flooding. Larger floods than those estimated are possible; however, the combination of factors that would be necessary to produce such floods would rarely occur. Local jurisdictions must request flood hazard studies which are provided without cost but with the provision that they be used. Only the Soil Conservation Service requires localities to assume printing and distribution costs for the final report, which includes detailed analysis as well as maps indicating anticipated flood heights and land likely to be flooded.

Since flood levels are described in statistical as well as descriptive terms, it must be recognized that a 100 year or standard project flood could occur in any year or in successive years or months. For example, Henrico County experienced 50 year level floods in 1955 and and 1959 and severe flooding in 1960. Hurricane Camille in 1969 and Tropical Storm Agnes in 1972 were only three years apart and both reached greater than 100 year flood proportions in some areas of the State.

The State Water Control Board has been designated by the Governor to coordinate and review flood hazard studies. SWCB receives all requests from local jurisdictions for studies, establishes priorities and forwards the requests to appropriate agencies. Technical review is conducted by SWCB at three stages during the development of a study for accuracy, sufficiency of data and clarity. The agency's goal has been to establish a reliable 100 year flood line statewide, avoid duplicative studies, assign studies to agencies with prior knowledge of the area, and clarify confusing differences in federal agency format and terminology. Between 1960 and July, 1973, approximately 440 river miles in the State had been studied. Between 1973 and 1975 Hurricane Agnes recovery funds were used by SWCB to accelerate flood hazard studies in the interests of reducing future damages in floodplains. An additional 350 river miles, mainly in the James River basin, were mapped with these funds, which with the continuation of the regularly funded program has resulted in a total of approximately 1200 river miles completed to date in Virginia. This represents only a third of the 3500 river miles that SWCB believes needs to be studied because of high flood probability and an insignificant portion of the 27,240 total river miles in the State.

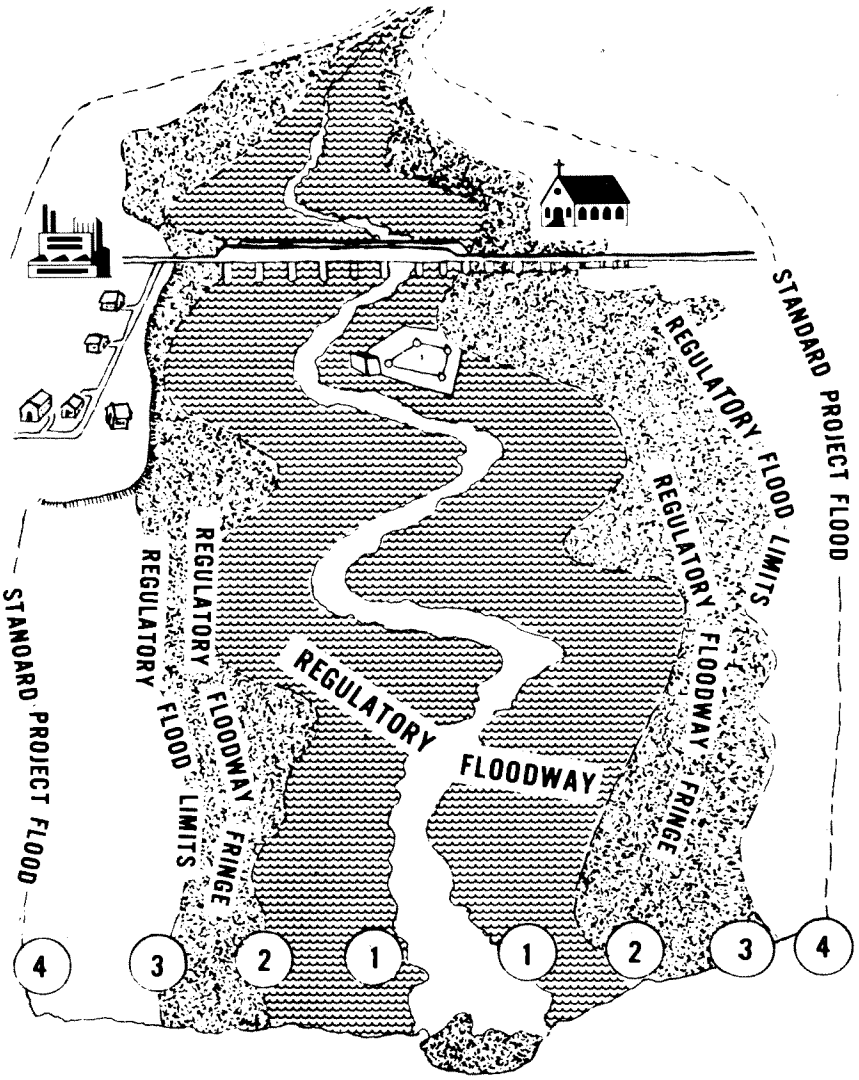
The floodplain information process is now in a transitional phase due to the impact of the national flood insurance program. Under this program, Congress authorized studies for all flood-prone areas in the nation. As a first step, the U. S. Geological Survey was authorized to map all flood-prone areas nationwide on the basis of readily available information. Because of the lack of specific data, these maps outlined flood-prone areas in a general manner. The maps are used by the Federal Insurance Administration to identify communities with flood-prone areas and by local jurisdictions entering the insurance program as preliminary sources of flood information. Once communities are officially enrolled in the program, detailed technical studies similar to the flood hazard studies are prepared. These technical studies provide the basis for insurance rate maps based on the degree of hazard in particular areas and for flood ordinances required under the program to regulate new development in floodplains. These studies are conducted by the Corps of Engineers, Soil Conservation Service, U. S. Geological Survey, Tennessee Valley Authority or by private consultants when directed by the Federal Insurance Administration. Technical studies prepared under the insurance program are also coordinated by the State Water Control Board. According to SWCB officials, a limitation of the FIA funded technical studies that may have serious consequences is the lack of concern for future development when flood lines are delineated. Since new development has been shown to increase flood peaks by as much as eight times, the flood lines indicated on the FIA maps may become outdated very quickly for some urbanizing communities in Virginia. People may unknowingly settle in areas beyond the FIA designated floodplain only to find out later that the area is unsafe. Nevertheless, since 248 Virginia communities are enrolled in the flood insurance program, completion of these maps will help to establish minimum flood lines and standards for flood ordinances over a broad area of the State. The preparation of each study takes 18 months. The maps for 12 communities have been completed and 90 are in progress. The Federal Insurance Administration intends to complete studies for all the enrolled communities by 1981, but this time schedule may be overly optimistic within the limits of appropriated funds. Those presently completed or in progress represent only about one-third of the enrolled communities and 28% of all local jurisdictions in the State.

Floodplain Regulation. Although significant amounts of flood hazard information will become available statewide, it will be meaningless unless used to regulate unprotected development in flood-prone lands. Local jurisdictions derive their regulatory authority from the State. It is based on "...recognition of both the private right to use lands and the interest of the State to guide such use to achieve public health, safety, and general welfare objectives."[15] During the 1970's, there has been an increase in the number of communities with floodplain regulations. Only 14 jurisdictions responded to the JLARC survey that floodplain regulations had been enacted prior to Hurricane Camille which was a major Statewide storm, while 86 (47 counties, 24 cities, 29 towns) reported ordinances enacted after that date. However, this represents only a beginning, since two-thirds of the State's jurisdictions have yet to enact such regulations.

Floodplain ordinances usually regulate development on valley bottoms or on floodplains adjacent to streams and rivers which are most subject to periodic overflows. These areas act as natural reservoirs and as temporary channels for flood-prone areas. Within the floodplain is the floodway in which waters will be deep enough to reach dangerous velocities and which can serve as a pathway for carrying away excess water. The object of regulation is generally to maintain channels or floodway capacity by limiting or preventing obstructions in the

Figure 21

RIVERINE FLOOD HAZARD AREAS



FLOOD PLAIN (SPF)

1. REGULATORY FLOODWAY - Kept open to carry floodwater - no building or fill.

2. REGULATORY FLOODWAY FRINGE - Use permitted if protected by fill, flood-proofed or otherwise protected.

3. REGULATORY FLOOD LIMIT - Based on technical study - outer limit of the floodway fringe.

4. STANDARD PROJECT FLOOD (SPF) LIMIT - Areas subject to possible flooding by very large floods.

Source: United States Water Resources Council, Regulation of Flood Hazard Areas to Reduce Flood Losses, Washington, 1970, p.47

floodway and to allow certain land uses compatible with the degree of risk in the floodplain (i.e., recreation and agriculture). Figure 21 illustrates the various parts of a river's flood hazard area.

Conclusion

If mapping for the flood insurance program continues as planned, flood-prone jurisdictions will be provided with hazard information valid for a particular point in time. This will represent significant progress toward development of information as the basis for effective floodplain management. However, to achieve maximum protection from flood damages regular updating will be required to take new development into account, and the interrelatedness of land use actions beyond jurisdictional boundaries must be recognized. This will necessitate State guidelines for local action and delineation of an accurate continuous flood line along rivers and streams throughout the State. Every flood-prone jurisdiction in Virginia should develop means for effectively regulating development in floodplains.

FLOOD INSURANCE

The national flood insurance program provides protection against flood losses. Owners of property located in designated flood-prone areas are allowed to purchase federally subsidized flood loss insurance at reasonable rates. However, before property owners are eligible for such insurance, local governments must adopt and enforce floodplain regulations to reduce the probability and severity of flood damages. There are two ways in which local governments are penalized for failing to participate in the insurance program: (1) all federal financial assistance for acquisition or construction of property in flood-prone areas is denied, including federal disaster aid; and (2) federal agencies responsible for regulating lending institutions are directed to prohibit banks and savings and loan associations from making loans to property owners in flood-prone areas.

Overall administration of the program is the responsibility of the Federal Insurance Administration in cooperation with the coordinating agency designated by the governor in each state--the State Water Control Board is the designated agency for Virginia. The actual sale of policies and adjustment of claims is a private responsibility. It is carried out under the auspices of the National Flood Insurers Association (NFIA), an association of 123 licensed insurance companies who have contributed $44 million to the flood insurance pool. NFIA is represented in Virginia by the Insurance Company of North America, which provides manuals and other materials to participating insurance companies in the State and initially processes policies and claims. Enforcement of the mandatory enrollment provisions of the program is the responsibility of banks and other lending institutions.

The entry phase of the program, generally referred to as the emergency program, makes available limited amounts of subsidized insurance to owners of existing property in flood-prone areas. Local governments cannot obtain full benefits until after receiving flood insurance rate maps provided by the Federal

Insurance Administration. Communities must meet the requirements of the regular program no later than six months from the date on which FIA provides the rate maps. The maps establish actuarial insurance rates based upon the degree of hazard to specific flood-prone areas of the community. The rate maps and supporting technical data also provide the basis for preparing local floodplain regulations.

By October, 1975, a total of 248 Virginia jurisdictions had enrolled in the program, representing approximately 98% of the State's population. Of these, 236 are in the entry phase and 12 are in the regular program. Most jurisdictions became enrolled after Congress made the program mandatory in 1973 for jurisdictions with identified flood-prone lands.

Table 18

INSURANCE COVERAGE IN REGULAR PROGRAM

	First Layer--Entry		Second Layer--Regular		
	Limit	Subsidized Rates (per $100)	Limit	Actuarial Rates	Total Limits of Coverage
Single Family Residential	$ 35,000	25¢	$ 35,000	Varies	$ 70,000
Other Residential	100,000	25¢	100,000	"	200,000
Non-Residential	100,000	40¢	100,000	"	200,000
Contents, Residential (per unit)	10,000	35¢	10,000	"	20,000
Contents, Non-Residential (per unit)	100,000	75¢	100,000	"	200,000

Source: U. S. Department of Housing and Urban Development, *Hud News*, Washington, D.C., March 10, 1975.

Insurance Coverage

Flood insurance is not covered under an ordinary homeowners policy. Under the entry program, insurance is available at subsidized rates up to specific limits of coverage, $35,000 for a single family residence and $100,000 for non-residential structures (Table 18). Insurance for a $35,000 home costs $88. Tenants as well as homeowners may insure their belongings for up to $10,000.

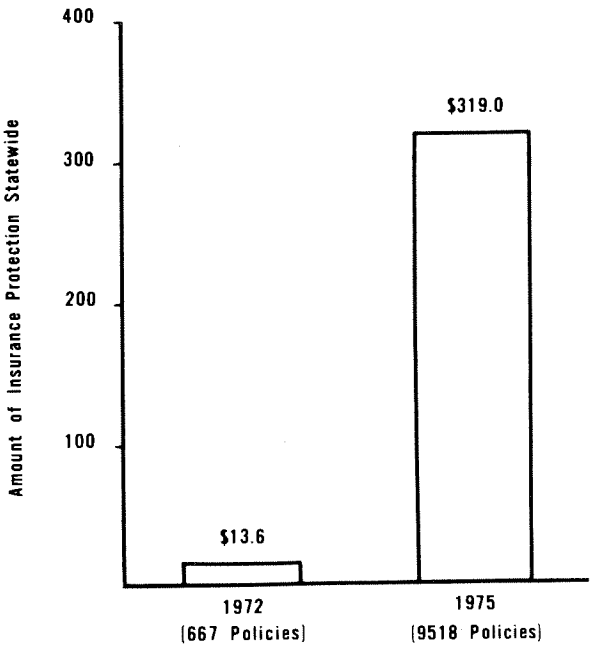
When communities qualify for the regular program, additional amounts of insurance become available at unsubsidized rates (second layer). These rates apply to additional coverage for properties already partially covered by subsidized insurance and to all new construction and major improvements. Rates reflect the degree of hazard to the area in which property is located. Rates vary from $.01 to over $21 per $100 of insurance for non-residential structures or for multi-family residences (more than four units). The maximum rate on a one to four family residence is $.50 per $100 of coverage under certain conditions.

Policies in Force. As of October, 1975, there were 9,518 policies in force in Virginia with a total value of $319 million, compared to 667 policies

and $13.6 million in 1972[16] (Figure 22). It is difficult, however, to relate the actual number of policies sold to the need for coverage statewide. No survey of property owners in flood-prone areas has been conducted; and, figures used by

Figure 22

AMOUNT OF FLOOD INSURANCE IN FORCE
(Millions of Dollars)



Source: Federal Insurance Administration, November 12, 1975.

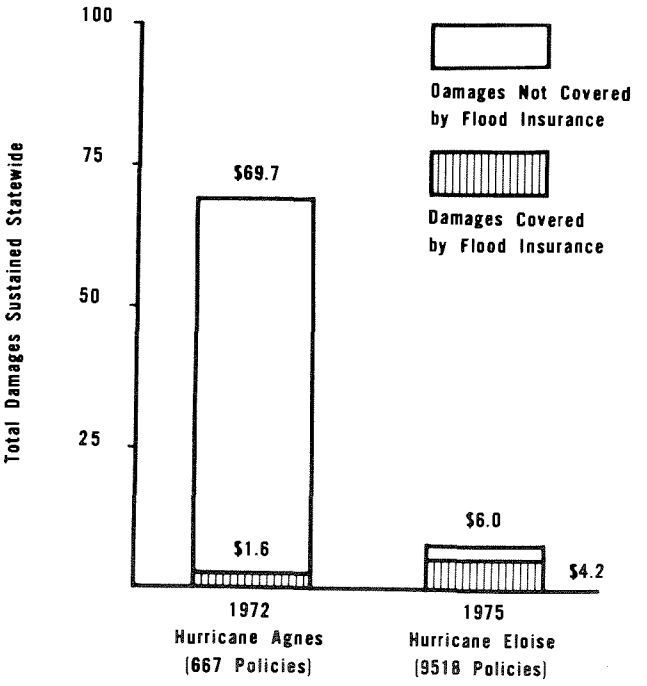
various government and insurance officials are based on estimates. Some State personnel estimate that the most critical needs could be covered by 10,000 policies covering those who had incurred losses during recent floods. However, although the number of policies is approaching that level, the identities or precise locations of policy holders are not known. It is not encouraging that a door-to-door survey of flood-prone neighborhoods in Big Stone Gap revealed that only 20% of the neighborhoods had flood insurance. The survey was conducted as part of the town's project to develop a relocation plan for these neighborhoods because the town had experienced a major flood at least once every five years.[17] Other estimates of need are based upon the estimated number of structures in

flood-prone areas. These have ranged from 20,000 to 40,000 policies or higher. JLARC attempted to arrive at an estimate based on a survey of local administrators. Of the 325 jurisdictions in the State, 150 responded to the survey question requesting a best estimate of the number of businesses and residences located in the flood-prone areas on FIA prepared maps. The estimated total of 29,806 structures indicates that there may be substantially greater number statewide and an apparent need for more intensive efforts by insurance companies and local governments to promote the sale of policies. Serious consequences face property owners in flood-prone areas who fail to buy flood insurance. They are ineligible for financial assistance from the federal government for flood losses.

Impact of Coverage. From January 1 to October 31, 1975, Virginia ranked fifth in the country in total monetary property losses covered by flood insurance, according to National Flood Insurance Association figures. There were 702 claims totaling $6,058,797.[18] Many of these claims resulted from Hurricane Eloise which caused substantial damage in Northern Virginia in September, 1975. A comparison of the insured losses statewide from Eloise and Agnes in 1972 (Figure 23) shows the positive impact of the present flood insurance program on property owners (prior to 1973 flood insurance was optional). Although there were great differences in the amount of damage sustained from both hurricanes the increase in the percent of insured losses from 2% for Agnes to 70% for Eloise is very significant.[19]

Figure 23

DAMAGES COVERED BY INSURANCE
(Millions of Dollars)



Source: Federal Insurance Administration, November 18, 1975.

Management Gaps

There are two key administrative phases of the flood insurance program in need of improvement: (1) community enrollment and coordination of studies, and (2) enactment of local ordinances.

Enrollment and Coordination. The sale of policies is considered to be an on-going function of private insurance agencies. However, there appears to be an informational gap which provides state and federal agencies with aggregate numbers and does not provide local governments with any information on the number or location of policies sold. Since local governments enter the program to secure insurance benefits for their citizens and to reduce flood damages, they should be aware of the level of citizen participation. This will enable them to determine the adequacy of the program and to encourage participation in under-insured areas. The Insurance Company of North America and SWCB should make every effort to inform local governments of the number of policies purchased.

FIA has only six persons to administer and coordinate the flood insurance program in five states comprising Region III. Therefore, FIA places considerable reliance on state coordinating agencies during the enrollment phases of the insurance program. In many ways this allows a state to exercise substantial control over the administration of the flood insurance program and to incorporate the program's mandatory provisions into an overall statewide scheme for preventing and controlling floods. The State Water Control Board has been very active during the enrollment phase and has worked along with the FIA, consulting agencies and local governments in coordinating floodplain studies. Personnel funded through a federal Economic Development Administration (EDA) grant, now terminated, were utilized for that purpose. Community and FIA negotiations on studies and enactment of floodplain ordinances will have the highest priority until approximately 1983. This second phase will require considerable expertise to utilize rate maps and hydrologic data to arrive at meaningful local flood regulatory ordinances. Nevertheless, SWCB does not appear able to make more than a token personnel commitment, now that the EDA grant has ended, to assisting localities or to attending the three required coordination meetings for each project. Agency requests for additional personnel for the 1976-78 biennium were not funded. This reduction in State role may have serious implications for the Commonwealth.

Local Ordinances. The nature of the flood problem transcends jurisdictional boundaries, and jurisdictions adjacent to streams and rivers are vulnerable to the actions of nearby and upstream communities. Floodplain ordinances will not be effective unless enacted by communities throughout the State. Moreover, FIA rules require suspension from the program of a community that fails to enact acceptable ordinances within six months of receiving floodplain rate maps from FIA. Suspension will terminate flood insurance protection for residences and business establishments (existing policies are only for one year) and eliminate the availability of mortagage and improvement loans for property in flood-prone areas. State Water Control Board personnel estimate that it will take one to three man weeks per community to provide necessary technical assistance for the design of local floodplain ordinances that take into account federal guidelines as well as local and State conditions. Several states have initiated statewide guidelines or management programs for floodplains. California induces adoption of local floodway regulations according to minimum state standards. Iowa requires that local regulations meet the approval of a state agency. In Nebraska, a state agency delineates floodplains and floodways and submits this

information with minimum regulatory standards to local jurisdictions. The local jurisdiction has one year to adopt local land use regulations which meet or exceed the standards of the agency. If it does not act, the state agency enforces the restrictions. A New York State statute is directly related to the insurance program. It requires local governments to participate in the program. If the locality fails to do so, the state is authorized to formulate and administer floodplain management measures meeting minimum FIA standards.

If there is a major flood disaster in Virginia, as occurred during Hurricane Agnes, residents of ineligible communities can experience personal hardships and severe economic losses. Although flood insurance is a federal program with specific requirements for local jurisdictions, the Commonwealth should have a significant interest in its implementation.

Conclusion

The flood insurance program represents a comprehensive program to reduce flood losses. It provides insurance to mitigate losses to existing property and requires future floodplain development to be compatible with the hazard involved. Basic floodplain information is provided at no cost to the State or to local jurisdictions. Although the mandatory provisions of the insurance program have been controversial, they were a direct outgrowth of high flood losses resulting from the inability of state and local jurisdictions to control development of floodplains. Most Virginia communities are still in the entry phase and will not qualify for the regular program until technical studies and rate maps have been completed by FIA and local floodplain ordinances have been enacted. Based on the insurance indemnification of flood losses sustained from Hurricane Eloise, it appears that the State has much to gain from continuing to actively coordinate the flood insurance program so that Virginia residents may obtain the full measure of benefit. The State Water Control Board should assign a high priority to this effort and provide communities with supplementary information and technical assistance.

STRUCTURAL FLOOD CONTROL

Although recent emphasis has been on reducing flood damage through nonstructural measures such as floodplain regulation and flood insurance, a well balanced flood management program also includes appropriate use of engineering devices such as dams, reservoirs, levees (earth embankments), flood walls (concrete), and channel improvements to protect already developed areas. For the purpose of flood control, dams and reservoirs are used to store water during excessive stream flow for gradual release after the threat of flooding has passed; levees and flood walls form a protective barrier for populated areas and confine flood waters to a floodway; and channel improvements increase the capacity of a stream by deepening or widening its bed, straightening bends or removing obstructions. These structures are designed to withstand floods of a certain magnitude, usually the 100 year flood, and to protect specific land areas. Nevertheless, they cannot be completely effective because larger floods can and do occur and well documented national studies have shown that losses can actually be increased by new development in flood-prone areas that is stimulated by the existence of

flood control structures. For example, in Wilkes-Barre, Pennsylvania, water got behind a floodwall constructed by the Corps and was unable to recede, thereby greatly increasing damages.

Projects in Virginia

Relatively few major reservoir or local protection projects are now in place in Virginia. This has been attributed to the project feasibility criteria and lengthy administrative process of federal agencies, failure of the State to actively pursue projects, the high cost factor to local governments, and the environmental impact and unattractiveness of structures. The study phase for Corps projects may extend as long as 15 years and projects must be justified on the basis that the damages which would be prevented would at least be equal to the cost of building the project. Therefore, communities subject to extensive flooding may not qualify for construction projects because of the limited value of property to be protected or because of the high cost of extensive engineering works as was the case for Scottsville in Albermarle County. A study prepared by the Corps of Engineers concluded that the costs of constructing a floodwall to protect the downtown business district of Scottsville outweighed the average annual benefits of the project. Major reservoir projects are 100% federally funded, but local protection projects (such as channel improvement projects or floodwalls) that meet federal feasibility criteria require provision of easements, right-of-way and land by local jurisdictions. Localities must also agree to maintain projects after completion. Exclusive of maintenance, the local share of a flood protection project is about 20%. For example, the City of Galax with a population of 6,200 contributed $185,000 towards a channel improvement project.

The federal Soil Conservation Service is also involved in watershed flood prevention projects. Projects must have a local sponsor (usually a soil and water conservation district) and be justified on the basis of flood prevention. Sponsors are responsible for obtaining easements and land rights, and for maintaining projects after completion. Since many projects are multi-purpose, local sponsors pay a required share of non-flood related aspects. For example, if a flood prevention impoundment is used for public water supply purposes, the local sponsor finances 100% of this part of the project. In 1970 the General Assembly authorized the Small Watersheds Flood Control and Area Development Fund to provide assistance, in the form of loans, to local jurisdictions for the purpose of paying the non-federal share of adding water supply to SCS flood control projects. However, limited funds have been made available for this program.

SCS and Corps Projects in Virginia. As of June 30, 1975, 38 Soil Conservation Service small watershed projects had been approved, of which eleven had been completed. Approximately 91 miles of channel had been excavated and an additional 74 miles of clearing and dredging work had been carried out. One hundred and ninety-nine single or multi-purpose structures were planned and 105 constructed.[20] (List of SCS projects in Appendix IV.)

The Corps has completed eleven reservoir or local protection projects and has initiated several others. Projects underway or completed are listed in Tables 19 and 20. Additional projects for the City of Richmond were completed in 1927, 1940 and 1975. Included in the federal budget this year were: $200,000 for advance engineering and design in Buena Vista, $8.3 million for construction

at Four Mile Run for Alexandria and Arlington, $11.5 million for continued construction on Gaithright Dam in the James River Basin and $269,000 for flood control construction on Verona Dam.[21] Local protection projects have been recommended for Buena Vista and Farmville.

Table 19

ARMY CORPS OF ENGINEERS
FLOOD CONTROL PROJECTS UNDER CONSTRUCTION

Location	Type of Structure	Cost
Gaithright Reservoir (Norfolk District)	Dam and reservoir	$41,300,000
Four Mile Run - Alexandria and Arlington (Baltimore District)	Channel, levee, floodwall	21,710,000

Source: Compiled from figures in *Water Resources Development in Virginia*, U. S. Army Corps of Engineers, North Atlantic Division, 1973.

Limits of Structural Protection

Flood control structures are designed to eliminate substantial risks from floods of specific magnitudes to all or parts of established communities. However, a certain degree of risk remains after project completion because no project can be designed to completely control all flooding.

National Costs. There has been considerable national concern about the costs resulting from flood waters higher than the design capacity of projects (e.g., flood water exceeds the height of a floodwall) and of uncontrolled new development in flood-prone areas. Since 1936 more than $7 billion has been spent on flood control projects by the Corps of Engineers and the Soil Conservation Service; yet, annual flood losses exceed $1 billion.[22] In 1966 a federal task force concluded that "the country is faced with a continuing sequence of losses, protection and more losses."[23] According to the task force, with no change in floodplain use, annual national expenditures of $300 million for construction purposes would only slow the rate of damages (Figure 24). High annual losses of approximately $700 million would still be sustained. Similar concerns led the nationally established Water Resources Commission to conclude in 1973 that regulation of land use in flood-prone areas adjacent to flood control structures would be necessary to reduce damages. The Commission also recommended revised cost sharing formulas for federally funded flood control projects to make local and State governments more aware of their regulatory responsibilities and to reduce federal costs. The Water Resources Development Act of 1974 requires the President to conduct a study of federal and non-federal cost sharing of projects. In the near future, it is possible that state and local governments may be required to bear a larger percentage of the cost of flood control projects. Therefore, it is economically important to the Commonwealth and local governments to actively support participation in the flood insurance program. Reliance on this flood prevention alternative reduces the need for expensive flood control structures in developed areas.

Table 20

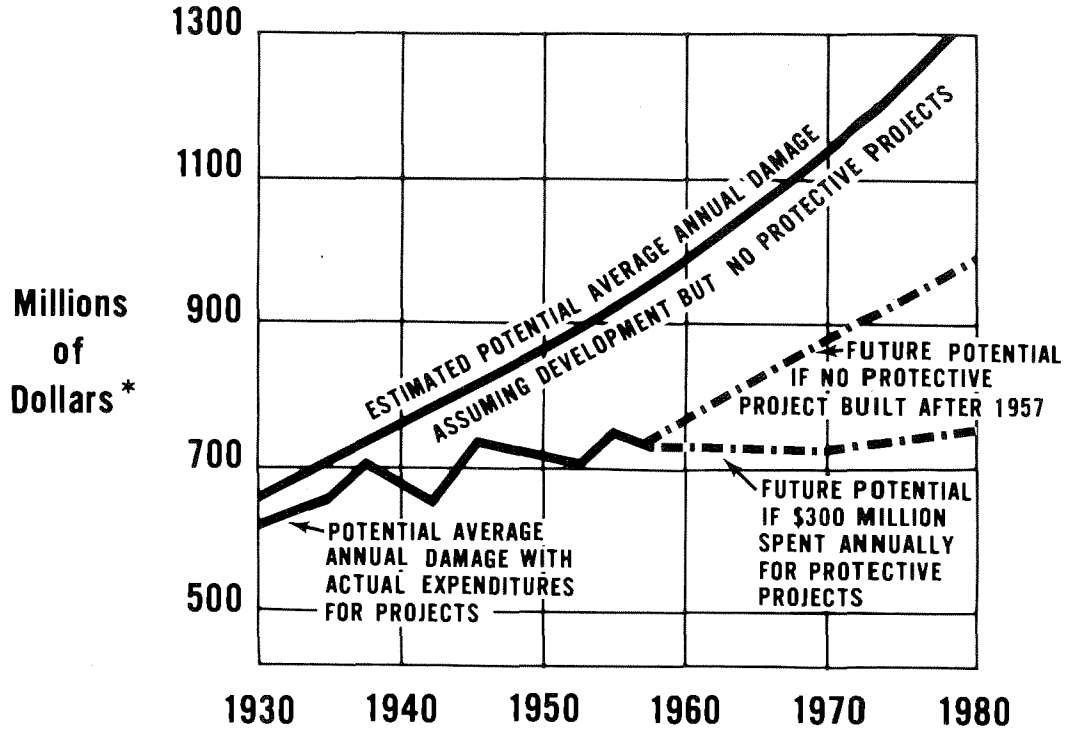
ARMY CORPS OF ENGINEERS FLOOD CONTROL PROJECTS (COMPLETED)

Location	Type of Structure	Date of Completion	Cost	Estimated Damages Prevented
Bridgewater, Va. (Baltimore District)	Earth levee	1952	$ 136,500	
North River and Tributaries (Baltimore District)	Farm levees	1950	27,800	
Bluestone Lake, Va. & W. Va. (Huntington District)	Dam and reservoir	1950	29,200.000	$95,000,000
John W. Flannagan Reservoir (Huntington District)	Dam and reservoir	1966	20,300,000	27,100,000
North Fork of Pound Reservoir (Huntington District)	Dam and reservoir	1966	6,200,000	730,000
Galax (Huntington District)	Improved channel, relocation of one highway bridge, extension of one R.R. bridge	1951	667,000	950,000
John H. Kerr Reservoir, Va. & N.C. (Wilmington District)	Dam and reservoir	1952	87,545,000	12,300,000
Philpott Reservoir (Wilmington District)	Dam and reservoir	1951	14,364,000	700,000
New Market Creek (Norfolk District)	Dam, channel improvements	1969	1,550,097	2,000,000
Downtown Norfolk (Norfolk District)	Floodwall, interior drainage	1971	2,354,971	2,000,000
Lick Run, Roanoke (Wilmington District)	Channel	1972	1,248,300	

Source: Compiled from U. S. Army Corps of Engineers, North Atlantic Division, *Water Resources Development in Virginia, 1973*.

Figure 24

ESTIMATED GROWTH OF POTENTIAL AVERAGE FLOOD DAMAGE



*Adjusted to 1959 dollars.

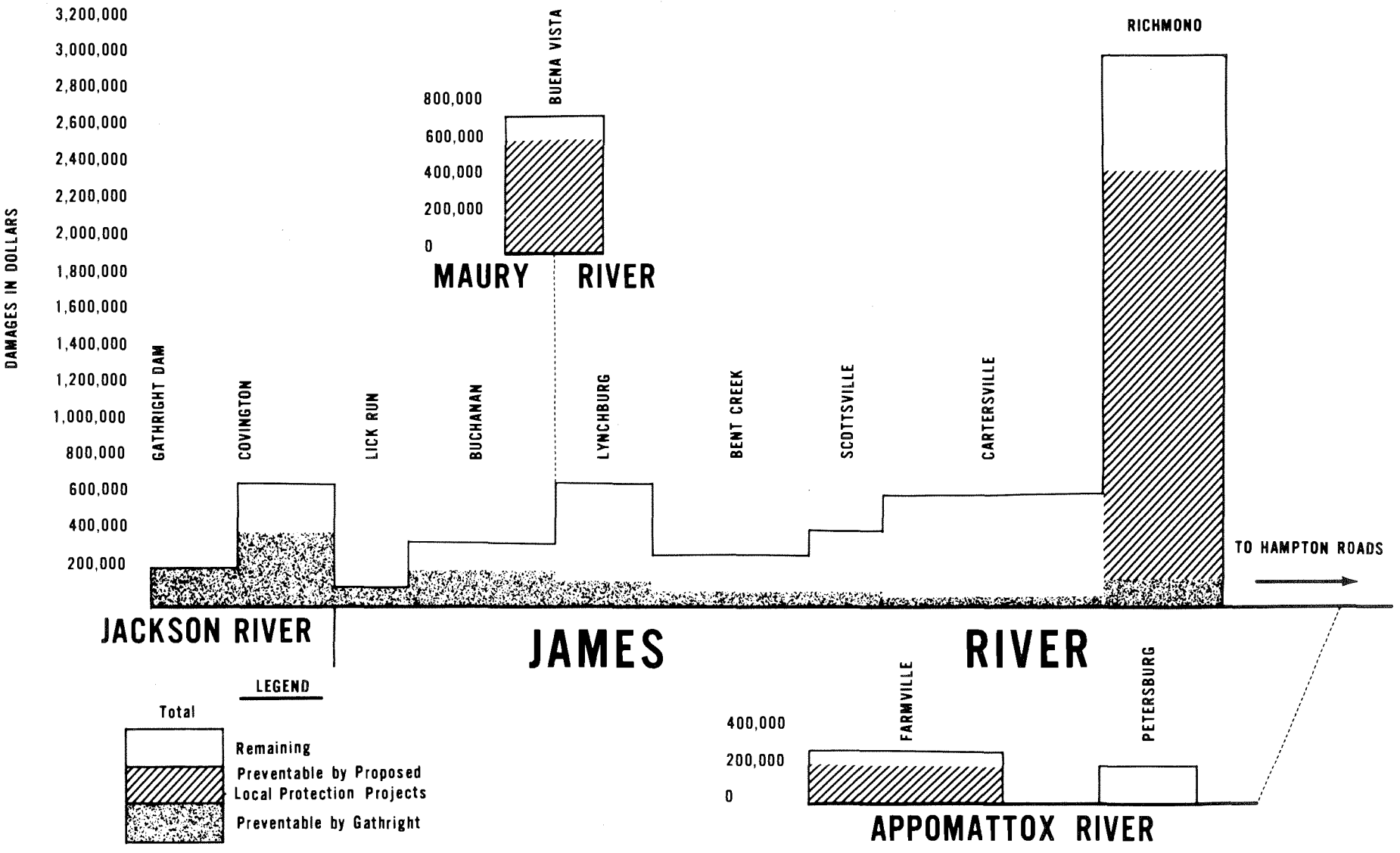
Potential Damage--Average annual damage that would occur during period of normal flood experience with no change in floodplain use. (Not actual damage in year indicated.)

Source: Adapted from U. S. Congress, House of Representatives. *A Unified Program for Managing Flood Losses*, Government Printing Office, Washington, 1966, p. 5.

Flood Control in the James River Basin. The Norfolk District Corps of Engineers has provided a very useful graphic representation of the effects of projects either proposed or under construction in the James River Basin (See Figure 25). Gaithright Dam is the only project currently under construction and it will in itself control only approximately 20% of the flood problem in the basin. Generally dams are effective in reducing flood peaks in streams immediately below the structure, but the effect diminishes with distance downstream. Local protection projects have been proposed for Buena Vista, Farmville and Richmond. If these projects are funded for construction the combined effect, along with Gaithright, can be expected to control approximately 50 to 55% of the losses in the basin. However, the remaining risk will require a mix of structural (i.e., flood proofing, additional projects) and non-structural (i.e., evacuation,

Figure 25

DAMAGES PREDICTED BY SPECIAL FLOOD CONTROL PROJECTS IN JAMES RIVER



Source: U.S. Army Corps of Engineering, Norfolk District, May 1975

floodplain regulation) measures. The effectiveness of the planned projects could also be impaired by large scale upstream development that would heighten flood flows.

Project Evaluation

Extensive flood control projects (stream channelization and dams) have generated controversy concerning environmental impact, the use of cost benefit factors, and the lack of formal effectiveness evaluations for completed projects. These considerations have led to recent changes in the planning process of federal construction agencies (i.e., Corps, Soil Conservation Service) to increase public participation, assure consideration of a broader range of options and to include quantified environmental factors in cost benefit analyses. Prior to these changes, Corps studies, for example, generally established the feasibility of construction projects on a favorable cost benefit ratio based primarily on economic development criteria. Benefits were evaluated primarily in terms of prevention of physical damages and business losses, elimination of flood fighting and repair costs, and the anticipated value of increased outputs of goods and services resulting from the protection. Environmental factors were not consistently quantified nor fully evaluated as part of the analyses. They were considered as part of the environmental impact statement that was prepared after a construction plan had been selected.

It is now required that beneficial as well as adverse environmental factors be quantified and included appropriately in the cost benefit analysis throughout the planning and evaluation phase of projects. According to the National Water Resources Council, environmental objectives include: (1) management, preservation or enhancement of areas of natural beauty or especially valuable archaelogical, historical, biological, and geological resources and ecological systems; (2) enhancement of the quality of natural resources; (3) avoiding irreversible commitments of resources to future uses. Introduction of environmental factors into the cost benefit process may result in a ratio more favorable to modified structures or to a non-structural alternative that would resolve the flood problem without costly environmental damages. For example, as a result of the enviromental analysis performed by the Corps on plans for the James River Basin, small reservoir works and channelization projects proposed by the Department of Agriculture would be more discriminately screened in favor of floodplain management alternatives. Controversy over the possible adverse environmental impact of the proposed Salem Church Lake Reservoir project near Fredericksburg recently resulted in withdrawal of the Corps' recommendation. In addition, concerns over maintaining water quality in the James River resulted in a revised Corps plan for floodwalls in Richmond to include plans for protection of the city's sewage treatment plant. The State Water Control Board and the Council on the Environment were actively involved in the review of both projects. State agencies will most probably have increased opportunities for involvement under the expanded federal procedures. It is essential that the State point of view be effectively represented with regard to environmental and water resource priorities to ensure adequate flood control protection and optimal use of the State's land and water resources.

Safety of Structures

There is no doubt that the safety of engineering works, particularly dams impounding water for any purpose, is very much related to flood hazards. Hurricane Agnes in 1972 reached over 125-year flood proportions in several areas of Virginia resulting in abandonment of inundated flood pumps in Richmond, failure of Lake Barcroft in Fairfax County, breaching of Lake Louisa in Louisa County and near loss of a water supply dam on the Occoquan River. Failure of a mine dam on Buffalo Creek in West Virginia in 1972 brought the dangers of unsafe impounding structures to national attention when 125 people were killed and 4,000 left homeless. On August 8, 1972 Congress passed legislation which required the Corps of Engineers to conduct a program of safety inspection of dams throughout the United States (PL 92-367). An inventory of dams 25 feet or more in height with an impounding capacity of 50 acre feet or more was compiled for each state and presented to Congress and the respective state governor. Excluded were smaller dams and dams under federal jurisdiction or licensed by the Federal Power Commission. However, no on-site inspections took place and the Chief of Engineers recommended to Congress that the actual safety inspections be handled by individual states with the aid of federal monies. To date no action has been taken by Congress.

Safety in Virginia. The Norfolk District of the Corps conducted the inventory for Virginia identifying 168 dams within the specified criteria, many of them constructed by the Soil Conservation Service (SCS) and now the property of local jurisdictions. It is not possible to tell if this list is all inclusive since it was developed on the basis of aerial surveillance, requests to local jurisdictions, and Soil Conservation Service records. According to the State Water Control Board, there are over 100 dams in Virginia whose failure would be disastrous in terms of both human life and property and over 1,000 other dams which pose differing degrees of hazard.[24] Thirty-six jurisdictions responded to the JLARC survey that dams within their jurisdiction had failed; 23 respondents reported that failures had resulted in damages caused by dams with multiple uses (i.e., residential subdivisions, private ponds, water supply); and 12 reported that existing structures posed a potential hazard. The amount of potential damage, however, is related to the value of property in surrounding areas. For this reason, the Corps of Engineers takes into account the flood hazard from existing dams when evaluating developments in which federal money would be invested (Executive Order 11296). In Virginia, the Corps recommended against a proposed project in Chesterfield County because an existing water supply dam (upstream from the proposed project) could not meet safety standards.

Regulation. As a result of a State Supreme Court ruling and of recent enactment of dam safety legislation, the authority of the State to regulate the safety of dams is unclear. Two key concerns related to dam safety are: (1) the division of dam safety regulation responsibilities between the State Water Control Board and State Corporation Commission and (2) the exemption of potentially hazardous dams from State regulation.

In 1971, the Virginia Supreme Court (Vaughan vs. VEPCO) interpreted the Water Power Act as applicable to the licensing of any dam proposed to be constructed in or across the "Waters of the State" regardless of the purpose for which the dam was to be used. "Waters of the State" are defined as including navigable streams or any stream or part thereof in which the impoundment would affect the interests of interstate or foreign commerce. This decision is signi-

ficant because it broadens the dam licensing powers of the SCC over all types of impoundments. In 1976, however, the General Assembly passed dam safety legislation which directs the State Water Control Board to promulgate rules and regulations "to ensure that impounding structures in the State are properly and safely constructed, maintained, and operated."[25] A critical exemption of this legislation excludes all dams licensed by the SCC. As a result of the Supreme Court ruling, SCC could license, over a period of years, many dams that would be beyond the review authority of the SWCB.

Under the Water Power Act, the SCC licenses dams for generation of hydroelectric and other forms of power. However, the agency is concerned only with safety standards in the design stage and there is no inspection during or after project construction. This is not a problem with regard to large hydroelectric impoundments because the Federal Power Commission also licenses these structures and does conduct inspections during construction and for the life of the project. There are no federal safety controls, however, for dams used to impound cooling water for fossil or nuclear fueled plants also licensed by the SCC. Consequently, as the present dam safety legislation is written, this type of dam will not be inspected by SCC or SWCB. Furthermore, SCC has not taken any action to develop procedures or guidelines for reviewing requests to construct dams in "Waters of the State." Clearly, the present arrangement for regulating dam safety is confusing and inefficient. This confusion could be eliminated by clarifying the dam safety regulatory responsibilities of SWCB and SCC. First, the Water Power Act could be amended taking away SCC authority to regulate non-power related dams constructed in "Waters of the State." Second, regulation of power-related dams, including those used for cooling purposes, could be the joint responsibility of SCC and SWCB.

The effectiveness of the Commonwealth's efforts to regulate dam safety will also be hindered by the many exemptions in the legislation. As already noted, dams licensed by the SCC are exempted. Other exemptions include: dams designed, constructed or maintained in accordance with specifications of the United States Soil Conservation Service; dams constructed, maintained or operated primarily for agricultural purposes; and, dams creating impoundments of not more than 100 acre feet capacity and not more than 25 feet in depth. (An acre-foot is defined as a volume of water that would cover one acre to a depth of one foot.) There is reason for concern over the long range safety of agricultural dams. As areas urbanize it would not be unlikely for an agricultural structure to be used for water supply or recreational purposes in a densely populated subdivision. Perhaps this problem can be addressed in the rules and regulations being promulgated by SWCB, bringing structures for which the purpose or ownership changes under the provisions of the law.

A similar problem is created by the exemption of dams not more than 100 acre feet capacity or 25 feet in depth. Small dams in populated areas may cause considerable damage. The failure of a relatively small private dam in North Carolina in February, 1976, dramatized the hazard that can result as well as inadequacies in that state's permit and inspection system. The dam that failed had an impounding capacity of 40 acre-feet; it caused four deaths and as much as $1.5 million in damages. It was not included in the Corps inventory but would have come under the provisions of the North Carolina dam safety law. However, while the law governs older structures it does not require them to be registered, and inspections are conducted on a complaint basis only. According to a North Carolina official, nobody in authority knew the dam existed. North Carolina is

now considering safety requirements based on down stream potential for damage (SWCB regulations should also take this into consideration). It is also significant that the federal Department of Housing and Urban Renewal requires an environmental review of smaller structures than included in the Virginia law. Reviews are required prior to approval of financing for any project involving impoundment of two surface acres of 25 acre-feet capacity.[26]

The SWCB should take into account the dam safety permit experiences of North Carolina and of other states and incorporate its findings into Virginia's rules and regulations. In light of the failures of dams in West Virginia, North Carolina, and Idaho and the 12 dams considered potentially hazardous by local administrators in Virginia, the General Assembly should reconsider the types of dams exempted from the dam safety law.

EMERGENCY PREPAREDNESS AND DISASTER ASSISTANCE

Floods are a natural occurrence which cannot be completely prevented or thwarted, but property damages and loss of life can be minimized by an adequate warning system, a predesigned emergency plan of action, and effective coordination of local, State, and federal resources. In the aftermath of a flood disaster, assistance may take the form of emergency repairs, restoration of essential services, and financial assistance for physical and economic recovery. The State Office of Emergency Services is responsible for coordinating State and local actions, monitoring damages, and assessing emergency needs and for administering federal disaster grants.

Warning Systems

One of the most effective ways to reduce flood losses is by use of a warning system that allows sufficient time to put emergency measures into effect. Generally, predictions of flood stages on major streams can be fairly reliable. Flash floods present an altogether different problem, particularly in mountainous areas where streams with small drainage areas rise very quickly and the interval between heavy rainfall and flooding is often too short for emergency preparations. This situation was illustrated on the one hand by Hurricane Camille in 1969 where mountain areas sustained heavy loss of life and property. On the other hand, the City of Richmond 90 miles down river had 36 hours warning before the flood crest reached the city to take safety precautions and avoid loss of life and personal injury.

Warning forecasts include information on the expected height and time of arrival of flood crests, areas to be affected, peak discharges, and maximum velocity. They are prepared for most of Virginia by the National Weather Service Flood Forecast Center in Harrisburg, Pennsylvania and communicated via Weather Service wire circuits to a district office within the affected area. Forecasts are then modified to meet local conditions and communicated to the public and to appropriate private and public agencies. Southwestern parts of Virginia fall within the forecast area of centers in Cincinnati, Atlanta, and Slidell, Louisiana. This apparently does not cause problems for the Weather Service because of rapid communication systems. However, Virginia is considered part of a local forecast area which includes Maryland and Washington, and the Weather Service

Office in Richmond does not have a professional hydrologist. The Office of Emergency Services does consider the lack of local forecasting capability in Virginia to be a problem. During the emergency hours it has been necessary for State Water Control Board hydrologists to make modifications in flood stages forecasted for streams and rivers within the State by the Weather Service office in Maryland.

The State Water Control Board has also taken steps to supplement flood gauges that it maintains throughout the State in addition to those maintained by the National Weather Service and U. S. Geological Survey. Monuments have been placed on high ground opposite existing gauges at 65 points in the State and are designed for easy reading at a distance to prevent information gaps when gauges are inundated or telephone communication with automated gauges is interrupted. However, SWCB still believes that portions of the State, particularly Southside and the Shenandoah Valley, are not sufficiently guaged. Moreover, implementation of newer methods for flash flood prediction are needed. These may include installation of specialized river gauges which sense pre-selected critical water levels and sound an alarm or initiation of self-forecast procedures to enable local officials to collect rainfall data and determine flood crests for their particular community on the basis of predetermined flood curves.

Communications. The success of any warning system is dependent on a viable communications network. Extensive use is made of mass media for alert purposes. But, the police teletype network (VCIN) is used by the Office of Emergency Services (OES) to communicate specific information directly to local governments. Information is relayed to participating local enforcement agencies which are supposed to fan out to all jurisdictions. The lack of voice contact to make certain that messages are received or understood has apparently made the system less effective than desirable. According to OES, there is only a 65% response to monthly tests; response during flooding in September, 1975, was 60 to 65%. Significantly, out of the 45 jurisdictions in the State that consider flooding to be a serious problem, one-third to half indicated on the JLARC survey they had not received adequate warning during five recent flood situations.

There is a National Warning System with 17 local stations in Virginia. It was designed primarily for interstate communication during war emergencies and does not lend itself well to intrastate communication. However, a "Mini-Nawas" warning and communication system now being developed is planned to have telephone communication in each of the planning districts in the State tied to the National Warning System. The federal Defense Civil Preparedness Administration (DCPA) will pay for installation of the equipment, which includes hot lines with voice communication to all the jurisdictions in the planning district, as well as half the operating expense. Local jurisdictions must pay the other half.

Emergency Action Plans

A warning is only useful if a community is able to react rapidly to call on available resources for the protection or evacuation of people and moveable property. This is best accomplished through implementation of a timely emergency action plan that clearly identifies resources and assigns action responsiblities. The Office of Emergency Services has utilized much of a $250,000 federal planning grant to update the Commonwealth's Operations Plan for Peacetime Disasters. According to OES, the plan was tested in October, 1976, with good

results. However, only 111 jurisdictions are engaged in emergency services programs. Most towns do not have emergency action plans and there is a wide range in the comprehensiveness and timeliness of existing local plans. The balance of the $250,000 planning grant will be used by OES to employ three planners through June, 1977, to work with localities to develop plans. This effort will permit completion of approximately two local plans per month. In addition, beginning in January, 1977, OES will obtain a federal matching grant ($25,000 State/$25,000 federal funds) on an annual basis to maintain State and local government peacetime disaster preparedness programs. OES feels a major problem is the funding of personnel and administrative costs for local government emergency services organizations. The Defense Civil Preparedness Agency has for many years provided federal matching funds to State and local governments for civil defense purposes. The dual use of these funds to prepare for national emergencies as well as natural disasters has, until this year, been established as a policy of the federal government. However, in the fall of 1975, the White House Office of Management and Budget adopted the position that because PL81-920, as amended, only authorized the expenditure of federal funds for preparedness for nuclear war, the "dual use" policy is terminated. Since the local governments cannot maintain separate organizations for natural and nuclear war disasters they can no longer qualify for federal matching funds to support their disaster preparedness programs. The Office of Emergency Services is attempting to obtain State funds to support local government participation in disaster preparedness programs until such time as the policy to permit "dual use" of federal funds is restored. Since flood disasters are a major problem in this State, steps must be taken to overcome deficiencies in emergency preparedness planning. This should have a high priority by OES and by local jurisdictions.

Disaster Assistance

There is no provision in the Commonwealth's disaster law for financial assistance to local jurisdictions or to individuals. The State does participate in the recently enacted federal family grant program that requires 25% matching funds. The program is administered by the Department of Welfare and designed to meet the basic needs of flood victims. In addition, the Office of Emergency Services administers federal disaster assistance to local jurisdictions and the State's sum sufficient account to offset extraordinary expenditures by State agencies. The family grant program has not yet been applicable in this State and sum sufficient expenditures have been limited since agencies have either been able to absorb losses or apply for federal reimbursement. Total cost to the State after Hurricane Agnes and two other 1972 storms was $71,728. Of this amount about $60,000 represents salaries for three persons added to the OES staff for processing of disaster assistance claims.[27]

Disaster Declarations. A local emergency is declared by the local governing body when the threat or actual occurrence of a disaster is or threatens to be of sufficient magnitude to be beyond the resources of the locality. A State of Emergency is declared by the Governor when a disaster in any part of the State is severe enough to warrant assistance by the State to supplement the efforts and available resources of the localities and relief agencies involved. If the disaster is beyond the resources of the State, the Governor may request a Presidential declaration of a major disaster which activates federal disaster assistance and recovery programs under PL93-288. There have been four such declarations for Virginia: Hurricane Camille, 1969; Hurricane Agnes, 1972; and

two other storms in 1972. The President may also make a determination that an emergency exists and authorize specialized assistance to save lives and property and ensure public safety during the emergency phase. The Corps of Engineers engages in flood fighting and rescue operations and repairs federally authorized flood control structures. In the case of a severe but limited disaster, the Governor may request aid from specific federal agencies through the Federal Disaster Assistance Administration. Agencies such as the Small Business and Loan Administration and the Farmers Home Administration may declare a limited emergency and provide low interest loans to individuals, small businesses, and farmers. No aid to local jurisdictions is included in this aid category.

Disaster Assistance Claims. In the case of a Presidential declaration, a federal coordinating officer is appointed to work with the State coordinator. Aid to individuals is coordinated through the establishment of one-stop Disaster Assistance Centers in the affected area. Most public and private agencies with assistance programs are represented at the Center to arrange for food, clothing, legal aid, unemployment compensation, and other types of assistance. Federal assistance is available to State and local governments and non-profit organizations for restoration of services, emergency repairs to the level of minimum safety standards, and permanent repairs to pre-disaster levels. In addition, community disaster loans, which under certain conditions may be forgiven, are also available to jurisdictions that suffer substantial loss of revenue due to the disaster. To apply for aid, local governments must designate a local agent, participate in damage surveys with State and federal engineers, and follow up field audits to verify project completion and proper use of funds, and provide suitable documentation of expenses and losses. There is a fiscal audit by the State Auditor and by FDAA prior to final settlement of claims over $25,000.

Reimbursement for damages to public property in Virginia total $19.4 million (See Table 21), either paid or pending as of November, 1975.[28] The processing of disaster claims is a complicated procedure that has caused problems for all levels of government, particularly local jurisdictions. Based on the JLARC survey, of the 87 jurisdictions that had applied for disaster assistance, 57% indicated that they had experienced delays and 18% had received substantial reductions in claim settlements. Those who experienced delays considered both State and federal processing to be a serious problem as well as insufficient information as to the eligibility of projects. Those who had substantial reductions in claim settlements tended to consider delays at the State level more of a problem than the federal level.

Delays at the State level have been addressed by the newly appointed State Auditor who requested additional funds from the General Assembly to expedite this work during the present biennium. As of October 1, 1975, there was a backlog of 19 claims to be audited, dating back to October, 1973.[29] There has also been some confusion over the appropriate depth of a State audit which needs to be resolved by the agencies involved. The Office of Emergency Services questions the necessity for a lengthy, detailed evaluation of documents as well as engineering decisions in view of the pre and post-audits conducted by the Federal Disaster Assistance Administration.

Table 21

DISASTER ASSISTANCE TO JURISDICTIONS AND STATE AGENCIES

Flood	Number of Jurisdictions	Number of Agencies	Total Amount of Assistance
Camille 1969	16	5	$ 5,629,047.32
Agnes 1972	81	14	11,836,001.18
September 1972	3	3*	901,421.00
October 1972	23	2	1,047,787.29
Total	123	24	$19,414,256.79

*Entities other than jurisdictions.

Source: Letter, Deputy Director, Office of Emergency Services, November 26, 1975.

CONCLUSION

Local administrators believe that flooding and stormwater drainage are the most serious water resource problems in the State, but the Commonwealth lacks a coordinated, comprehensive flood management program. The commitment of State resources in terms of personnel and funds is limited. The State role has been mainly reactive to federal initiatives and while commendable efforts at coordination have been made, a project by project or crisis orientation seems to prevail. Although various sources of flood data exist, the data have not been incorporated into a plan for flood management in Virginia. As a logical extension of the water resource planning function, the State Water Control Board should be authorized to develop a statewide flood management program.

Historically, local communities have relied on costly structures such as dams and floodwalls to reduce flood damages. However, federal studies have concluded that structures are most effective when used in combination with non-structural alternatives such as floodplain regulations. In Virginia, nearly two-thirds of the local governments do not regulate the use of land in flood-prone areas. The national flood insurance program is designed to reduce flood losses by requiring communities to adopt floodplain regulations. If a community fails to adopt acceptable floodplain regulations, owners of property in flood-prone areas are ineligible for federal disaster aid and federally guaranteed loans from lending institutions. Most important, property owners are prohibited from purchasing flood insurance. In light of the severe economic and personal losses experienced by local communities in Virginia and the high costs of building flood control projects, the Commonwealth should assume an active role in implementing the flood insurance program. This could include establishment of minimum State floodplain regulation standards to be implemented locally.

The safety of any sort of impoundment is of particular concern as the State population increases. There are over 1,100 dams in Virginia that pose various degrees of hazard. The failure of dams in West Virginia, North Carolina, and Idaho have demonstrated the need for a State administered dam permit/inspection system. The General Assembly has taken an important step in requiring the State Water Control Board to establish dam safety regulations. However, the effectiveness of these regulations will be limited by the many exemptions allowed, includ-

ing continued authority of the State Corporation Commission to license dams constructed in "Waters of the State." Because of the recent flooding disaster caused by the failure of a small dam in North Carolina, the General Assembly should reconsider the kinds of dams that are exempted from Virginia's dam safety law. Also, if the dam safety legislation is to be efficiently administered, the Water Power Act should be amended restricting SCC authority over non-power related dams constructed in "Waters of the State" so that uniform regulatory standards may be implemented by SWCB.

The Commonwealth has taken steps to improve its response to flood disasters. However, more State and local emphasis on local emergency plans, communications systems, and the prediction of flash floods appears necessary. In cases where local claims for federal disaster assistance are still pending because of auditing delays at the State level, requests should be expedited as much as possible.

POWER

Electric power generation is important to the economic development and continued growth of the Commonwealth. However, it is necessary to effectively balance the need for energy with protection of the State's waters for uses such as water supply and recreation. State regulation of power facilities is primarily exercised by the State Corporation Commission (SCC) under the Water Power Act.

Although State authority over hydroelectric facilities has been generally pre-empted by the Federal Power Commission (FPC) which also licenses such facilities, a State license is still required. Nevertheless, the SCC has, in the past, accepted the terms of federal licenses without a critical State level review and has not participated in FPC proceedings, although eligible to do so. Consistent with the intent of House Joint Resolution No. 126, passed by the 1976 General Assembly, the SCC should actively represent State interests before the FPC and conduct a review of proposed projects to determine the need for the facility and to assess its safety and impact on local jurisdictions.

Since availability of environmentally suitable sites will be limited in the long run by statewide growth, power plant siting decisions should be made in the context of overall State water resource needs. This need requires completion of water resource plans by the State Water Control Board.

V. POWER

Water is used for production of hydroelectric power or for cooling purposes in steam electric plants run by fossil or nuclear fuels. In either case, large quantities of water are required and power plants are generally located close to sources of water and may require dams. According to the National Water Resources Commission, in 1970 steam electric facilities accounted for approximately half of the water diverted nationally for any water use.[1] Similarly, large diversions occur in Virginia. According to figures compiled by the State Water Control Board about 86% of the water withdrawn by northern Virginia jurisdictions in 1972 was for power purposes.[2] Since Virginia generally has abundant water supplies, the water needs of power generating facilities have been accommodated with minimal adverse environmental impacts including thermal pollution. Nevertheless, as the State grows, there will be an increasing need to balance the water demand for power generation with other competing water uses and with protection of the State's water resources. The availability of sites for power projects is likely to be limited by urbanization and by public concern over the environmental impact of nuclear plants and major impoundments. A proposed power generating facility on the New River by the Appalachian Power Company has been a recent source of much controversy and litigation. This chapter reviews new developments in regard to facility regulation: the relationship of State and federal regulatory responsibilities; the applicability of the State's Water Power Law; and procedures for evaluating environmental impact and siting decisions. Although power generation has a broad range of environmental and socio-economic impacts, this report focuses on those that are primarily water related.

Legislative Intent

Major State legislation which affects power generation is the Water Power Act and the Utility Facilities Act. The former act was enacted to ensure maximum use of the State's waters for hydroelectric development, and the latter provides for supervision in the public interest of the facility development of electric utilities. Both acts are administered by the State Corporation Commission.

Water Power Act. This law, enacted in 1928, resulted from the need of the Commonwealth for increased taxable income as well as to improve rural life. It was the work of the Water Power and Development Commission. The Commission reported to the 1925 General Assembly that while Virginia's water resources were comparable to those of North Carolina and Tennessee, there was a lower proportion of economic development in Virginia with a corresponding lag in wealth.[3] The report emphasized the need for development of hydroelectric power and identified major power sources among the State's rivers.

The act established State policy as presently expressed in the *Code*:

> ...It is hereby declared to be the policy of the State to encourage the utilization of the water resources in the State to the greatest practicable extent and to control the waters of the State, as herein defined, and also the construction or reconstruction of a dam in any rivers or streams within the State for the generation of hydroelectric energy for use or sale in public service...[4]

It further declared that development of the waters for hydroelectric purposes would be paramount over other uses.[5]

Utility Facilities Act and Public Service Law. The State Corporation Commission (SCC) is also required to determine whether the public would be better served by the construction or expansion of facilities owned by public utilities. The Utility Facilities Act makes it unlawful for public utilities to expand without first obtaining a certificate of convenience and necessity from the SCC.

A 1972 amendment to the Public Service Law requires the SCC to give consideration to the environmental impact of any facility it approves. SCC is authorized to impose conditions on a proposed project to minimize its adverse environmental impact. For this purpose, studies prepared by State agencies and the comprehensive plans of local jurisdictions are considered by SCC.[6] However, the law is not specific as to the depth of study required. It also does not specify the primary factors that would affect decisions (i.e., thermal pollution, competing water uses, future growth, chemical discharge) nor the nature of the proceedings.

Federal Pre-emption. The Federal Water Power Act passed by Congress in 1920 requires the Federal Power Commission to license hydroelectric impoundments. Congress has jurisdiction over the navigable waters of the United States under the commerce clause of the Constitution (Article 1, Section 8) which empowers Congress to "regulate commerce with foreign nations and among the several states." Federal areas of jurisdiction have been considerably expanded over the years as the courts have made the definition of navigability more inclusive. For example, the courts have ruled that waterways which might be made navigable through reasonable improvements, and non-navigable portions of navigable waterways, come under federal regulatory power.

This broad interpretation of navigability mades it highly unlikely that a hydroelectric project of any size will come under state but not federal jurisdiction. Moreover, the Supreme Court of the United States has held that the Federal Power Law supercedes state laws. The decision in the 1946 case of First Iowa Hydroelectric Cooperative vs. Federal Power Commission[7] deals with the relevant issues. The Court stated that the provision in the federal act that requires applicants to furnish satisfactory evidence of compliance with the requirements of state laws does not protect state laws from supercedure and does not itself require compliance with state law. The FPC may take under advisement material which the respective states may have prescribed in state statutes as a basis for federal action. Recognizing the need for greater State involvement in federal proceedings, the 1976 General Assembly acted by resolution to encourage the SCC to use its expertise to a greater extent before federal regulatory agencies to further the interests of the citizens of the Commonwealth. The SCC is urged to appear in cases involving licensing of facilities for construction and in other matters under the jurisdiction of federal agencies in which the SCC has comparable jurisdiction for the Commonwealth.[8]

Organization

The organization for power development and regulation involves federal, State and local agencies as well as investor owned public utilities. The utilities are responsible for long-range planning, site acquisition and facility development

for which they have the right of eminent domain. Local governments may become involved in siting decisions as a result of their planning and zoning authorities.

State Agencies. The State Corporation Commission is responsible for licensing hydroelectric projects and for regulating power generating facilities. This has not been a major part of the Commission's overall function which centers primarily on rate regulation. The State Water Control Board and other State agencies are involved under their own permitting authorities, where applicable, as well as in the review of federal agency Environmental Impact Statements (EIS). The agencies that issue permits are the State Air Pollution Control Board, State Water Control Board, State Department of Health, Marine Resources Commission, Virginia Soil and Water Conservation Commission and the Department of Conservation and Economic Development. Review of federal EIS is coordinated by the Council on the Environment, and the State position is represented before the appropriate federal agency by the Attorney General.

Federal Agencies. The Federal Power Commission licenses the construction and operation of impoundments for hydroelectric facilities located on navigable waters. The licensing procedure takes approximately six years since the applicant must first apply for a permit to study the site (permit good for three years) and then for a license to construct and operate. The license provides for the design, capacity and safety of the facility.

The Nuclear Regulatory Commission regulates power plants that use nuclear fuel issuing both a construction permit and an operating license. The agency is concerned with the safety aspects of the plant and with protecting public health and safety against radiological hazards.

The responsibilities of the Environmental Protection Agency (EPA) and the Army Corps of Engineers apply to all types of facilities. EPA oversees State administration of water quality standards. The Corps is responsible for authorizing construction in navigable waters under the Rivers and Harbors Act. A Corps permit is required for construction of a cooling water intake or discharge facility which extends into navigable waters or their tributaries and for dredge and fill operations. Power may also be generated at Corps-operated dams. In Virginia, this is the case at Philpott Lake and Kerr Reservoir.

PLANNING AND LICENSING

The State role in planning and licensing of power facilities has undergone significant change since enactment of the 1928 Water Power Act. Primary factors in this change have been growing federal involvement in hydroelectric power decisions and the use of other fuels for power generation. Generally, the SCC has not participated actively in the licensing of hydroelectric power projects and the State has failed to incorporate power generating needs into an overall water resource management program.

Applicability of the Water Power Act to Licensing

The 1928 Water Power Law was enacted to encourage development of the State's waters for hydroelectric purposes. The SCC is required to base licensing

decisions for hydroelectric facilities on the finding that the applicant's plans provide for the greatest use of the waters of the State and that the applicant is financially capable of constructing and operating the proposed facility. There is a minimum of two years in which construction must be initiated. The Commission must take into account the respective advantages and disadvantages from the standpoint of the State as a whole. Consideration must also be given to the effects proposed construction will have upon local jurisdictions or upon the prospective development of other natural resources. In addition, the license includes terms with regard to the type of construction, operation, and maintenance of the structure as necessary for the public safety. The law, therefore, provides for development consistent with the public interest regarding economic and safety considerations.

The law as presently applied by the SCC has limited value. As long as the Water Power Act remains in effect utilities could be required to participate in a formal SCC administered public hearing. However, under present SCC regulations, utility companies need not participate in public hearings prior to filing for a federal permit. In the most recent case of the proposed $715 million pumped storage project on Back Creek in Bath and Highland Counties, the Virginia Electric and Power Company applied to the Federal Power Commission for a license without an SCC review of the proposed project. The SCC is willing to accept the terms of an FPC license without conducting a formal public hearing on the project. Moreover, SCC has not participated in FPC hearings on the Vepco project, although eligible to do so.

While it is true that the FPC is also concerned about the development of Virginia's waters for hydroelectric purposes, the State's interests could better be served if the intent of the Water Power Act were to be more fully implemented. The SCC would be instrumental in serving as the initial public forum for at least a preliminary hearing on proposed projects. This would allow development of a comprehensive State position based on public hearings and full evaluation of the impact of a project. The SCC would then act to further the interests of the Commonwealth and to provide useful information to the Federal Power Commission. Presently, the case of the Vepco pumped storage project is before the FPC. Local officials have raised questions about the impact of 1,650 construction workers and their families on county school systems. Officials estimate that $1 million will be needed to educate children of construction workers. The SCC has not developed a State position on this issue, even though the Water Power Act authorizes the Commission to investigate the effects of proposed projects on local communities.

Increased SCC action in licensing proceedings is the intent of House Joint Resolution No. 126 passed by the General Assembly in the 1976 session. The resolution commends the SCC for its appearances before federal agencies and encourages it to use its legal and technical expertise in additional situations to further the interests of the citizens of the Commonwealth. Specified instances include: (1) licensing of facilities for construction whose costs will be borne in whole or in substantial part by the citizens of Virginia; and (2) matters under federal jurisdiction for which SCC has comparable jurisdiction for the Commonwealth. Hydroelectric projects fit within both categories since construction costs are reflected in consumer rates and a State license is required in addition to the federal.

It appears that as presently implemented by SCC the applicability of the Water Power Act is limited with regard to licensing hydroelectric and pumped storage projects. The law should be better used by SCC to develop an official State position with regard to all proposed power projects and to represent State interests before federal regulatory agencies. Consistent with the intent of HJR 126, public utilities should be required to participate in SCC held public hearings prior to applying for FPC permits.

Water Resource Planning

Since availability of water is an essential component in power facility siting decisions, the Federal Power Commission has recently completed a study for the National Water Resources Council on the amount of water needed to meet the nation's projected energy needs. In Virginia, the State Water Control Board will include similar assessments in water resource plans for the river basins. However, as noted in Chapter 1 these plans have been slow to develop. The basin plans could identify potential sites and provide State input into FPC licensing proceedings on proposed power generating facilities. The FPC license for hydroelectric projects is based upon the determination that the project is best adapted to a comprehensive plan for the development and use of water power and for other public uses such as recreation and water quality. However, in the absence of State water resource plans, the FPC can only apply its own view of future water use in the Commonwealth. It is important that the State Water Control Board include water power needs in its water management planning program.

ENVIRONMENTAL REVIEW

Environmental review of proposed power projects is necessary because all forms of power generation have some potential impact on water use and quality. While it may not be possible to eliminate all adverse effects, they can be minimized by the availability of sufficient water, engineering design, and site selection.

Environmental Impact Statements

The federal Environmental Policy Act (NEPA) of 1976 requires preparation of comprehensive environmental impact statements (EIS) for major projects constructed or licensed by federal agencies. Statements are prepared by the Federal Power Commission for hydroelectric projects and by the Nuclear Regulatory Commission for nuclear projects. They are then reviewed by appropriate federal, State and local agencies and at public hearings. The act does not guarantee that adverse impacts will be minimized, but it does require full consideration of the overall impact of projects by federal regulatory agencies. In Virginia, the State Council on the Environment coordinates the response of State environmental agencies. A State position is prepared and presented in the appropriate forum by the Attorney General.

The usefulness of the environmental impact statement process is reduced by inadequate coordination with the permit processes of individual environmental agencies. For example, in Virginia the State Water Control Board is responsible

for certifying that water quality standards will not be violated by the proposed project and the Marine Resources Commission issues permits for any projects affecting wetlands or subaqueous beds. The scope of an agency's environmental review is limited by its statutorily assigned responsibilities. Consequently, it is possible for projects that are not damaging within narrowly defined air or water quality parameters to be undesirable from the standpoint of physical environmental considerations. Unfortunately, present time limits for reviewing permits often require decisions by agencies before the environmental impact statement has been completed or public hearings held. A proposed oil refinery for Hampton Roads has recently occasioned strong opposition from some State agencies and citizen groups because of its overall impact on the environment. However, the EIS public hearing of the Army Corps of Engineers took place after the project had already been granted permits by the State Air Pollution Control Board, State Water Control Board (dredging permit), and Virginia Marine Resources Commission.

It appears that changes in both federal and State laws and procedures may be necessary to improve the process and prevent individual permits from being issued until the comprehensive environmental impact statement has been completed and reviewed. In addition, consideration should be given to requiring a State environmental impact statement for fossil fueled plants. Currently, there is no federal regulating agency required to prepare an EIS on fossil fueled power projects, and State EIS requirements apply only to projects sponsored by State agencies and built with State funds.

The 1976 General Assembly has provided an optional procedure for applicants who wish to make a single application for multiple State permits. If applicants elect this option, individual agencies will still review and approve permit applications, but the Council on the Environment will be able to coordinate and consolidate the hearing and review process within a 90 day period from completion of the single application.[9] This will facilitate complicated procedures for the applicant and avoid duplicative agency hearings. It will also allow the interrelated impacts of a proposed project to be explored by the agencies involved. However, at present, applicants may still choose the option of separate applications to individual agencies. Consideration should be given to making a single application mandatory for all proposed projects to ensure that the overall impact will be adequately assessed. Another possible option is to require State environmental impact statements for large projects, commonly referred to as "key facilities", prior to applying for necessary permits. A State environmental assessment would only be prepared for those projects not covered by federal EIS requirements.

Role of the SCC in Environmental Review

The Public Service Law was amended in 1972 to require the State Corporation Commission to consider the environmental impact of proposed power facilities whenever the Commission is required to approve their construction. SCC must consider the effects of the facility on the environment and establish such conditions as may be desirable or necessary to minimize adverse environmental impact. In these proceedings SCC must consider all State agency environmental reports that relate to the proposed facility and, where requested, comprehensive land use plans of local jurisdictions.

SCC has developed new procedures which appear to apply to all types of power facilities. The agency intends to require applicants to prove that the site selected will have the least impact on the environment based on analysis of alternate sites considered, anticipated emissions into the atmosphere, and quantities of water to be withdrawn or consumed. The SCC, however, is not an agency with an environmental orientation nor with expertise in this type of evaluation, and the legislation is not specific as to the agencies to be consulted or to the nature of the reports to be evaluated. To be effective, the review should be indepth and comprehensive. Recently the report of the Land Use Council, *Siting of Key Facilities*, recommended that the Council on the Environment coordinate the responses of environmental agencies[10] for SCC proceedings. The Council already performs this function for federal and State environmental impact statements and this would be a useful extension of its present duties.

Impact on Water Quality

Power plants must comply with State water quality standards established pursuant to the State Water Control Law and the Federal Water Pollution Control Act Amendments of 1972. Section 401 of the federal law specifies that no federal license or permit may be issued unless the appropriate State agency certifies that discharges will comply with State water quality standards. The permit must be granted or denied within one year or the function is considered waived by the agency. In Virginia the 401 permit is the responsibility of the State Water Control Board which sometimes requires changes in the proposed engineering design in order for facilities to comply with water quality standards.

Thermal Pollution. The State Water Control Board also administers the National Permit Discharge Elimination System (NPDES) which controls discharges into the water, including heat and chemical discharges from power plants. Discharge standards set by the Environmental Protection Agency (EPA) for steam electric plants will require some form of off stream cooling device (i.e., evaporative cooling towers) in order to achieve compliance with the best practicable technology requirements of PL92-500 by 1977. Regulations apply to plants becoming operational after January 1, 1974 and to larger units (500 megawatts or more) which became operational after January 1, 1970. Completion of staggered installments on older plants is required by 1983. However, utilities may apply for variances to the standards. This involves extensive biological monitoring of the river or stream within controlled areas to prove that the cooling tower requirement is too stringent and that the discharge is not harming aquatic life. SWCB will also grant an exemption if the utility proves that it is unable to obtain land for building cooling devices.

According to SWCB, most large plants in Virginia are in compliance with NPDES permits. VEPCO's Yorktown plant has been exempted from best practicable technology requirements of PL92-500 due to lack of available land. Plants at Bremo Bluff, Possum Point, Chesterfield County, Surrey and Portsmouth are being considered for variances.

EPA's discharge standards have been controversial and are being contested nationally by utility companies. Scientific opinion is reported to be divided. Apparently larger plants, while more economical, tend to heighten the potential waste heat problem. Smaller bodies of water may not be able to support consumptive losses or assimilate the heat without detrimental effects on aquatic life

and stream quality. Since concern about thermal pollution is of relatively recent origin, it appears that biological studies being conducted by power companies and research laboratories are needed to clarify the situation. A number of cooling methods are available, including use of free flowing streams for once through cooling, cooling ponds or lagoons, and cooling towers. It is possible that advanced technology could put the waste heat to beneficial use.

Legislative Trends

Many states have already taken steps to improve the decision making capability of regulatory agencies and to minimize adverse environmental impacts of proposed projects. Virginia's inclusion of environmental considerations in SCC procedures is part of this process. States such as Arizona, South Carolina, New Hampshire and Connecticut have also taken steps to forbid power companies from acquiring real property or beginning site preparation or construction prior to receiving certification. Virginia now requires SCC approval for expenditures or financial commitments related to construction of new facilities.

Maryland Power Plant Siting Program. In 1971 the State of Maryland established a comprehensive power plant siting program that combines related environmental and economic factors. The program forms the basis of recommendations to the Maryland Public Service Commission for conditions relating to the design, construction and operation of a power plant that are necessary for the protection of the environment. It combines long-range research, monitoring of existing plants, site evaluation and site acquisition. Funding is partially provided by a surcharge per killowatt hour generated.

The utilities are required by law to provide the Public Service Commission with long range ten year facility plans. Proposed sites in the plans are evaluated on a preliminary basis by the Department of Natural Resources. Unsuitable sites are deleted from the plan and a detailed environmental impact statement is prepared for potentially acceptable sites. These statements must be published at least two years prior to construction, which allows for review in Maryland before the utility applies for a federal license. The law also mandates that the State have in its possession not less than four nor more than eight acceptable sites for utility expansion. These can be available to electric companies to avoid costly delays when sites are rejected by the Public Service Commission. Additionally, the Department of Natural Resources publishes a biennial report of the cumulative environmental impact of all electric power plants operating in the State.

This siting program provides the Public Service Commission with environmental information to be used in certificates of convenience and necessity proceedings. It also serves to reserve environmentally sound sites and to avoid their preemption for other purposes not compatible with power development. A similar program might be adaptable for use in Virginia. This is an area in which further study and consultation with other State and federal regulatory agencies would be useful.

CONCLUSION

Electric energy generation is important to the economic development and continued growth of the Commonwealth. However, it is necessary to effectively balance the need for energy with protection of the State's waters for multiple uses, including industrial and municipal water supply and recreation. Power facilities divert large quantities of water for generation or for use in the cooling process of steam electric plants. Moreover, there are resulting actual and potential negative environmental impacts, principally chemical and thermal pollution of the waters.

State and federal procedures provide for environmental review of proposed projects, but they need to be strengthened. The State now offers applicants the option of a single, consolidated application for permits from individual State environmental agencies. This consolidated procedure administered by the Council on the Environment can provide many benefits to applicants and agencies and result in more comprehensive review of projects. Consideration should be given to making this process mandatory.

The environmental review procedures now required of the State Corporation Commission under the Public Service Law would be facilitated by coordination of agency comments by the Council on the Environment. However, more benefit might be derived from a formally established research and advisory program such as has been established by the State of Maryland. Since availability of environmentally suitable sites will be limited in the long run by increased urbanization, siting decisions should be made in the context of overall State water resource needs. This will require completion of water resource plans by the State Water Control Board.

The State Water Power Law encourages needed power development commensurate with the public safety and interest. Consistent with the intent of House Joint Resolution 126, development of a State position on proposed projects on the basis of SCC hearings prior to federal regulatory proceedings would be beneficial. Also, increased SCC participation in federal regulatory proceedings would help to ensure that all aspects of State and local interest are adequately considered in the licensing of power projects.

RECREATION

This chapter briefly assesses the relationship between water and recreation and the State's efforts to integrate them. The Commission of Outdoor Recreation is responsible for developing the Virginia Outdoors Plan, which analyzes recreation demand and supply and offers a program for meeting identified needs. In general, there is a well conceived and developed plan for outdoor recreation, but it is not coordinated with water resource management plans.

The scenic rivers system has established aesthetic values as a beneficial water use and identified rivers with scenic potential. It does not offer much protection to a river however in the absence of local subdivision commitment to the same goals. More direct measures may be needed to preserve the scenic quality of the Commonwealth's rivers.

VI. RECREATION

Water is a major focus of the $88 million recreation industry in Virginia; many State and local parks derive much of their recreational attraction from water. Principal activities directly related to water are fishing, boating, canoeing, beach use and surfing. Activities such as camping, waterfowl hunting, picnicking, and hiking do not depend directly on water but are enhanced by its proximity. Although water is central to much recreation activity, State recreation programs do not focus on it as a separate element. Rather, water serves as an important criterion for evaluating sites for potential acquisition and development. In addition, acquisition of recreation sites adjacent to water is a major priority of the Virginia Outdoors Plan.

This chapter reviews the relationship between recreation and water and the integration of the two in State water resource programs. Principal areas of interest are: (1) coordination of recreation and water resource planning, and (2) the establishment of the scenic rivers system.

Legislative Intent

State involvement in recreation dates from 1936 when six State parks were established. Until the mid-1960's, involvement was largely based on the availability of surplus federal land in the western parts of the State. However, localities provided the bulk of recreational opportunities readily accessible to most Virginians, a pattern which is still evident today. In 1965, the Outdoor Recreation Study Commission (ORSC) reported a growing demand for recreational opportunities not matched by available facilities and resources. This demand was the product of growth in population, income and leisure time. The Commission recommended that the Commonwealth establish and implement an outdoor and open space policy that would reflect the joint responsibilities of all levels of government, and urged that the Commonwealth's efforts be integrated with and make use of, federal aid programs through the U. S. Bureau of Outdoor Recreation. The establishment of the Virginia Commission of Outdoor Recreation (COR) was recommended to provide coordination for recreation policy and programs. The basic emphasis of the Outdoor Recreation Study Commission was that land and water resources threatened by urbanization and industrialization should be protected and the Commission sought to promote the efficient mobilization of federal, State and local resources to achieve this end.

Two ORSC recommendations were concerned specifically with water. One recommended advance planning and land acquisition in areas of major water impoundment. The ORSC noted that the recreation potential of these reservoirs "...can only be realized fully when the State and localities involved consider in advance the problems of public access, recreation areas, pollution control and zoning."[1] A second recommendation called for initiation of water resource and river basin studies, noting that:

> It is increasingly clear that present demands on Virginia's rivers--their waters and their shorelines--require comprehensive river basin research and planning to conserve our most vital resource and a prime recreation asset. There is no provision for this type of research and planning in Virginia and only an uncoordinated scattering of agencies

concerned with various aspects of water--such as groundwater, surface water, and pollution.[2]

The ORSC recommendations were adopted and reflect the General Assembly's intent to accelerate the pace of recreational planning and development. It is also evident that the conservation of water resources and the provision of adequate water-based recreational opportunities were intended. This effort was to address all aspects of recreation in Virginia and be coordinated with water resource management programs.

Legislative intent introduces two criteria for evaluating recreation as it relates to water. The first is coordination between recreation and water resource planning programs, and the second is the actual provision of water-based recreation facilities--supply versus demand.

Program Organization and Expenditures

All levels of government provide recreational facilities. The federal government provides facilities directly through the U. S. Park Service and the National Forest Service. The U. S. Bureau of Outdoor Recreation administers the Land and Water Conservation Fund from which grants are made to the states for recreation facilities. In the Commonwealth, three State agencies are involved in recreation. These are:

- *The Commission of Game and Inland Fisheries* is responsible for game and wildlife management and the enforcement of the Motor Boat Safety Law. Water related activities include fish propagation, maintenance of wildlife management areas, and provision of boat ramps for the public.

- *The Division of Parks* in the Department of Conservation and Economic Development operates and maintains a system of 20 State parks. Major activities include park acquisition and development and provision of facilities and programs.

- *The Commission of Outdoor Recreation* is the coordinating body for Virginia's recreation programs. The COR is charged with the development and updating of the Virginia Outdoors Plan, the administration of federal grant monies and the development of the State scenic rivers system.

In addition to the above agencies, numerous local governments also provide recreation facilities and programs through recreation departments and park authorities. Appropriations for the three State agencies are shown in Table 22. The figures are for all activities and do not relate exclusively to water.

PLANNING FOR WATER RECREATION FACILITIES

The ORSC was primarily concerned with the coordination of recreation programs in Virginia, but it also recognized the need to balance recreation with competing uses, particularly in water. As a result, two interrelated planning strategies were recommended. The first is the Virginia Outdoors Plan which

Table 22

APPROPRIATIONS FOR RECREATION PROGRAMS[a]
(Fiscal Years 1977 and 1978)

Agency	General Fund	Special Fund	Total	Percent of Total
Division of Parks	$4,345,605	$ 10,000	$ 4,355,605	22%
Commission of Game and Inland Fisheries	---	14,721,225	14,721,225	75
Commission of Outdoor Recreation	479,060	---	479,060	3
Total	$4,824,665	$14,731,225	$19,555,890	100%

[a]Operating funds only. Does not include capital outlay.

Source: Commonwealth of Virginia, *Appropriations Act*, 1976-1978.

analyzes recreation supply and demand, distribution of facilities, and establishes priorities among recreational and regional needs. The outdoors plan is a broad guideline showing generally what kinds of recreation are needed and where; it is not a plan for specific development. The second strategy is water resource planning which relates recreation to other uses within a river basin and develops a strategy by which these various needs can be met.

The Virginia Outdoors Plan

The Commission of Outdoor Recreation has developed three outdoor plans since 1965. The first was based on the Outdoor Recreation Study Commission report. This plan was revised in 1970 and most recently in 1974. The 1974 plan sets goals and objectives for recreational management, provides an in-depth analysis of recreational demand and supply, and includes a program for meeting recreation needs throughout the Commonwealth. Although it is not a blueprint for development, the outdoors plan does identify specific needs for each region of the State and its program is offered as one plan for meeting these needs. An estimate of the cost of the program is included and the plan sets priorities for project development and organization.

The outdoors plan deals extensively with water resources. Where it deals with water the plan describes the need for river mileage for swimming, fishing and canoeing as largely a problem of legal and physical access. Water resource recommendations are as follows.

- Reservoir shorelines should be acquired or controlled so that recreational, aesthetic and economic values are protected.

- A reasonable percentage of the total cost of every water impoundment project should be spent for public recreational areas and facilities where these are compatible with project purposes.

- Utility companies and other construction agencies should coordinate their reservoir planning, power line routing, and other activities which affect the natural environment, with appropriate State agencies at the very earliest.

- Environmental impact and potential for recreation should be taken into consideration in any use of the State's water resources.

- A procedure should be established in the State government for consideration and approval of every proposal for, or alternation of, the State's water resources, for the purpose of determining the recreational or other multi-purpose potential, or the effect on scenic or recreational values. Where a public recreational potential is identified, the State should require that reasonable provisions be made for developing it as part of the project.

- Adequate guidelines for controlling projects which modify the Commonwealth's free-flowing waterways should be financed and translated into regulations by the State Water Control Board, whereupon under existing statutory authority the Board should implement a permit system requiring approval of stream modification projects initiated by federal, State, and local agencies, as well as private landowners.

- Requests from any governmental body for financial assistance for projects involving the use of floodplains should be evaluated with respect to the adequacy of resource management plans and zoning controls.[3]

The plan also recommends development of the State scenic rivers system and declares areas with frontage on the ocean, rivers, lakes, estuaries, and reservoirs to have the highest priority for acquisition or development.

In short, the Virginia Outdoors Plan appears to fulfill the intent of the General Assembly. It is a comprehensive analysis of recreational needs and devotes considerable attention to water recreation.

Water Resource Planning

The second strategy recommended by the ORSC, comprehensive water resource planning, was carried out for only a few years by the Division of Water Resources before it was transferred to the State Water Control Board. Two river basin plans have been prepared and recreation is addressed in each. Currently, the COR is preparing the recreation component of the James River basin comprehensive plan. Water resource planning is discussed more fully in Chapter I, but it should be noted here that the major deficiency in water resource recreation planning stems from SWCB not fully implementing the 1966 legislative mandate for comprehensive water resource planning.

SCENIC RIVERS

The Virginia scenic rivers program was created by the 1970 General Assembly as a means of encouraging the preservation of rivers in their natural state. Designation as a scenic river prohibits impounding or impeding the natural flow of a river without authorization of the General Assembly and requires the appointment of a management agency and an advisory committee of local residents and riparian landowners to work toward preservation of the river's natural and scenic values.

Legislative Intent

The scenic rivers concept emerged because of the desire to ensure the preservation of scenic and natural values in a period of increasing urbanization and industrialization. The intent was not that every stream be left untouched, but rather that their natural and scenic values would be accorded the same recognition given to economic and other uses of water; that values be balanced among each other on a statewide or extra-local basis so that part of this natural heritage could be preserved for future generations. This intent is clearly evident in the Scenic Rivers Act which states:

> It is hereby declared to be the policy of the Commonwealth of Virginia that rivers, streams, runs and waterways including their shores and immediate environs which possess great natural and pastoral beauty constitute natural resources, the conservation of which constitutes a beneficial public purpose. *It is further declared that preservation of certain rivers or sections of rivers for their scenic values is a beneficial purpose of water resource policy.*
>
> The purpose of this legislation is to provide for the *identification, preservation, and protection* of certain rivers or sections of rivers which possess natural beauty of high quality, and therefore should be included in a Virginia Scenic Rivers System to assure their use and enjoyment for their scenic, recreational, geologic, fish and wildlife, historic, cultural, or other values.
>
> In all planning for the use and development of water-related land resources, including the construction of impoundments, diversions, roadways, crossings, channelization, locks, canals, or other uses which change the character of a stream or waterway or destroy its scenic values, *full consideration and evaluation of the river as a resource shall be given before alternative plans for use and development are approved.*[4] (Emphasis added)

The integration of scenic rivers with water resource planning and management was clearly intended by the sponsors. In the original scenic rivers report it was stated that "development of the Virginia Scenic Rivers...would be greatly aided by the broadest possible approaches to water resource planning."[5]

The Scenic Rivers Act also embodies the intent to preserve and protect rivers of exceptional natural and scenic beauty, but how this is to be achieved is never elaborated. The COR is authorized to identify scenic rivers and make recommendations for designations to the Governor and General Assembly, but the means of preserving and protecting the river are left vague. The legislation

says only that no dam shall be built on a scenic river without legislative authorization and that an agency designated by the Assembly shall administer a river "...to achieve the purposes of this chapter, and in accordance with its powers and duties conferred elsewhere by law."[6] The result is a program which identifies and designates scenic rivers and encourages better land use on the part of localities and landowners by suggesting that a river is a resource of statewide significance.

The Scenic Rivers System

The development of the scenic rivers system since 1970 has partially fulfilled the intent of the General Assembly. Scenic values are now recognized as a beneficial use of water and 29 rivers and streams have been identified (See Appendix VI) as possessing characteristics which qualify them as potential scenic rivers. However, both were achieved as part of the initial effort to establish the scenic rivers system; recognition of scenic values was made by the Scenic Rivers Act and the potential scenic rivers were identified in the report which preceded passage of the act. Only two rivers--the Rivanna River and Goose Creek--have been designated as scenic rivers. A third, the Staunton (Roanoke) River, was provisionally designated in 1975, subject to re-enactment of the legislation by the 1978 General Assembly. Four other rivers have been studied for possible inclusion in the system but were not recommended to the General Assembly because of insufficient public support.[7]

Designation of a scenic river in Virginia is a four-stage process which begins when residents of an area request scenic status for a river. The COR reviews these requests and, if warranted, directs its staff to study the river to determine its potential for designation. The staff study evaluates population and economic trends, recreation resources, geology and natural habitat of the river corridor. The study also presents a conservation plan and recommends an agency to manage the scenic river if it is so designated. The study is presented to the COR which then decides whether or not to make a recommendation to the General Assembly. To date, COR has conducted seven studies and three designation bills have been introduced to the Assembly. Two scenic rivers have been designated and both have been placed under the management of local government agencies. Studies for the five other potential scenic rivers recommended management by a State agency such as the Division of Parks or the Commission of Game and Inland Fisheries.

The lack of success in designating scenic rivers is the result of two factors. One is the conflict over desired uses of a river; designation of the Staunton River has been delayed by a proposal to use the river for power generation. There is an unresolved dispute between the desirability of utilizing the river for energy production and maintaining it in its natural state. The lack of State water resource plans means that the General Assembly must choose between two conflicting uses of a river without comprehensive and objective analysis of basin-wide and statewide needs. The unsuccessful attempt to designate the Rappahannock-Rapidan scenic river illustrates the second factor--disputes over how best to manage and protect a river. Local landowners feel that they have done a good job of protecting the river and see no need for the State to become involved. The recommended plan for this river called for management by a State agency and recreational facility development which landowners feared would endanger the scenic quality of the river through increased use.

CONCLUSION

Planning for water-based recreation activities appears adequate but suffers from a lack of integration into water resource management plans. The result is that no overall balance between recreation and other uses exists in Virginia. Water resource policies provide little basis for decision making among competing uses of water. It is necessary to develop comprehensive water resource plans so that the need for and desirability of various water uses, including recreation, are identified and properly evaluated.

The scenic rivers program has established scenic values as a beneficial use and identified rivers of particular scenic value, but it affords protection only where there is sufficient local interest or there are no competing development interests. The vagueness of the protection and management intent of the Scenic Rivers Act has created fears of a State "take-over" of private land.

The original scenic rivers concept was based on the hope that voluntary action on the part of local governments and private landowners would serve to protect the natural and scenic values of Virginia's rivers. The State interest as defined in the Scenic Rivers Act was to preserve and protect potentially scenic rivers by encouraging localities and landowners to take appropriate actions. This approach appears to have been less than successful since only two scenic rivers have been designated. If a legitimate State interest in scenic rivers does exist then it is necessary to re-evaluate the means for promoting this interest.

ORGANIZATION AND COORDINATION

Authority for managing the Commonwealth's water resources is distributed among numerous public agencies. This organization precludes efficient and effective management because it results in fragmented coordination among interrelated water program areas. The nature of the State's current and emerging water supply, quality control, and utilization programs and problems requires better focus and carefully planned direction.

Comprehensive management of water resources can be achieved. Specifically, increased attention to all water resource concerns is needed with the SWCB water pollution control activities closely coordinated with the drinking water safety programs of the Department of Health. To achieve these objectives, the creation of a single organization to address all dimensions of water resource management--supply, conservation and use, and quality--is desirable.

In keeping with previous recommendations of the Commission on Governmental Management, a water resource agency could be created which encompasses the programs of the State Water Control Board and the Bureau of Sanitary Engineering, Department of Health. A citizens board would be retained to advise the agency director, Governor, and General Assembly on policy and planning matters. The establishment of such an agency is one option available to the General Assembly to ensure there is an effective State response to all aspects of water resource management.

VII. ORGANIZATION AND COORDINATION

A centrally coordinated and administered water resource management program does not exist in Virginia. Fourteen State organizations conduct water resource programs and some agencies perform similar, if not identical, functions (Figure 26). At the local level, more than 300 political subdivisions possess the authority to manage water for their own use, and the right of a large number of private individuals to use water is recognized by statute. Because authority is so dispersed, there is no single agency responsible for managing the State's water resources.

The Commonwealth's approach to water resource management is fragmented and oriented to narrowly defined problem areas and does not address the broad interrelationships among them. This orientation is due in large part to the proliferation of federal and State laws that have been enacted over the years addressing specific problem areas such as power, pollution, supply, and flood control. These laws assigned new responsibilities to existing agencies or created new agencies in response to these problems. Furthermore, recent federal initiatives to abate water pollution have prompted the State Water Control Board to concentrate most of its efforts in this one program area at the expense of other equally important water resource concerns. In short, the Commonwealth manages its water resources through numerous programs conducted separately by a wide array of local and State organizations.

THE NEED FOR COORDINATION

If the State is to effectively manage its water resources to meet the needs of all Virginians, coordination will be needed to minimize the adverse effects of various water uses on one another and to promote efficient use of existing waters. The findings of this report indicate that there are three critical areas where coordination is necessary: (1) water resource policy and planning, (2) water pollution control and drinking water safety, and (3) land and water resources.

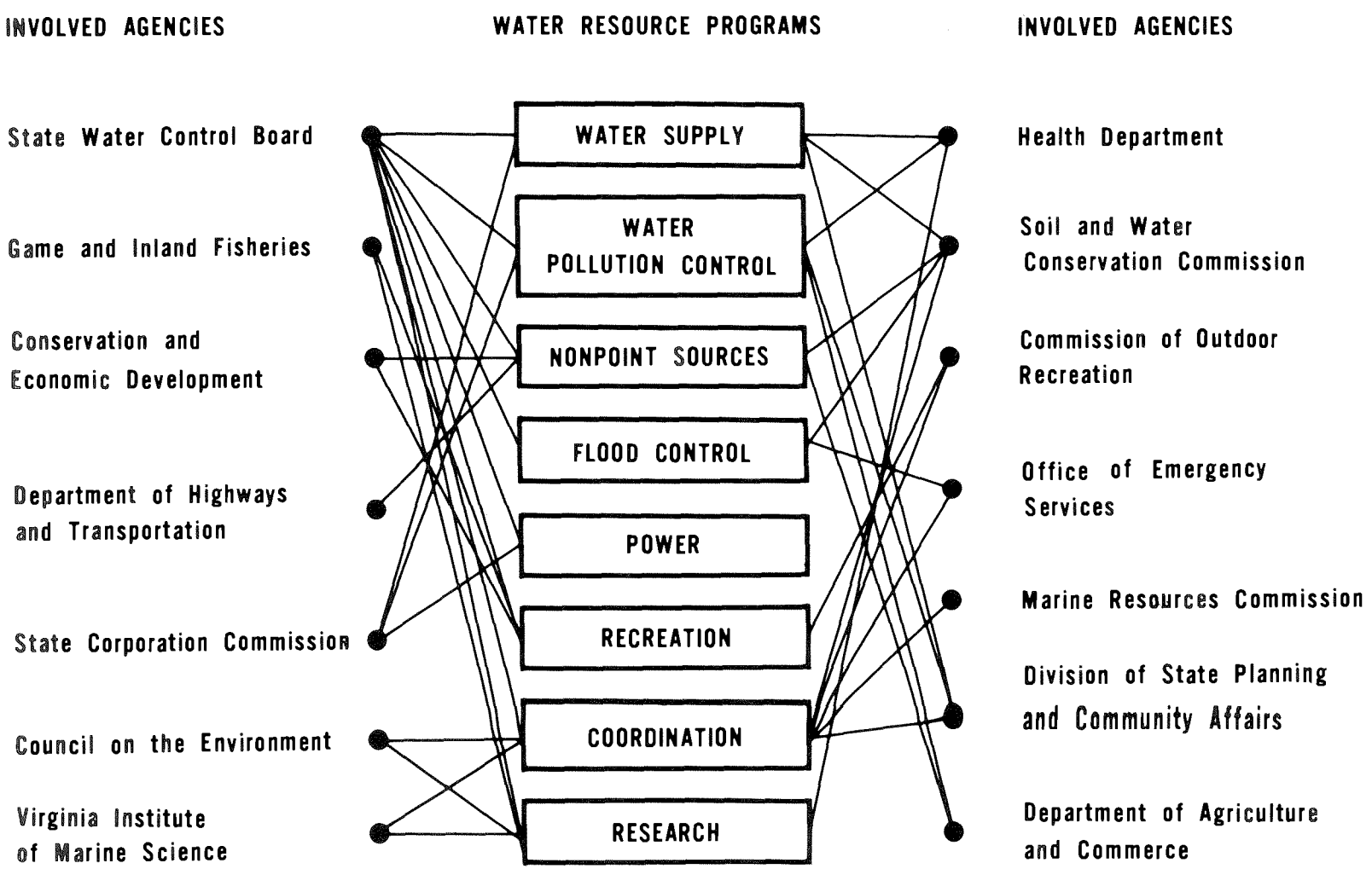
Water Resource Policy and Planning

A State water policy and plan are prerequisites of effective water resource management. Policy reflects a philosophy of water use and establishes the framework for decision making. Policy "...focuses on objectives and establishes priorities, thus encouraging consistency of action and providing guidance for the development of particular water resource plans."[1]

State water resource policies are formulated by numerous public institutions including the General Assembly, Governor, and State agencies. The Constitution of Virginia states that it is the "...Commonwealth's policy to protect its atmosphere, lands and water from pollution impairment, or destruction for the benefit, enjoyment and general welfare of the people of the Commonwealth." The Virginia Environmental Quality Act contains a policy statement almost identical to the one presented in the Constitution. The State Policy as to Waters declares State waters to be natural resources subject to regulation by the State

Figure 26

EXISTING STATE WATER RESOURCE MANAGEMENT RESPONSIBILITIES



Source: JLARC

and reasonable beneficial use to be the criterion for determining the right to use water. Finally, the Water Control Law states that:

> It is in the public interest that integration and coordination of uses of water and augmentation of existing supplies for all beneficial purposes be achieved for the maximum economic development thereof for the benefit of the State as a whole.[2]

These constitutional and statutory provisions establish a general policy of seeking maximum benefit from the use of water consistent with protection of the environment. This policy provides general direction but is of little value in evaluating proposed uses of State waters. The more specific policy which can be used to evaluate proposed water use is the responsibility of the SWCB which is empowered to formulate a statewide water resource policy and water resource plans. SWCB policies and plans were discussed at length in Chapter I; the interest here is their use as guides for decision making and control of water resource use.

Both the SWCB water resource policy and partially completed water resource basin plans provide some guidance for water resource decision making--the former establishes criteria for use of groundwater, surface water, and floodplains and the latter provides basic data necessary for decision making on water uses. To the extent that other water resource organizations are willing to use and follow the policies and plans to guide their decisions, there is consistency of action. These instruments are limited, however, since there is no statutory requirement that other public agencies conform (the one exception to this is water pollution control where SWCB possesses considerable statutory authority). The Governor's Council on the Environment is empowered to coordinate the plans and programs of State environmental agencies but lacks sufficient statutory authority to compel agency compliance.

Another shortcoming of the SWCB water resource policy and plans is the failure to address emerging issues which are central to effective water resource management in Virginia. As noted in Chapter I, SWCB policy fails to address the problem of water shortage and how to obtain water in areas where supply is inadequate. One respondent to the JLARC survey noted:

> ...the State Water Control Board at present is oriented towards water quality and weak in carrying out its assignment in water resources. Any water utility must expand in increments to keep pace with increasing water consumption. Since the State claims ownership to all waters, *the State should provide policies and plans for water resources to benefit the areas in the State that have a demonstrated need.* This would include interbasin transfer, if necessary. (Emphasis added)

Three key factors limit the effective coordination of water resource policies and plans in the Commonwealth: (1) deficiencies in the SWCB water resource policy and lack of plans; (2) considerable program autonomy possessed by State and local organizations involved in water resource programs; and (3) lack of authority to deal with existing water rights. If the Commonwealth is to provide the kind of coordination and leadership needed to develop an effective water resource management program, it must address the full range of water

resource issues rather than limiting itself to one area. As a first step, the State Water Control Board should fulfill legislative intent by addressing the supply problems in its water resource policy and by developing a State water resource plan. Second, the Board should be assigned the responsibility to review, comment and make recommendations on all proposed water related projects to ensure conformity with its policies and plans. Ultimately, however, if effective coordination of all water programs is to be achieved, the Commonwealth may have to regulate water use by administrative review.

Water Pollution Control and Safe Drinking Water

The relationship between water pollution control programs and those to ensure the safety of drinking water is one of particular interest because of recent concern over the effect of drinking water on human health. Water pollution control is commonly perceived as an environmental program while the regulation of drinking water is considered more oriented toward health concerns. In practice, however, both are closely related and impact on public health. The relationship stems from the fact that water used for the disposal of municipal and industrial wastes by one community is often the source of another community's drinking water, and consequently, substances discharged as wastewater can adversely impact the quality of drinking water. Both the SWCB pollution control program and the State Department of Health drinking water safety program seek to eliminate or reduce the presence of harmful pollutants in water, and thus, each is concerned with protecting public health.

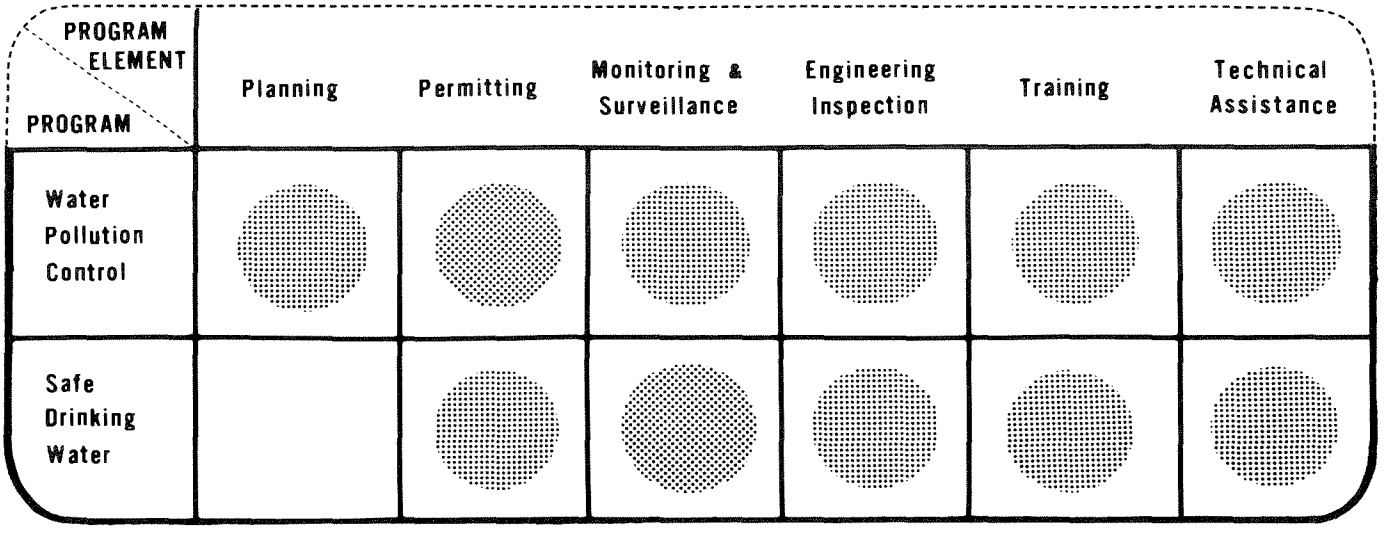
There are also extensive similarities between the two programs. The program elements of each are virtually identical; both issue regulatory permits, monitor system operation, conduct training, provide technical assistance, and enforce State laws and regulations (Figure 27). Water quality standards for the pollution control and drinking water programs are similar, and both programs are based on the technology of sanitary engineering and employ similarly trained personnel. Most important, however, is the fact that the two programs focus on the same bodies of water. In short, the Commonwealth's drinking water and pollution control programs regulate the same water in much the same manner.

The close relationship between drinking water safety and pollution control programs necessitates close coordination between them to ensure protection of public health and the environment. Present statutory and administrative arrangements between the State Department of Health and SWCB encompass only domestic wastewater discharges and exclude discharges of industrial wastewater. This exclusion limits the opportunity for SDH to comment on the potential impact of proposed industrial waste discharges on drinking water. Furthermore, the State Department of Health review of domestic wastewater discharges tends to focus largely on the design of treatment plants, a time consuming activity which reduces its capability to conduct an adequate drinking water safety program.

To correct these deficiencies SDH and SWCB should develop a unified program of water quality management with clearly identifiable activities for pollution control and drinking water safety. In addition to the existing program activities described in Chapters I and II, this new program would include: (1) an inventory of all wastewater discharges showing type, location and geographic relationship to sources of drinking water, (2) an evaluation of potential hazards of each discharge, (3) comprehensive water quality standards which relate to both

Figure 27

SAFE DRINKING WATER AND
WATER POLLUTION CONTROL PROGRAM ELEMENTS



Source: JLARC.

environmental protection and drinking water safety, and (4) adequate staffing for the health department's drinking water safety program.

Development of this unified program can be accomplished within the present SWCB-SDH organizational structure. Responsibility for technical review of proposed domestic wastewater discharges and for sewage plant inspections should be transferred to SWCB. This would allow the Bureau of Sanitary Engineering, SDH to concentrate solely on drinking water safety. Coordination between drinking water safety and SWCB water pollution control activities would be accomplished through BSE review of preliminary proposals for all wastewater discharges, municipal and industrial. Such an arrangement would permit greater surveillance of waterworks and drinking water quality, and would focus greater attention on the relationships between the two programs.

Another option which should be considered is combining the pollution control and drinking water programs into a single water quality program administered by one agency, as recommended by the Commission on Governmental Management. However, merger with the SWCB as presently constituted is not recommended at this time; the Board's unwillingness to integrate water resource planning with its water quality program does not warrant transfer of responsibility for a vital program such as drinking water safety. Instead, the contemplated merger should be achieved as part of any general reorganization and reorientation of State water resource programs. Such a merger would promote more efficient use of existing personnel by combining the dual system of regional offices and different administrative regions presently maintained by the State Water Control Board and Bureau of Sanitary Engineering. Development of single regional offices will

facilitate access by localities and other owners who must now deal with two separate regions and staffs. Most importantly, the combination of the two programs will provide a unified approach to the Commonwealth's water quality management program.

Water and Land Resources

Although this report is concerned with the effectiveness of Virginia's water resource management program, it is necessary to view the management of the water in the context of the broader natural environment. Each of the areas reviewed in this report--water supply, water pollution control, nonpoint sources, flood control, power, and recreation--are closely interrelated with land resource concerns. Water resource management is highly dependent on land use patterns. For example, local land management practices which encourage uncontrolled growth can result in shortages of surface water and in pollution from increased runoff and erosion. In the case of water pollution control, wastewater treatment facility plans must assess changes of land use and community development in order to design adequate facilities. Unfortunately basin water resource planning has been carried out by SWCB without a knowledge of the State's position toward future development in each of the major river basins. The absence of such information makes it difficult to effectively manage the Commonwealth's water resources. In a recent article published by the Virginia Polytechnic Institute and State University, Cooperative Extension Service it was stated that:

> We must soon come to understand that we cannot be serious about managing our water resources unless we are equally serious about managing our land resources. Somehow land-use management must be clothed with respectability--at least with acceptability--if there is to be any real hope of adequately managing our water resources.[3]

The Commonwealth lacks a program to deal with the management of land resources. In an effort to fill this void the Secretary of Commerce and Resources recently appointed two committees to study the land use needs of the State: (1) the Land Use Advisory Committee composed of representatives from citizen and private organizations, and (2) the Land Use Council composed of elected and appointed State officials whose agencies or responsibilities include land use or the environment. The Vice-Chairman of the Land Use Advisory Committee has recognized the major shortcomings of the State's approach to land resource management:

> By statute State Planning (Division of State Planning and Community Affairs) is authorized to prepare and maintain a State master plan but they presently are little involved in the planning carried on by other agencies. This total planning effort, now very fragmented throughout the State government is not coordinated and most unresolved disputes are left unresolved unless they can obtain access to the Governor's office after a crisis has been created.[4]

To date, the Division has not prepared a State master plan. The Secretary of Commerce and Resources, realizing the need for an overall statewide development plan has listed the formulation of a statewide growth policy as a top priority for fiscal year 1976. The Secretary has obtained the assistance of the Division of

State Planning and Community Affairs in formulating this policy. Moreover, the Division along with the Marine Resources Commission and Virginia Institute of Marine Science, has been participating in the preparation of a plan for the future management of the coastal shoreline. The statewide growth policy and coastal zone plan can serve as valuable guides to decision makers in resolving complex land and water resource issues.

Within the past ten years Congress and the General Assembly have tried to bridge the gap between water resource and land resource concerns by enacting laws which require an environmental assessment of proposed projects. The enactment of the National Environmental Policy Act (NEPA) of 1969 and the Virginia Environmental Quality Act of 1972 have provided decision makers with information on the environmental implications of a proposed federal or State project. The Governor's Council on the Environment is responsible for considering the impact of major public and some private actions on air, land and water uses. Because of its small staff, it is nearly impossible for the Council to effectively monitor all water and land resource actions in the Commonwealth.

ACHIEVING EFFECTIVE COORDINATION

Since 1950 several special studies have addressed the issue of water resource management in Virginia. Most concluded that the existing State legislation and governmental organization were inadequate to allow the State to respond effectively and efficiently to growing water resource problems including both water quality and quantity. In order to improve interagency coordination the Legislature transferred all policy and plan-making duties of the Division of Water Resources to the SWCB in 1972. The General Assembly and Governor have made progress in reorganizing Virginia's water resource management agencies and programs, but the Commonwealth still lacks a single State agency that can plan, coordinate, and implement a comprehensive water resource program encompassing both water quality and quantity.

Based on the JLARC review of agency water programs and agencies, an organization to effectively manage water resources in Virginia should meet the following criteria:

- Clearly defined responsibilities and goals for developing programs relating to both water supply and water quality.
- Sufficient statutory authority to formulate and implement water resource plans for the State under any system of water rights law preferred by the General Assembly.
- Equal concern for both public health and environmental protection.
- It must allow for meaningful local and regional involvement in both planning and operations and encourage local initiative and experimentation.
- It must promote efficiency in the provision of water supply and wastewater treatment with decisions being made at the

lowest feasible level of government, but with due recognition of the economies of scale possible through consolidation and regionalization.

- Water resource plans and programs should be developed in conjunction with other resource management programs, especially land use.

- Reorganization should involve the least possible disruption of State and local agencies.

Present Water Resource Reorganization Options

There are many options available to the General Assembly for dealing with the present water resource program organization. First, the General Assembly may choose to maintain the existing arrangement, the least disruptive to State and local agencies. However, the findings of past legislative study commissions authorized to examine the efficiency and effectiveness of water resource management programs in Virginia indicate that this option would perpetuate existing fragmentation and duplication of agency programs and would not provide for a more efficient and effective response to the Commonwealth's water resource problems. The Virginia Advisory Legislative Council (VALC) has proposed transfering the responsiblity for review of plans and specifications for sewerage systems from the State Department of Health to the State Water Control Board. As discussed earlier, consolidation of these activities within SWCB would eliminate much of the duplication and confusion between the Bureau of Sanitary Engineering and State Water Control Board. A third organizational concept, proposed by the Commission on Governmental Management, is the creation of a Department of Air and Water Pollution Control. Within this department would be included the water resource responsibilities of the SWCB and Bureau of Sanitary Engineering, SDH. The advantage of this alternative is the consolidation of similar environmental programs and functions into one agency. The activities of this department would be monitored and coordinated by a Secretary of Natural Resources in the Governor's Cabinet. The most ambitious approach available to the General Assembly is the reorganization of all environmentally oriented agencies, including water agencies, under the direction of a single administrator. This proposal was made by the VALC in 1973, but has not been adopted by the General Assembly.

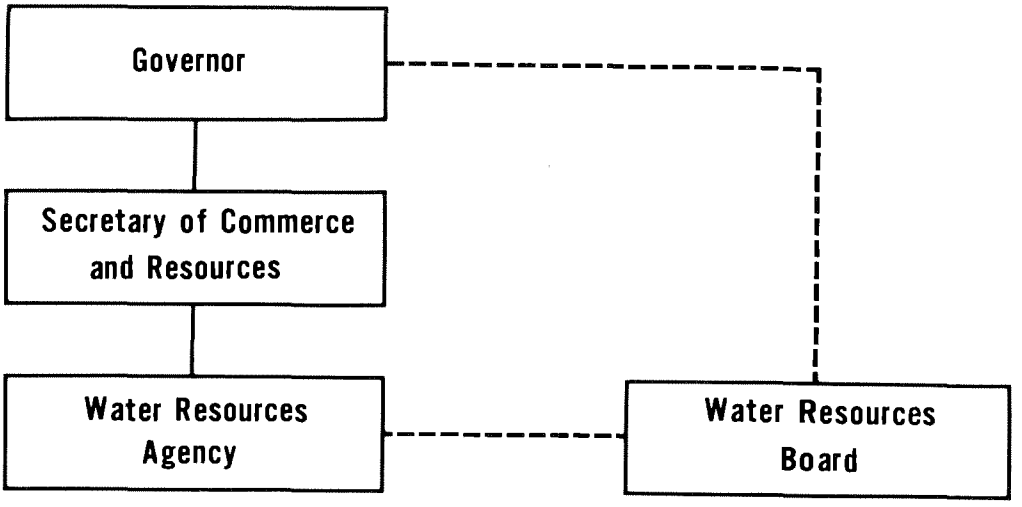
A Water Resource Agency

Most of the options presented above focus on the State organization for water resource management. The traditional notion of water resource management being totally a local responsibility does not apply today. The growing number of water resource problems which are of an interjurisdictional or inter-basin nature require the attention and the leadership of the State. The General Assembly has enacted legislation which authorizes the State to address these problems through a continuous water resource planning process. The preceding chapters of this report indicate that the lack of State leadership in the area of water resource management is of major concern. The SWCB possesses broad responsibility and authority to develop policies and plans to guide State agencies, local governments and individuals in their use of water, but has chosen not to exercise this authority.

Improving coordination and control of the use of water in Virginia requires (1) providing clear leadership and policy on how the water resources of the Commonwealth should be used to promote the general welfare of its people, and, (2) addressing problems in all areas of water resource management, water pollution, water supply, and flood control. One means of accomplishing these objectives could be through a new water resource agency which would encompass the present SWCB. The agency should be headed by a director appointed by the Governor to serve at his pleasure (Figure 28). Program review could be assigned to the Secre-

Figure 28

PROPOSED ORGANIZATION FOR A
WATER RESOURCES AGENCY



Source: JLARC.

tary of Commerce and Resources. Policy would be established by the General Assembly and Governor and would be implemented by the agency.

A citizens board could be appointed by the Governor for fixed terms to serve in an advisory role to the agency director. The powers and duties of the board would include:

- Conducting public hearings on water resource concerns of vital public interest.
- Participating in the formulation of a comprehensive water resource policy for the approval of the General Assembly and Governor.

- Reviewing and commenting on water resource and water quality management plans.

- Reviewing and commenting on annual program and construction grant priorities.

- Establishing and approving water quality standards.

- Advising the director on matters related to the performance of his duties and reviewing internal audit findings.

Orienting the board from a policy making function to largely an advisory role would remove the burden of having to deal with the complex technical areas of enforcement, construction grants, water supply management, and agency administration. The board would have considerably more time to devote to water resource policy making and planning activities and, to obtaining statewide public support of agency programs. Educating the public about critical water resource needs of the Commonwealth would be an on-going concern of the board.

Creation of a water resources agency would involve little administrative reorganization of State agencies. The staff of the present SWCB would form the nucleus of the new agency and only the Bureau of Sanitary Engineering, SDH would have to be transferred to the agency. Statutory changes would be required to establish the agency and board, to clarify and strengthen the agency's authority and to transfer responsibility for public water supply and wastewater control now vested in the SDH. Responsibilities would include all existing SWCB functions as well as the above two programs of the SDH. In addition to water pollution control programs, the agency should be responsible for:

- Administration of the Public Water Supply Law now administered by the Bureau of Sanitary Engineering, SDH which would be transferred to the new water resources agency.

- Development of a State policy and plan for water resource management as now required by the General Assembly. The plan and accompanying recommendations would be submitted to the Governor and General Assembly for approval.

- Review and comment on all major federal, State, and local projects affecting water utilization and development, to ensure consistency with the State water resource plan.

- Review and coordination of all federal and State grants or loans for water related projects.

- Review of State agency programs affecting nonpoint source pollution to coordinate them with water quality control programs. This could be done by cosigning all permits issued for water related activities such as for deep mining and surface mining.

- Development, coordination, and implementation of flood control programs, plans and projects.

- Implementation of the water resource policy and plan approved by the Governor and General Assembly. This could be done through the authority to serve as a conduit for all federal and State funding and to cosign permits.

Internal reorganization of present SWCB and BSE staff and administrative regions would be necessary to permit the agency to effectively assimilate its new functions and discharge its duties.

The proposal to create a new water resource agency is consistent with current trends in the Commonwealth. One trend is the growth of State responsibility for comprehensive management of its water resources. This trend was begun in the mid-1950's with the establishment of the Legislative Commission on Water Resources and continued with the creation of the Division of Water Resources and its subsequent merger with SWCB in 1972. The second trend is toward greater executive responsibility for the management of State programs reflected in the creation of the Governor's Cabinet and more recently in the recommendations of the Commission on State Governmental Management. The above proposal will facilitate more effective management. It emphasizes long range planning for all aspects of water management and provides for State leadership, through the Governor and Secretary of Commerce and Resources, to enable all Virginians to share the benefits of the Commonwealth's abundant water resources.

END NOTES

Chapter I - Water Supply

1. On July 1, 1976, a number of State organizations were re-organized and and re-named. However, organizational references used throughout this report are based on the State organization that existed prior to July, 1976.

2. *Code of Virginia (1950)*, Section 62.1-44.36.

3. *Code of Virginia (1950)*, Section 62.1-44.37 and Section 61.1-44.38.

4. Virginia, Governor's Special Committee on Water Resources, *Report on the Governor and General Assembly*, (Richmond, 1965), p. 3.

5. Ibid.

6. Ibid., p. 8.

7. Virginia, *Acts of Assembly*, Regular Session 1966, Chapter 561, pp. 744-747.

8. Virginia, State Water Control Board, letter from T. M. Petty, Director of Management Services, SWCB, to Philip A. Leone, Senior Analyst, Joint Legislative Audit and Review Commission, November 18, 1975.

9. Virginia, State Water Control Board, Memorandum from D. B. Richwine, Director, Planning Division, SWCB to Philip A. Leone, Senior Analyst, Joint Legislative Audit and Review Commission, March 11, 1976.

10. Virginia, State Water Control Board, Excerpt from the proceedings of the SWCB meeting, April 1-2, 1974, Minute 17.

11. *Code of Virginia (1950)*, Section 15.1-1250.1.

12. Virginia, State Water Control Board, *Groundwater 1975*, (Richmond, 1975), pp. 5, 8.

13. Virginia, Office of the Attorney General, letter from Andrew P. Miller, Attorney General, to Thomas R. McNamara, Chairman, State Water Control Board, January 8, 1976, pp. 3-4.

14. U. S., Environmental Protection Agency, *Preliminary Assessment of Suspected Carcinogens in Drinking Water, Interim Report to Congress*, (Washington, D. C., 1975), p. i.

15. *Code of Virginia (1950)*, Section 62.1-46.

16. *Code of Virginia (1950)*, Section 62.1-47.

17. *Code of Virginia (1950)*, Section 62.1-44.18.

18. *Code of Virginia (1950)*, Sections 32.428 through 32-438.

19. *Code of Virginia (1950)*, Section 62.1-44.18:1 and 62.1-44.18:2.

20. *Code of Virginia (1950)*, Section 62.1-44-18 and 62.1-44.19.

21. Virginia, State Water Control Board, *Budget Exhibit*, (Richmond, 1975), p. B-1.

22. U. S., Congress, *Public Law 93-523*, Section 1413.

23. U. S., *Federal Register*, XL, No. 153, August 7, 1975, 33224 - 33239.

Chapter II - Water Pollution Control

1. Virginia, Address, Governor E. Lee Trinkle (House Document Number 2, 1924).

2. *Code of Virginia (1950)*, Section 62.1-44.2.

3. *Code of Virginia (1950)*, Section 62.1-44.5.

4. Virginia, State Water Control Board, *Water Quality Standards*, (Richmond, November, 1974), p. iii.

5. Ibid., p. 3.

6. Virginia, State Water Control Board, *Water Quality Inventory*, (Richmond, April, 1975), p. 2.

7. Ibid., p. 5.

8. Ibid., p. 115.

9. Ibid.

10. Ibid., p. 103.

11. Ibid., p. 125.

12. Ibid.

13. Ibid., p. 102.

14. Ibid., p. 134.

15. Ibid., p. 135.

16. Ibid.

17. Ibid., p. 144.

18. Ibid., p. 151.

19. Ibid., p. 155.

20. Ibid., p. 156.

21. Ibid., p. 157.

22. Ibid., p. 173.

23. Ibid., p. 172.

24. Ibid., p. 173.

25. Ibid.

26. *Code of Virginia (1950)*, Section 62.1-44.15(13).

27. U. S., National Commission on Water Quality, *Issues and Findings* (Washington, D. C., November, 1975), pp. 1-68.

28. Virginia, State Water Control Board, Response to JLARC *Preliminary Report on Water Resources Management in Virginia*, August 20, 1976, p. 25.

29. Virginia, State Water Control Board, *NPDES Quarterly Non-Compliance Report*, (Richmond, November, 1975 - January, 1976).

30. Virginia, State Water Control Board, *Major Municipal and Industrial Reports--Yearly Summary--1975*, (Richmond, 1975).

31. Ibid.

32. Meeting with Mr. R. E. Bowles, Director, Bureau of Enforcement, State Water Control Board, January 13, 1976.

33. Virginia, State Water Control Board, *Industrial Minor Exception Reports*, (Richmond, July - December, 1975).

34. U. S., Environmental Protection Agency (Region III, Philadelphia, Pa.), *Evaluation Report--Virginia Fiscal Year 1976 Water Pollution Control Program Plan*, (Washington, D.C., February 27, 1976), p. 3.

35. *Roanoke Times*, March 20, 1976. p. 2.

36. U. S., General Accounting Office, *Implementing the National Water Pollution Control Permit Program: Progress and Problems*, (Washington, D. C., February 9, 1976), p. 40.

Chapter III - Nonpoint Sources of Pollution

1. Virginia, Water Resources Research center, *Water News*, November, 1975, p. 3.

2. *Richmond Times-Dispatch*, "Secondary Pollution Faced", October 26, 1975.

3. Virginia, State Water Control Board, *Budget Exhibit*, (Richmond, 1975), p. WQ2.

4. Virginia, State Water Control Board, *Water Quality Inventory (305(b)) Report, Virginia, 1975 Report to EPA Administrator and Congress*, Information Bulletin 509, (Richmond, April, 1975).

5. Virginia, *Report of the Task Force on Erosion and Sedimentation Control,* (Richmond, 1971), p. 4.

6. Ibid, p. 7.

7. Virginia, State Water Control Board. *(305(b)) Report,* p. 50.

8. Virginia, State Water Control Board, *Long Range Planning Goals,* (Richmond, June, 1975), p. 54.

9. *Roanoke Times*, "Erosion Control in the County", April 26, 1975.

10. Virginia, State Water Control Board, *Long Range Planning Goals,* p. 51.

11. Virginia, Water Resources Research Center, *Water News,* February, 1976, p. 11.

12. Virginia, Water Resources Research Center, *Water News,* January, 1976, p. 9.

13. Virginia, State Water Control Board, *(305(b)) Report,* p. 12.

14. *Nonpoint Water Pollution,* (presented at the S.E. Regional Conference, Virginia, Water Resources Research Center by John R. Churchill, Interagency Coordinator, Water Planning Division, U. S. Environmental Protection Agency, (Blackburg, May, 1975)).

Chapter IV - Flood Prevention and Control

1. Virginia, State Water Control Board, *Memorandum on the Proposed Flood Damage Reduction Act*, (Richmond, Va., 1975) p.1.

2. U. S., Congress, House of Representatives, *Unified National Program for Managing Flood Losses*, 89th Congress, 2nd Session, House Document #465, Government Printing Office, Washington, D. C., August 10, 1966, p. 14.

3. *Code of Virginia (1973)*, Section 62.144.36.

4. *Code of Virginia (1973)*, Section 15.1486 and Section 15.1466.

5. *Code of Virginia (1973)*, Section 62.1148.

6. *Code of Virginia (1973)*, Section 15.131.

7. *Code of Virginia (1975)*, Section 21.2.

8. Virginia, Soil and Water Conservation Commission, letter from Donald L. Wells, Deputy Director, to Susan Urofsky, Associate Analyst, Joint Legislative Audit and Review Commission, February 20, 1976.

9. Virginia, Office of Emergency Services, *Budget Exhibit*, (Richmond, 1975), p. 1.

10. Virginia, State Water Control Board, *Ark*, (Richmond, Winter, 1975-76).

11. Virginia, Office of Emergency Services, letter from Harold K. Anderson, Deputy Coordinator, OES, to Susan Urofsky, Associate Analyst, Joint Legislative Audit and Review Commission, November 26, 1975.

12. Ibid.

13. U. S., Army Corps of Engineers, *Agnes in Virginia*, (Virginia, 1972), p. 134.

14. U. S., Geological Survey, *Effects of Urban Development on Floods in Northern Virginia*, Geological Survey Water Supply Paper 2001C, (Washington, D.C., 1970), p. C21.

15. Ernst Liebman, *Legal Problems in Regulating Flood Hazard Areas*, ASCE National Water Resources Engineering Meeting, (Washington, D. C., 1973), p. 22.

16. Material provided by the Federal Insurance Administration, Washington, D. November 12, 1975.

17. Virginia, State Water Control Board, *Ark*, (Richmond, Winter, 1975-76).

18. Ibid.

19. Material provided by the Federal Insurance Administration, Washington, D.C., November 12, 1975.

20. U. S., Department of Agriculture Soil Conservation Service, *Annual Progress Summaries Small Watershed Projects PL 534 and PL 566*, (Richmond, 1975), pp. 41-42.

21. Virginia, Water Resources Research Center, *Water News*, February 1976.

22. Ernst Liebman, *Legal Problems in Regulating Flood Hazard Areas*, pp. 4-5.

23. U. S., Congress, House of Representatives, *Unified National Program for Managing Flood Losses*, p. 1.

24. Virginia, State Water Control Board, *Long Range Planning Goals*, (Richmond, 1975), p. 104.

25. Virginia, *Acts of Assembly*, Chapter 710, April 11, 1976.

26. Raymond, Parish, Pine and Plavnick, *Land Use Issues in the Siting of Key Facilities*, A Report Prepared for the Division of State Planning and Community Affairs, Commonwealth of Virginia, Washington, D. C., 1975, p. 40.

27. Telephone Conversation between Susan Urofsky, JLARC, and Harold K. Anderson, Deputy Coordinator, Virginia Office of Emergency Services, December 2, 1975.

28. Harold K. Anderson, Letter, November 26, 1975.

29. Virginia, Office of Emergency Services, Memorandum from George L. Jones, Coordinator, OES to Wayne Whitham, Secretary of Transportation and Public Safety, July 11, 1975.

Chapter V - Power

1. U. S., National Water Commission, *Water Policies for the Future*, (Washington, D. C., June, 1973), p. 173.

2. Virginia, State Water Control Board, *Planning Bulletin 264*, (Richmond, September, 1972), pp. 340 PS -- 3-47 PS.

3. Virginia, Water Power and Development Commission, *Water Power The Key to Virginia's Development*, (Richmond, October, 1925), p. 7.

4. *Code of Virginia (1973)*, Section 62.180.

5. *Code of Virginia (1973)*, Section 62.182.

6. *Code of Virginia (1973)*, Section 5646.1.

7. First Iowa Hydroelectric Cooperative v. Federal Power Commission, 328, U.S. 152 (1946).

8. Virginia, House Joint Resolution No. 126, 1976.

9. Virginia, *Acts of Assembly*, Chapter 466, 1976.

10. Virginia, Land Use Council, *Final Report Findings and Recommendations on the Siting of Key Facilities*, (Richmond, December, 1975), p. 10.

Chapter VI - Recreation

1. Virginia, Outdoor Recreation Study Commission, *Virginia's Common Wealth*, (Richmond, 1965), p. 10.

2. Ibid., p. 11.

3. Virginia, Commission of Outdoor Recreation, *Virginia Outdoors Plan 1974*, (Richmond, 1974), p. 15.

4. Virginia, *Acts of Assembly*, Chapter 468.

5. Virginia, Commission of Outdoor Recreation, *Virginia's Scenic Rivers*, (Richmond, 1970), p. 9.

6. *Acts of Assembly, 1970*, Chapter 468.

7. *Outdoors Plan*, p. 87.

Chapter VII - Organization and Coordination

1. William R. Walker and William E. Cox, "Virginia Water Policy: The Imprecise Mandate," *William and Mary Law Review*, 1972, p. 312.

2. *Code of Virginia*, Section 62.1-44.36(3).

3. William R. Walker and William E. Cox, "Land and Water: Kissing Cousins," Virginia Polytechnic Institute and State University Cooperative Extension Service, *Land: Issues and Problems*, October, 1975.

4. Michael C. Ritz, *The Commonwealth's Land Use Concerns: The Perspective of the Land Use Advisory Committee*, Paper presented at a conference on the Commonwealth's Land Use. December 2, 1975.

GLOSSARY

Administration of Water Rights	The distribution of water according to priority of right.
Aquifer	An underground bed or stratum of earth, gravel, or porous stone that contains water.
Biochemical Oxygen Demand (BOD)	A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. Large amounts of organic waste use up large amounts of dissolved oxygen; thus, the greater the degree of pollution, the greater the BOD.
BOD_5	The amount of dissolved oxygen consumed in 5 days by biological processes breaking down organic wastes.
cfs (cubic feet per second)	A measure of the amount of water passing a given point; 1 cubic foot = approximately 7.48 gallons.
Combined Sewers	A sewerage system that carries both sewage and storm water runoff. During dry weather combined sewers generally carry all the sewage to treatment plants; during storms only part of the sewage and storm water is carried to the treatment plants, and the remainder is discharged, untreated, directly into waterways.
Consumptive Use	A loss of water from a surface or groundwater supply due to withdrawals of water that are not returned directly to the supply. Water may be absorbed, evaporated, or incorporated into a manufactured product and therefore lost for immediate further use.
Cost Benefit Analysis	The comparison of the expected benefits of a water project with the anticipated costs of the project. Ordinarily, unless the computed benefits exceed the computed costs, the project is not considered feasible.
Dam	A structure built to hold back the water of a stream or any flowing water.

Depletion	The withdrawal of water from surface or groundwater reservoirs at a rate greater than the rate of replenishment.
Diversion	The removal of water from a natural watercourse.
Ecology	The interrelationships of living things to one another and to their environment.
Effluent	The outflow of used water from a sewer, holding tank, industrial process or agricultural process which introduces pollutants into bodies of water; pollutants may be untreated or partially or completely treated.
Environment	The sum of all external conditions and influences affecting the life, development and ultimately the survival of a living thing.
Erosion	The natural wearing away of the land surface by wind or water that is often intensified by man's land-clearing practices.
Floodplain	The land area bordering a body of water which is subject to flooding.
Floodway	The riverbed and immediately adjacent lands needed to convey high velocity flood waters.
Fossil Fuels	A term for coal, oil and natural gas fuels that are derived from the remains of ancient plant and animal life.
Groundwater	Water that occurs beneath the earth's surface in an aquifer or natural reservoir.
Heavy Metals	Metallic elements such as mercury, arsenic and lead that are generally toxic in low concentrations to plant and animal life.
Impoundment	A body of water, such as a pond, lake or reservoir confined by a dam, dike, floodgate or other barrier.

mgd (millions of gallons per day)	A common unit of measurement for the quantity of water pumped for domestic and industrial uses in a day.
National Pollutant Discharge Elimination System (NPDES)	A system of permits issued to municipal and industrial dischargers of wastewater into bodies of water; permits set a maximum allowable rate and amount of each pollutant to be discharged and a sequence of actions leading to compliance with discharge limits.
Nonpoint Source	The pollutants that do not flow from a pipe but that enter the water through runoff or drainage from the land which can carry sediments, pesticides, urban wastes and mine acids.
One Hundred Year Flood	A statistically computed flood having an average frequency of occurence of once in 100 years, although a flood this size could occur in any year or in successive years; used by most government agencies to delineate flood-prone areas.
Orphaned Land	The lands which have been stripped of vegetative cover through the mining process and not replanted or reseeded.
PCBs (Polycholorinated Biphenyls)	A group of organic compounds used in the manufacture of plastics that are highly toxic to acquatic life, are biologically accumulative, and exist in the environment for long periods of time.
Primary Sewage Treatment	The first stage in waste water treatment in which floating or settleable solids are mechanically removed by screening and sedimentation.
Reclamation	The process of restoring mined land to its natural state.
Reservoir	A pond, lake, tank or basin, natural or man made, used for the storage, regulation and control of water.
Riparian Doctrine	A system of water law which vests the right to use surface water in the owners of property adjacent to a body of water; water used must be

	reasonable and not substantially diminish either the quantity or the quality of water for use by downstream owners.
River Basin	The total area drained by a river and its tributaries.
Runoff	The portion of rainfall, melted snow or irrigation water that flows across ground surfaces and eventually is returned to streams.
Secondary Sewage Treatment	The use of biological processes to accelerate the decomposition of sewage and remove virtually all floating and settleable solids and approximately 90 percent of both BOD_5 and suspended solids.
Sediment	Soil or mineral material transported by water and deposited in streams or other bodies of water.
Septic Tank	An underground tank used for the treatment of domestic wastes; wastewater is received directly from the home.
Sewer	A pipe or conduit used to collect and carry away sewage or stormwater runoff from the generating source to treatment plants or receiving streams; sanitary sewers convey household and commercial sewage and storm sewers convey runoff. In some instances both are conveyed in combined sewers.
Standard Project Flood	A statistically computed flood which represents a reasonable upper limit of anticipated flooding in a geographical area.
Surface Water	Water on the land surface as in lakes and streams.
Thermal Pollution	The degradation of water quality by introduction of a heated discharge; deviations from normal water temperatures can affect aquatic life.
Waste Treatment Plant	A series of tanks, screens, filters, and other processes by which pollutants are removed from water.

Water Pollution	The addition of sewage, industrial wastes, or other harmful or objectionable material to water in concentrations or in sufficient quantities to result in measureable degradation of water quality.
Water Quality	The chemical, physical and biological characteristics of water in respect to its suitability for a particular purpose.
Watershed	The area drained by a given stream.
Water Supply Source	A stream, surface or underground body of water from which a supply of water is or can be obtained.
Waterworks	The system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed.

APPENDICES

TECHNICAL APPENDIX

Part 1 SURVEYS

As part of the water resource management study JLARC conducted: (1) a survey of local administrators; (2) a survey of the quality of drinking water produced by local waterworks, and (3) a review of water quality sampling data used by the State Water Control Board. A brief summary of each follows:

Survey of Local Administrators

A mail survey was conducted of chief administrators of all counties, cities, and towns in Virginia--a total of 324 officials. Questionnaires were mailed out the first week in January, 1976. Included along with the questionnaires was a prepaid, addressed envelope for each respondent. A reminder was sent out to each respondent two weeks later. A total of 240 usable questionnaires were returned. The rate of return for each of the three levels of local government follows:

	Number Received	% Returned
Counties	72	76%
Cities	33	80%
Towns	135	72%
Total	240	74%

Waterworks Survey

In order to ascertain the effectiveness of the Bureau of Sanitary Engineering drinking water program, JLARC staff reviewed analyses of water samples data submitted by the various waterworks or collected by Bureau personnel and analyzed by Consolidated Laboratories. This review was conducted on a random sample of water systems under the jurisdiction of BSE as of September 1, 1975. The original sample contained 191 systems in each of the five BSE regions. The size of the sample was determined to be that which would assure a tolerance level of $\pm$ 3.9% with a confidence level of 95% for an observed incidence of 10%. Systems were selected for the sample in random order with every seventh system being included. The starting point for the selection was determined randomly. Since JLARC was also interested in variations among systems of different sizes and larger systems comprised a very small proportion of the total population, a supplemental sample of systems with service populations greater than 5,000 was selected for use in analyzing these variations. The same procedure used in drawing the regular sample was also used for this purpose and every third system greater than 5,000 was selected to produce an additional sample of 21 larger systems.

BSE files were reviewed between November, 1975 and January, 1976 at four of the five regional offices. The full sample was reviewed only for the Richmond North region, reduced samples were used for three regions and the

Abingdon region was omitted entirely. The reduction in sample size was occasioned by the very low incidence of bacteriological contamination (less than 1%) in the Richmond North region. A spot check of a second region showed the same low incidence. The reduction was accomplished by taking a sample of the sample (approximately one-half). The comparison between the size of the two samples may be seen in the following table.

COMPARISON BETWEEN ORIGINAL AND REVISED SAMPLES

	Original		Revised	
Region	Regular	Extra	Regular	Extra
Richmond North	55	4	53	5
Richmond South	35	5	15	3
Lexington	45	6	23	2
Norfolk	26	3	13	2
Abingdon	30	3	0	0
Total	191	21	104	12

Review of Water Quality Data

The objectives of the JLARC review of water quality data were twofold: (1) To measure the extent to which water quality standards were being met; and (2) To determine whether the quality of the State's water is improving or getting worse. The results of the JLARC analysis were then compared with the findings of the State Water Control Board 1975 *Water Quality Inventory Report*.

In order to assess the quality of the State's waters, JLARC conducted a review of SWCB water quality sampling data available through the U. S. Environmental Protection Agency STORET (Storage and Retrieval) computerized system. In late 1975 a request was made to SWCB for an inventory of all fixed sampling stations maintained since 1968, the year SWCB first began collecting water quality data. There were 1000 stations in 1975, about 800 more than existed in 1968. Because of JLARC's interest in conducting a trend assessment of water quality data, only those stations with the longest continuous sampling data history were selected for analysis. There were 198 such stations over the period 1968 to 1975. A weakness of the SWCB 1975 water quality analysis was the failure to hold stations constant. SWCB compared water quality conditions between the periods 1967-71 to 1972-74. However, the water quality data between these two periods is not comparable since new sampling stations were constantly being added to the monitoring network by SWCB.

Since concentrations of pollutants in receiving waters will vary depending on the speed and amount of water flowing in the stream, water quality standards are based on a particular rate of stream flow; namely the lowest average 7-day stream flow expected to occur during any 10-year period. The concentration of pollutants can be adjusted statistically to determine what it would be at the 7-day, 10-year low flow. However, this information is not readily available, and SWCB does not include flow data in its water quality

analysis. Therefore, JLARC did not account for the flow of rivers in its analysis.

Selection of Stations. With the assistance of the State Water Control Board staff the 198 stations were plotted on maps by river basin and river. At least one river was chosen for analysis from each of the eight major river basins in Virginia. The selection of rivers was somewhat constrained by the location of sampling stations and the availability of water quality data. For example, water quality sampling of many rivers was not inititated until 1972, and some river segments are still not sampled. In the end, 106 stations were selected for final analysis representing 20 different rivers. Sixty-eight stations were sampled nearly every month during the period January 1970 to December 1975; 38 stations were sampled only during the summer months, usually June through September. The basins, rivers, sampling stations and river miles are presented in Table TA-1.

Water Quality Parameters. The next major step in the analysis was selection of water quality parameters which would serve as fairly good indicators of progress being made toward achieving the 1983 goal of making water suitable for fishing and swimming uses. It was decided that sampling data on dissolved oxygen and fecal coliform organisms would adequately serve this purpose.

- *Dissolved Oxygen - dissolved oxygen is essential to oxidizing organic wastes. If it is not present in sufficient quantities, wastes accumulate and the water becomes septic. Therefore, dissolved oxygen is a good indicator of other organic waste material being in the water.*

  Oxygen must also exist in sufficient quantities to allow fish and other aquatic life to breathe. For the rivers evaluated by JLARC 4.0 mg/l was used as the minimum standard for protection of aquatic life.

- *Fecal Coliform - fecal coliform bacteria are found in human feces. Although generally harmless to man, public health sanitarians believe the occurrence of coliforms are a good index to the presence of harmful fecal-borne pathogens that are difficult to detect. Since pathogenic organisms can cause dysentary and other diseases, close monitoring of fecal coliform bacteria is an important concern of the public.*

  All rivers that were classified by SWCB as secondary contact recreation (boating, fishing, etc.), JLARC used the fecal coliform standard of 2000/100 ml. For rivers classified as primary contact recreation (swimming, water skiing, etc.). JLARC used the standard of not to exceed a log mean of 200/100 ml.

Because of variations in sampling frequency, 68 stations had reasonably good monthly data since January 1970 to December 1975 for dissolved oxygen and since January 1971 to December 1975 for fecal coliform organisms; 38 stations had dissolved oxygen and fecal coliform data for the identical time periods, but for the summer months only, usually June through September.

Dissolved oxygen and fecal coliform data were taken from STORET printouts provided by SWCB and transferred to specially designed forms to identify missing values by month. Where sampling data were absent, a simple procedure

TA-1

SELECTED STATIONS
FOR ANALYSIS BY RIVER BASIN AND RIVER

RIVER BASIN/RIVER	Total Number of Stations	Summer Only	River Miles
Potomac-Shenandoah			
N. Fork Shenandoah	9	-	10.34- 90.16
Shenandoah River	2	-	22.63- 48.00
S. Fork Shenandoah	6	-	.58- 92.69
James			
Appomattox River	4	2	1.53-109.69
Chickahominy River	7	-	2.17- 74.79
E. Branch Elizabeth River	2	2	.07- 4.62
James River	17	9	7.77-309.13
Nansemond River	2	2	2.77- 16.23
Rappahannock			
Rappahannock River	18	15	8.42-147.10
Roanoke			
Dan River	4	-	56.84-100.00
Roanoke River	7	-	38.20-209.59
Chowan			
Blackwater River	4	-	0.0 - 70.73
Tennessee and Big Sandy			
Levisa Fork	3	-	130.00-146.49
Clinch River	4	-	211.00-323.61
N. Fork Holston	4	-	8.78- 85.20
York			
Mattaponi River	1	1	1.34
Pamunkey River	2	2	.98- 56.87
South Anna River	2	-	44.05- 96.83
York River	5	5	1.38- 28.10
New River			
New River	3	-	30.15- 83.29
Total	106	38	

was used for substituting the missing values. In most cases, a value was computed for the missing month by taking the average between the month preceding and following the missing value. In those cases where more than one sample was taken during a month, an average value was computed for the month.

In determining whether the dissolved oxygen (4.0 mg/l) and fecal coliform (200/100 ml.) standards were being met over the study period, JLARC reviewed monthly sampling data for consistent violations of water quality standards. This was done for each station and recorded.

Determination of dissolved oxygen trends were difficult to compute because of the lack of river flow data. Therefore, JLARC simply calculated the annual means for dissolved oxygen during the period 1970 to 1975. Annual means were then plotted for dissolved oxygen to identify any significant downward or upward trends in water quality. Any noticeable trends were compared with the incidence of water quality standard violations. A major drawback to this analysis is that from a statistical standpoint it is impossible to state with certainty that the quality of a stream is getting worse or better. JLARC used the results of this trend analysis as a general indicator of changes in water quality over a long period of time.

PART II QUESTIONNAIRES

Samples of each JLARC survey are presented on the following pages: (1) Statewide Water Resources Survey of Local Jurisdictions and (2) Survey of Sanitary Regulation.

COMMONWEALTH of VIRGINIA

Joint Legislative Audit and Review Commission
Suite 200, 823 E. Main Street
Richmond, Virginia 23219
(804) 770-1258

The Joint Legislative Audit and Review Commission is in the process of evaluating a number of water resource management programs in Virginia. Our study is most directly concerned with questions related to water pollution, water supply, flooding, erosion, and organization for water use planning. Each of these program areas have an important impact on counties, cities and towns; and, we believe that factual information and opinions provided by local administrators are an invaluable part of our research.

You are one of a group of local administrators across the State who have been selected to receive a questionnaire. It is important that each questionnaire be answered as completely and candidly as possible. If you wish to explain your response to any question, please feel free to attach additional comments. In addition, members of our staff may need to contact you to clarify a specific response. Your individual response will not be made available to anyone outside our agency and will be treated in strict CONFIDENCE.

Please take a few minutes to complete the questionnaire and return it to us today. A pre-addressed stamped return envelope is enclosed for your convenience. If you have any questions about this survey, please call Mr. Philip Leone (804) 786-1258.

Thank you for your prompt assistance.

Sincerely,

Ray D. Pethtel
Director

RDP:hlf

COMMONWEALTH of VIRGINIA

Joint Legislative Audit and Review Commission

STATEWIDE WATER RESOURCES SURVEY OF
LOCAL JURISDICTIONS

I. GENERAL BACKGROUND INFORMATION

1. Please identify your jurisdiction.
( ) County ( ) City ( ) Town of _____ .
(specify)

2. Please indicate the approximate population of your jurisdiction: (Please check.)

( ) Less than 1,000
( ) 1,001 to 2,500
( ) 2,501 to 5,000
( ) 5,001 to 10,000
( ) 10,001 to 25,000
( ) 25,001 to 50,000
( ) 50,001 to 100,000
( ) 100,001 to 250,000
( ) Greater than 250,000

3. Is your jurisdiction encountering any water resource problems in the following areas? (Circle the appropriate number for each area below.)

	Serious Problem	A Problem But Not Serious	No Problem
Surface Water Pollution	3	2	1
Ground Water Pollution	3	2	1
Surface Water Supply	3	2	1
Groundwater Supply	3	2	1
Flooding	3	2	1
Non-Point Source Pollution	3	2	1
Storm Water Drainage	3	2	1

II. THIS SECTION IS DESIGNED TO OBTAIN INFORMATION ON WATER SYSTEMS SERVING 25 OR MORE INDIVIDUALS OR 15 OR MORE CONNECTIONS, BOTH PUBLICLY AND PRIVATELY OWNED.

1. Does your jurisdiction have adequate volumes of usable water to meet present water supply needs? ( ) Yes ( ) No

2. Is your present water source capable of supplying all anticipated water demands in your jurisdiction through the year 1990? ( ) Yes ( ) No

3. Has the legal authority of your jurisdiction under the Commonwealth's riparian law (i.e., the common law doctrine which grants the right to use water to owners of property adjacent to water bodies) affected the ability of your jurisdiction to locate and develop new sources of water to meet growing demands? ( ) Yes ( ) No

- If Yes, what effect did it have?

( ) We were unable to develop an adequate source.
( ) We were unable to develop any source.
( ) We were unable to complete a project in time to meet needs.
( ) We cannot be certain about the dependability of a new source because of the possibility of legal actions brought by riparian owners.
( ) Other (Please specify.) _____

4. Do you think that the right to use specific amounts of water from a particular body of water should be allocated by the Commonwealth through the issuance of permits rather than on the basis of riparian law.
( ) Yes ( ) No

5. Has your jurisdiction received assistance from the State Water Control Board in determining future water supply needs or locating and developing new water sources? ( ) Yes ( ) No

- If Yes, was this assistance helpful?

( ) Yes, very helpful.
( ) Yes, somewhat helpful.
( ) No, not helpful at all.

6. Has your jurisdiction adopted a water conservation program?
( ) Yes ( ) No

7. During the past 5 years, have there been any interruptions of service in any water system serving your jurisdiction which prevented the distribution to the entire system for more than 24 hours? ( ) Yes ( ) No

8. Has your jurisdiction adopted a plan to meet water supply needs in the event that the regular system(s) cannot function? ( ) Yes ( ) No

9. Are there areas or communities in your jurisdiction that face potential health hazards because of unsafe or inadequate drinking water? ( ) Yes ( ) No

- *If No, skip to question 10.*

- If Yes, approximately how many persons are exposed to these health hazards?

_____

- What are the major problems in obtaining adequate and safe water for these areas or communities? (Check as many as apply.)

( ) Insufficient quantity
( ) Water unfit for consumption without extensive treatment
( ) Water unfit for consumption under any circumstances
( ) Inadequate distribution systems
( ) Inadequate treatment facilities
( ) Other (Please specify.) _____

10. Have there been any outbreaks of disease traceable to public drinking water supplies in your jurisdiction during the past 5 years? ( ) Yes ( ) No

- If Yes, how many outbreaks? _____

III. THIS SECTION DEALS WITH IMPLEMENTATION OF THE EROSION AND SEDIMENT CONTROL ACT.

1. Does your jurisdiction have erosion problems?
( ) Yes, very much ( ) Yes, somewhat ( ) No, not at all

2. Does your locality administer an Erosion and Sediment Control Ordinance either singly or in conjunction with another jursidiction? (Please check one.)

( ) Yes, under a State approved program.
( ) Yes, under a local program which has not received final State approval.
( ) No, a program is currently being developed.
( ) No, a program is not being developed at present.
( ) No, I am/will be included under a program administered by another jurisdiction. (Please specify.) _____
(Name of other jurisdiction.)

If you chose one of the Yes responses above, please answer all of the following questions.

If you chose one of the No responses above, please skip to question 8.

3. Did your jurisdiction have an Erosion and Sediment Control Ordinance prior to the enactment of the State's 1973 Erosion and Sediment Control Act?
( ) Yes ( ) No

- If Yes, what changes were/will be required to receive State approval? (Check as many as apply.)

( ) Adoption of the State's conservation standards
( ) Removal of activities exempted by the State
( ) Addition of enforcement and penalty provisions
( ) None
( ) Other (Please specify.) _____

_____

4. How many persons conduct on-site inspections to enforce the Erosion and Sediment Control Ordinance in your jurisdiction? _____

- Do any of these persons have other duties? ( ) Yes ( ) No

- Approximately how many man-hours are spent by these persons each week enforcing the ordinance? _____

5. For developments covered by the Erosion and Sediment Control Ordinance are any of the following required of a developer before issuance of a permit to build?

	Yes	No
Submit an erosion and sediment control plan for approval	( )	( )
Post a performance bond or establish an escrow fund	( )	( )
(Please specify the amount(s). _____		
Other _____	( )	( )

6. Was your State-approved ordinance enacted prior to June 30, 1975?
( ) Yes ( ) No

- If Yes, when? _____

If No, skip to question 8.

7. For the period that the ordinance was in effect between July 1, 1974 and June 30, 1975 please indicate the number of each of the following actions taken by your jurisdiction because a developer did not comply with the Erosion and Sediment Control Ordinance. (Please indicate the number.)

_____ Delayed building permit
_____ Denied building permit
_____ Revoked building permit
_____ Called violator
_____ Sent letter to violator
_____ Used escrow fund to correct erosion problem. Please indicate the amount spent. $_____
_____ Billed developer for correcting erosion problem.
_____ Took violator to court

- How many building permits were issued during the period covered above?

_____

8. Do you feel that the more critical erosion problems in your jurisdiction are covered by the Erosion and Sediment Control Act? ( ) Yes ( ) No

9. Do/will any of the following prevent you from adequately controlling erosion in your jurisdiction? (Check as many as apply.)

( ) Exemption of surface or deep mining from the Erosion and Sediment Control Act
( ) Exemption of tilling, planting or harvesting or agricultural, horticultural, or forest crops from the Erosion and Sediment Control Act
( ) Exemption of railroad structures or facilities from the Erosion and Sediment Control Act
( ) Exemption of preparation for separately built single family residences from the Erosion and Sediment Control Act
( ) Exemption of installation of public utility lines from the Erosion and Sediment Control Act
( ) Other exemptions of the Erosion and Sediment Control Act
( ) Lack of manpower to enforce the Act
( ) Lack of technical expertise to evaluate developers' erosion control plans
( ) Lack of adequate penalties
( ) Lack of strong enforcement authority at the State level
( ) Lack of control over erosion problems in existing developed areas
( ) Lack of control over increased runoff caused by a series of developments
( ) Exemption of State agencies (i.e. Highway Department) from local erosion ordinance controls

10. Have there been any law suits in your jurisdiction because of erosion problems? ( ) Yes ( ) No, but threatened ( ) No

11. Does your jurisdiction have a completed soil survey? ( ) Yes ( ) No

- Do you feel that a completed soil survey is/would be helpful to your jurisdiction in administering an Erosion and Sediment Control Ordinance? ( ) Yes ( ) No

12. For the groups listed below, please indicate whether you feel they should receive training in erosion and sediment control and whether you have held any training programs for them.

	Need Training (Check one)		Training Program Held (Check one)	
	Yes	No	Yes	No
Erosion Control Administrators	( )	( )	( )	( )
Developers	( )	( )	( )	( )
City/County Engineers	( )	( )	( )	( )
Inspectors - Enforcement Personnel	( )	( )	( )	( )
Other (Please specify.) _____	( )	( )	( )	( )

13. Have you received technical assistance from any of the following agencies in preparing an Erosion and Sediment Control Ordinance or in solving your erosion problems? (Check as many as apply.)

	Received Help in Preparing Ordinance	Received Help in Solving Erosion Problems
State Water Control Board	( )	( )
Virginia Soil and Water Conservation Commission	( )	( )
Local Soil and Water Conservation District	( )	( )
U. S. Soil Conservation Service (federal)	( )	( )
Other (Please specify.) _____	( )	( )

IV. THIS SECTION IS CONCERNED WITH THE SAFETY OF DAMS AND FLOOD CONTROL.

1. Do you have any publicly or privately owned dams within your jurisdiction?
( ) Yes ( ) No

- *If No, please go to question 5.*

- If Yes, please check the type(s) of dam(s).

( ) water supply
( ) flood control
( ) public recreation
( ) mining
( ) residential subdivision
( ) farm ponds
( ) power generation or cooling
( ) mill pond
( ) other (Please specify.) _____

2. Have any of these dams ever failed (i.e. overtop, washout, leak, bank erosion, collapse, etc.)? ( ) Yes ( ) No

- If Yes, please indicate the type(s) of dam(s) that failed and indicate whether damage resulted.

Type of Dam	Damage Yes	Damage No
_____	( )	( )
_____	( )	( )
_____	( )	( )

3. Is there any evidence that any existing dams may pose potential safety hazards? ( ) Yes ( ) No

   • If Yes, please indicate the type(s) of dam(s).

   _____ _____

   _____ _____

   _____ _____

4. Are any dams regularly inspected for safety by officials from your jurisdiction? ( ) Yes ( ) No

5. How often is your jurisdiction subject to the following types of flooding?

	Frequently	Rarely	Never
River or stream flooding	( )	( )	( )
Tidal flooding	( )	( )	( )
Flash flooding	( )	( )	( )

6. What type of land usually floods? (Check as many as apply.)

   ( ) farm land
   ( ) residential
   ( ) parks
   ( ) business or industry
   ( ) undeveloped
   ( ) none

7. If your jurisdiction experienced significant flooding during the past eight years, please complete the following question. Some of the major floods have been listed, but please list any others that affected your jurisdiction. (Do not include drainage problems.)

   (Check whether flooding occurred, whether advance warning was adequate and the extent of damage.)

	Flooded		Adequate Warning		Extent of Damage		
	Yes	No	Yes	No	Severe and Widespread	Severe in Limited Area	Light or none
Hurricane Camille 1969	( )	( )	( )	( )	( )	( )	( )
Hurricane Agnes 1972	( )	( )	( )	( )	( )	( )	( )
October Storms 1972	( )	( )	( )	( )	( )	( )	( )
March Storms 1975	( )	( )	( )	( )	( )	( )	( )
September Storms 1975	( )	( )	( )	( )	( )	( )	( )
Others (Please specify.)							
_____	( )	( )	( )	( )	( )	( )	
_____	( )	( )	( )	( )	( )	( )	
_____	( )	( )	( )	( )	( )	( )	
_____	( )	( )	( )	( )	( )	( )	

8. Did your jurisdiction apply for federal disaster assistance funds during the last eight years? ( ) Yes ( ) No

- *If No, skip to question 9.*

- If Yes, were significant delays encountered in settling the claims or were there substantial reductions in claim settlement?

( ) Yes, significant delays ( ) No significant delays
( ) Yes, substantial reductions ( ) No substantial reductions

- If significant delays were encountered or substantial reductions made in claim settlements, please indicate the extent to which each of the reasons cited below were a problem. (Circle the appropriate number.)

	Serious Problem	A Problem But Not Serious	No Problem
Insufficient information concerning eligibility of projects	3	2	1
Incorrect local damage assessment	3	2	1
Insufficient local documentation	3	2	1
Delay of Emergency declaration in Virginia	3	2	1
Delays in Federal agency processing	3	2	1
Delays in State agency processing	3	2	1
Delays in County agency processing	3	2	1
Other (Please specify.) _____	3	2	1

9. Please indicate whether any of the measures listed below to combat flooding and flood related problems have been initiated within your jurisdiction in 1969 or before, after 1969, initiated but dropped, or not initiated at all.

	Initiated in 1969 or before	Initiated After 1969	Initiated But Dropped	Not Initiated at all
Planning for flood control structures	( )	( )	( )	( )
Construction of flood control structures	( )	( )	( )	( )
Development of flood plain maps	( )	( )	( )	( )
Development of an operational emergency plan	( )	( )	( )	( )
Channelization of streams	( )	( )	( )	( )
Regulation of flood plain development	( )	( )	( )	( )
Funding of warning devices	( )	( )	( )	( )
Development of Master Plan for flood control	( )	( )	( )	( )
Enrollment in federal flood insurance program	( )	( )	( )	( )
Other (Please specify.) _____	( )	( )	( )	( )

10. Please indicate whether your jurisdiction is enrolled in the federal flood insurance program. ( ) Enrolled ( ) Not Enrolled

- If your jurisdiction is not enrolled, please check the reason(s) that apply and skip to Section V of the questionnaire.

( ) Not designated by HUD as flood prone area
( ) Designated by HUD but disagree with land areas covered by FIA flood maps
( ) Disagree with program concept
( ) Unable to take necessary steps to become eligible
( ) Other (Please specify.) _____

_____

- If your jurisdiction is enrolled please answer the following questions:

  - Are Federal Insurance Administration maps satisfactory? ( ) Yes ( ) No

  - If No, please check the reason(s).

    ( ) Too much land included
    ( ) Not enough land included
    ( ) Incorrect assessment of the flood problems

  - Did or will entry into the regular program require substantial change in the way your jurisdiction regulates development on the flood plain?
    ( ) Yes ( ) No

  - Please provide your best estimate of the number of businesses and residences located in the flood prone areas on the Federal Insurance Administration map.

    Number of businesses _____ Number of residences _____

  - Will the number of flood insurance policies sold in your jurisdiction protect most of these businesses and residences?
    ( ) Yes ( ) No ( ) Don't know how many policies have been sold

11. Please check the reason(s) that may have limited the number of policies purchased.

( ) Lack of sufficient publicity
( ) Lack of initiative on part of insurance sales people
( ) Failure of lending institutions to require flood insurance
( ) Minimal flood losses in recent years
( ) Limited number of new construction starts or major improvements
( ) Structural flood control measures in place
( ) Other (Please specify.) _____

_____

V. THE FOLLOWING QUESTIONS APPLY TO WATER QUALITY PROGRAMS AND THEIR IMPACT ON JURISDICTIONS.

1. Has your jurisdiction received any federal or State financial support to improve water quality? ( ) Yes ( ) No

   • If Yes, please indicate under which programs.

   ( ) Public Law 660
   ( ) Federal Water Pollution Control Act Amendments of 1972
   ( ) HUD Water and Sewer Grants
   ( ) HUD Community Development Block Grants
   ( ) Farmers Home Administration
   ( ) Appalachian Regional Commission
   ( ) Economic Development Administration
   ( ) Other (Please specify.) _____

2. Since 1972 has your jurisdiction encountered any delays from state agencies in processing wastewater project plans and specifications for federal funds?
   ( ) Yes ( ) No ( ) Never Submitted Plans and Specifications

   • If Yes, where have you encountered delays? _____

3. Has there been any change in your jurisdiction's water quality in the last five years? ( ) Improved ( ) No Difference ( ) Gotten Worse

   • If water quality has <u>improved</u> what kind of benefits have been derived by your jurisdiction?

   ( ) Increased property values.
   ( ) Economic Development (Attracted industries.)
   ( ) Commercial Fishing (Increased fish yield.)
   ( ) Health (Reduction or elimination of water quality related diseases.)
   ( ) Municipal Water Use (Decreased pre-use treatment costs.)
   ( ) Esthetic
   ( ) Recreation (Increases in water based recreational activities such as fishing and swimming.)
   ( ) Ecological (Improved natural environment.)
   ( ) Too early to tell
   ( ) None
   ( ) Other (Please specify.) _____

   _____

4. Are non-point sources of pollution (those which are not from a pipe, such as run-off from streets, parking lots, strip-mines, farms, etc.) a more serious water quality problem in your jurisdiction than point sources (municipal and industrial discharges)? ( ) Yes ( ) No

5. What is your jurisdiction doing to reduce pollution from non-point sources. (Check as many as apply.)

   ( ) Including ways to control non-point sources in our land use regulations
   ( ) Developing an erosion and sediment control ordinance in compliance with State laws
   ( ) Participating in areawide P.L. 92-500, Section 208 planning
   ( ) Applying for federal funds to control non-point sources
   ( ) No actions are being taken at this time.
   ( ) Other (Please specify.) _____

6. Are any areas of your jursidiction part of a formally established drainage district? ( ) Yes ( ) No

7. Is your jurisdiction preparing or has it adopted a storm water drainage improvement plan? ( ) Yes, preparing ( ) Yes, adopted ( ) No

8. Does your jurisdiction require developers to control storm water drainage run-off?

   ( ) within the limits of their project ( ) No
   ( ) beyond the limits of their project

9. Does your jurisdiction assess developers for providing drainage facilities located outside the property owned by him? ( ) Yes ( ) No

10. Is your jurisdiction included in a completed Metropolitan/Regional Plan and/or a 303(e) (or 3-C) basinwide water quality management plan? ( ) Yes ( ) No

    • If Yes, how are these plans used by your jurisdiction? (Check appropriate statements.)

    ( ) To determine present and future local wastewater needs and priorities.
    ( ) To find regional solutions to local water pollution problems.
    ( ) To coordinate between my jurisdiction and other State and local agencies.
    ( ) To become eligible for federal water pollution control grants.
    ( ) They are not of much use.
    ( ) Other (Please specify.) _____

    _____

VI. THE FOLLOWING STATEMENTS ARE CONCERNED WITH COOPERATION AND COORDINATION OF WATER RESOURCES MANAGEMENT PROGRAMS IN YOUR PLANNING DISTRICT.

1. Based on my experience, cooperation and coordination between federal, State, regional, and local agencies involved in water resources management is satisfactory? ( ) Yes ( ) No

2. The A-95 Project Notification and Review System and Environmental Impact Statements have improved coordination of water projects in my planning district. ( ) Yes ( ) No

3. Do you use basin water resources plans prepared by State agencies as guides in making local water supply and wastewater decisions or do you rely primarily on your own jurisdiction's planning studies? (Please check.)

   ( ) State basin water resource plans
   ( ) Local plans

4. In your opinion what type of water resources planning and implementing organization would best meet your future water resource (water supply and water quality control) needs? (Check the appropriate level(s).)

	Local Government	Local/Areawide Authority	Planning District	River Basin Commission	State Level Agency
Planning	( )	( )	( )	( )	( )
Implementing	( )	( )	( )	( )	( )

Please explain.

IF YOU WOULD LIKE TO MAKE ANY ADDITIONAL COMMENTS ABOUT THE STATE'S WATER RESOURCES MANAGEMENT PROGRAMS PLEASE FEEL FREE TO DO SO.

Name _____

Title _____

Phone Number _____

THANK YOU FOR YOUR COOPERATION.

SURVEY OF SANITARY REGULATION

Name of System: _____

Location: _____

Ownership: ( ) Public ( ) Private

Design Capacity: _____ Population Served: _____ No. Connections _____

Source: ( ) Surface ( ) Spring ( ) Well

Treatment: ( ) None ( ) Filtered ( ) Chlorination

( ) Iron Removal ( ) Softening ( ) Other

Bacteriological Quality

Number Samples Taken	Number Positive Samples	Number Positive Samples W/Positive Check Samples

Chemical, Radiological, Pesticidal Quality

Type of Analysis	Results

Number of Sanitary Surveys _____

_____

(Record Taker)

Indicator:

( ) Positive Bacteriological Check Samples
( ) High Chemical Concentrations
( ) High Pesticide Concentration ( ) Complaint
( ) High Radioactivity ( ) Poor Physical Quality

Date: _____

Response: ( ) Visit ( ) Telephone ( ) Letter ( ) None

Problem(s) Encountered: _____

_____

_____

Nature of Problem: ( ) Health ( ) Aesthetic

Action Taken: _____

_____

_____

Problem Resolved? ( ) Yes ( ) No ( ) Can't Tell From File

Date of Resolution: _____ Time Elapsed: _____

Indicator:

( ) Positive Bacteriological Check Samples
( ) High Chemical Concentrations
( ) High Pesticide Concentration ( ) Complaint
( ) High Radioactivity ( ) Poor Physical Quality

Date: _____

Response: ( ) Visit ( ) Telephone ( ) Letter ( ) None

Problem(s) Encountered: _____

_____

_____

Nature of Problem: ( ) Health ( ) Aesthetic

Action Taken: _____

_____

_____

Problem Resolved? ( ) Yes ( ) No ( ) Can't Tell From File

Date of Resolution: _____ Time Elapsed: _____

Appendix I

Table I-1

POPULATION OF WATER SHORT REGIONS IN VIRGINIA

	1973[a]	1980[b]	1990[b]	2000[b]
Planning District Eight Northern Virginia	985,500	1,150,000	1,380,000	1,586,400
Planning District Twenty Southeastern Virginia	770,000	827,000	898,000	952,800
Planning District Twenty One Peninsula	330,900	373,500	430,500	490,300
Total	2,086,400	2,350,500	2,708,500	3,029,500
Percent of State	43	44	45	46

[a]Source: Tayloe Murphy Institute, *Estimate of the Population of Virginia Counties and Cities, July 1, 1972 & July 1, 1973,* (Charlottesville, Va.: 1974).

[b]Source: Virginia, Division of State Planning and Community Affairs, *Population Projections, Virginia Cities and Counties 1980-2000,* (Richmond, Va.: 1975).

Table I-2

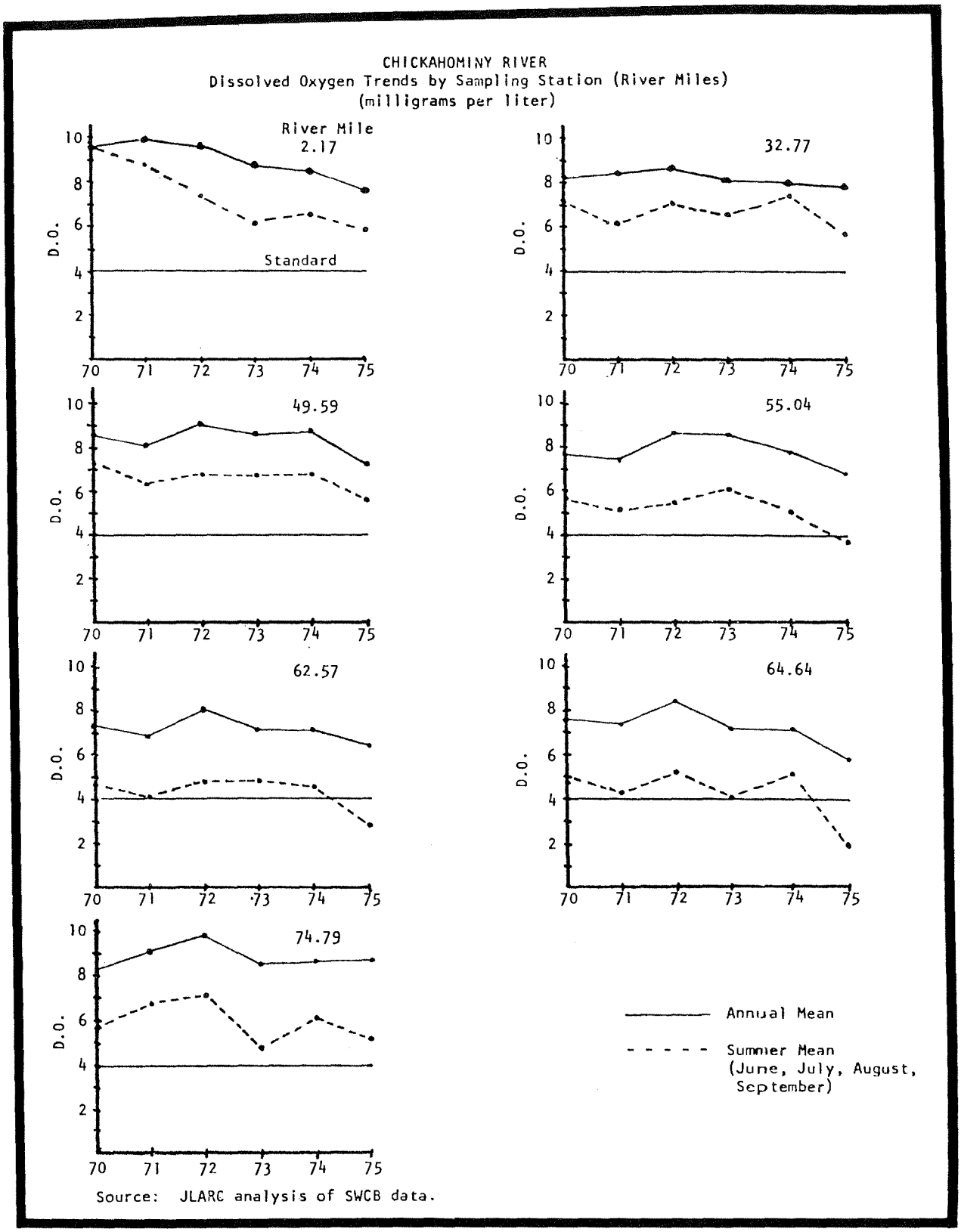
POPULATION AND URBANIZATION TRENDS
IN VIRGINIA

	Population	% Urbanized
1930	2,421,851	NA
1940	2,677,773	35.3
1950	3,318,680	47.0
1960	3,954,429	55.5
1970	4,651,487	63.0
1980	5,295,400	67.6
1990	5,968,000	71.6
2000	6,606,000	74.6

Source: Division of State Planning and Community Affairs.

Appendix II

Figure II-1



Source: JLARC analysis of SWCB data.

Figure II-2

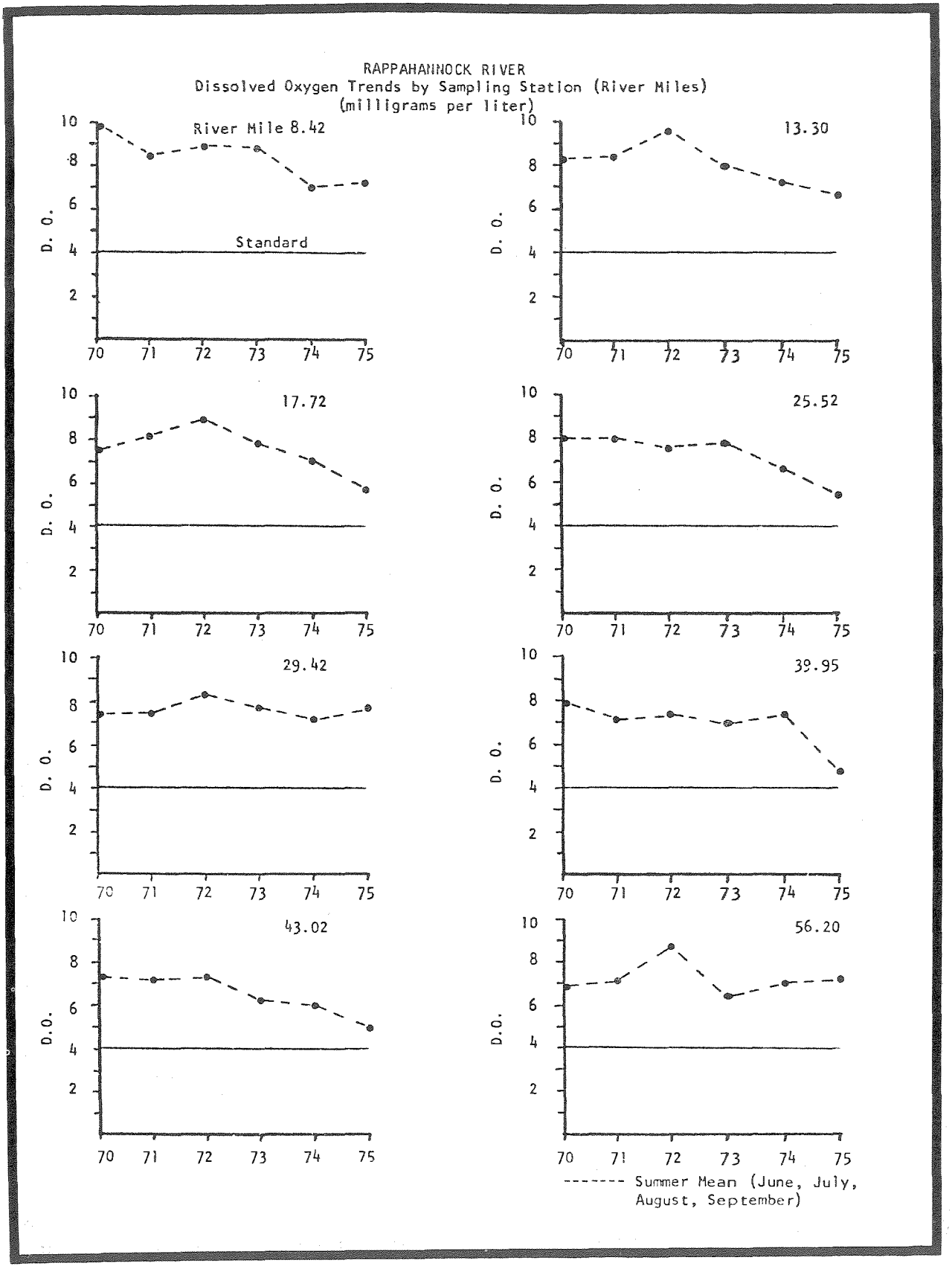
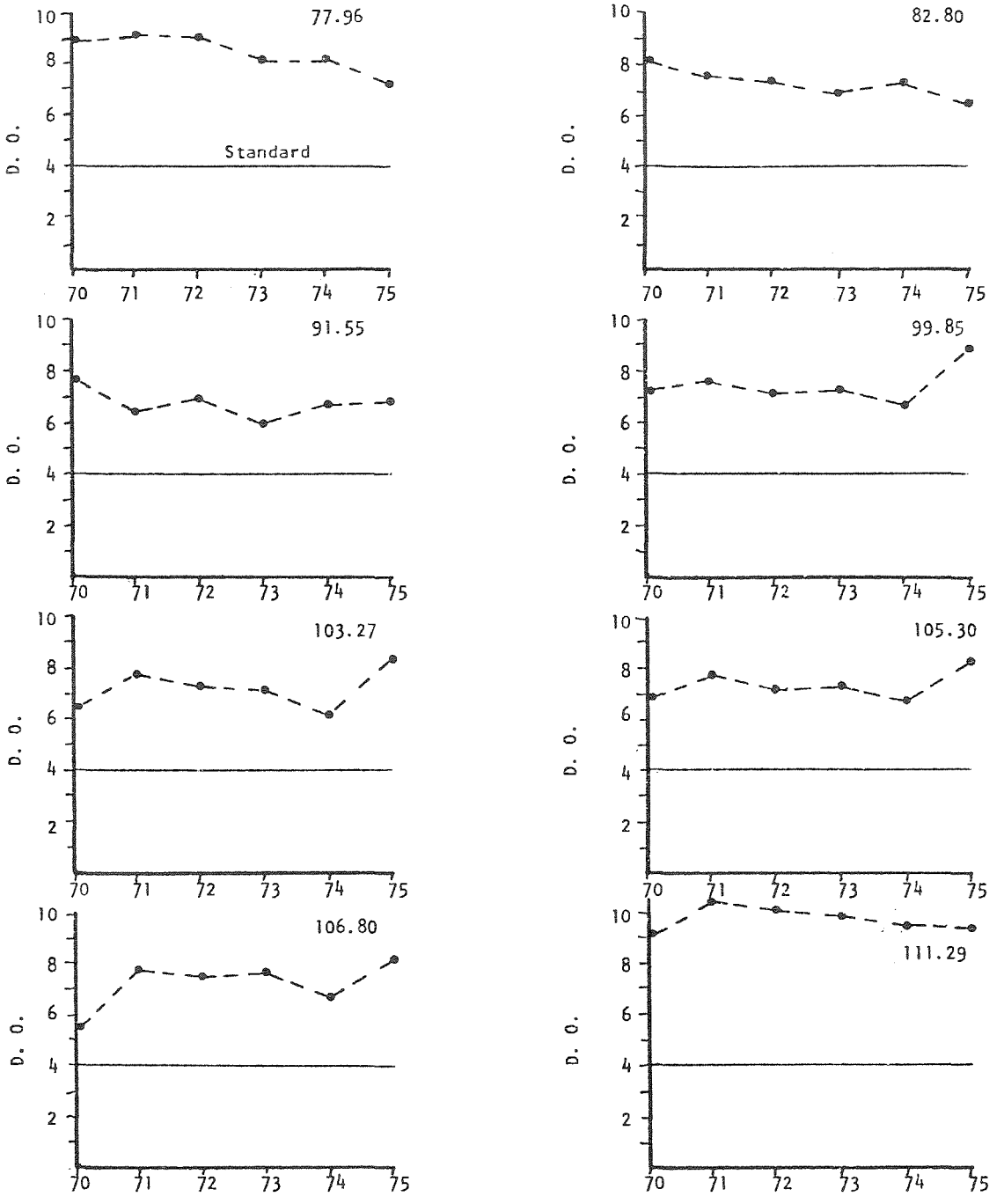

RAPPAHANNOCK RIVER
Dissolved Oxygen Trends by Sampling Station (River Miles)
(milligrams per liter)
River Mile 8.42
13.30
17.72
25.52
29.42
39.95
43.02
56.20
Standard
D. O.
D.O.
10
8
6
4
2
70
71
72
73
74
75
------- Summer Mean (June, July, August, September)

Figure II-2 (Continued)



Source: JLARC analysis of SWCB data.

------- Summer Mean (June, July, August, September)

Figure II-3

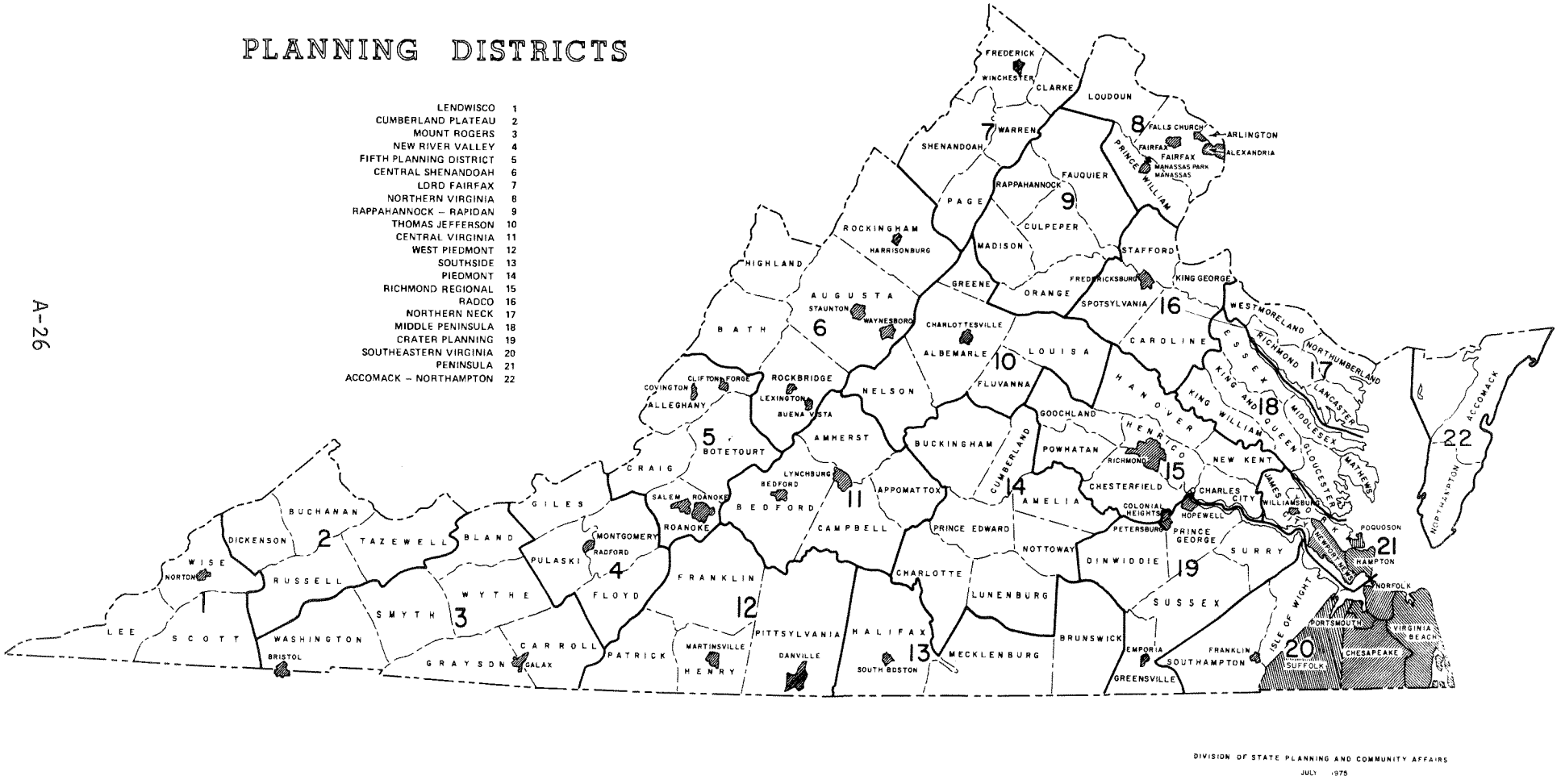

PLANNING DISTRICTS
LENOWISCO 1
CUMBERLAND PLATEAU 2
MOUNT ROGERS 3
NEW RIVER VALLEY 4
FIFTH PLANNING DISTRICT 5
CENTRAL SHENANDOAH 6
LORD FAIRFAX 7
NORTHERN VIRGINIA 8
RAPPAHANNOCK – RAPIDAN 9
THOMAS JEFFERSON 10
CENTRAL VIRGINIA 11
WEST PIEDMONT 12
SOUTHSIDE 13
PIEDMONT 14
RICHMOND REGIONAL 15
RADCO 16
NORTHERN NECK 17
MIDDLE PENINSULA 18
CRATER PLANNING 19
SOUTHEASTERN VIRGINIA 20
PENINSULA 21
ACCOMACK – NORTHAMPTON 22
DIVISION OF STATE PLANNING AND COMMUNITY AFFAIRS
JULY 1975

Figure II-4

F - Flow violation
C - Concentration violation
- Quantity violation (lbs/day)

SUMMARY PERFORMANCE REPORT
PLANT FLOWS 2.0-4.99 MGD
January-December, 1975

Owner	Parameter	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Blacksburg/VPI Stroubles Creek	Flow		F	F							F	F	
	BOD_5		#	#									
	SS		#	#									
	By-Pass	1	2	7		1					1		1
Bluefield	Flow												
	BOD_5												
	SS	C#					C	C	C				
	By-Pass												
Charlottesville - Meadow Creek	Flow			F				F	F	F	F	F	F
	BOD_5	C#			C#	C							
	SS	C#	C#	C#	C#	C#					#	C#	
	By-Pass	11	22	20	5	6	14	8	10	9	2	11	6
Charlottesville - Moores Creek	Flow		F	F				F	F	F	F	F	F
	BOD_5	C#	C#	C#	C#	C#						C#	C#
	SS	C#	C#	C#	C#	C#				#		C#	C#
	By-Pass	10	5			6	2	5	5	15	23	3	10
Covington	Flow												
	BOD_5												
	SS												
	By-Pass		1	2							1		
Dale Service - Section 1	Flow									F			
	BOD_5												
	SS												
	By-Pass							1	1	1	1		1
Dale Service - Section 8	Flow												
	BOD_5												
	SS												
	By-Pass						1	1	4	1			
Fredericksburg	Flow									F			
	BOD_5				C	C#	C#	C		#			C#
	SS						C			#	C	C	
	By-Pass								1	1			2
Harrisonburg	Flow	F	F	F				F	F	F	F	F	
	BOD_5		#		C#	C	C#		C#	C#	C#	C#	C#
	SS	C#	C#	C#	C#	C#	C				#	C#	C#
	By-Pass	4	16	13				12	6	10	16	3	2
Hopewell	Flow	F	F	F	F	F	F	F	F	F			
	BOD_5					#		#					
	SS												
	By-Pass												
HRSD - Western Branch	Flow												
	BOD_5										C		
	SS												
	By-Pass												
Martinsville	Flow												
	BOD_5	C			C				C				
	SS												
	By-Pass												
Massaponax	Flow												
	BOD_5										C		
	SS												
	By-Pass												
Prince William County - Old Centreville Rd.	Flow			F						F			
	BOD_5												
	SS												
	By-Pass												
Pulaski	Flow			F									
	BOD_5	C#		C#									C
	SS	C		C#		C#							
	By-Pass	1	2								1		
Radford	Flow												
	BOD_5							C	C	C	C	C	
	SS												
	By-Pass	1	5	3	2	2		1	2	5	2	1	1
Staunton	Flow												
	BOD_5											C#	C#
	SS	C	C	C									
	By-Pass												
Suffolk	Flow		F	F									
	BOD_5	C#	C#	C#	C#	C			C	C	C	C	C
	SS	C#	#	C#	C#						C	C	
	By-Pass												
Waynesboro	Flow			F									
	BOD_5												
	SS												
	By-Pass												
Winchester	Flow			F		F	F	F		F			
	BOD_5			#							C#	C#	C#
	SS	C	C	C#	C								
	By-Pass												

Source: State Water Control Board.

Figure II-5

SUMMARY PERFORMANCE REPORT
PLANT FLOWS - 5.0 MGD & GREATER
January-December, 1975

F - Flow violation
C - Concentration violation
- Quantity violation (lbs/day)

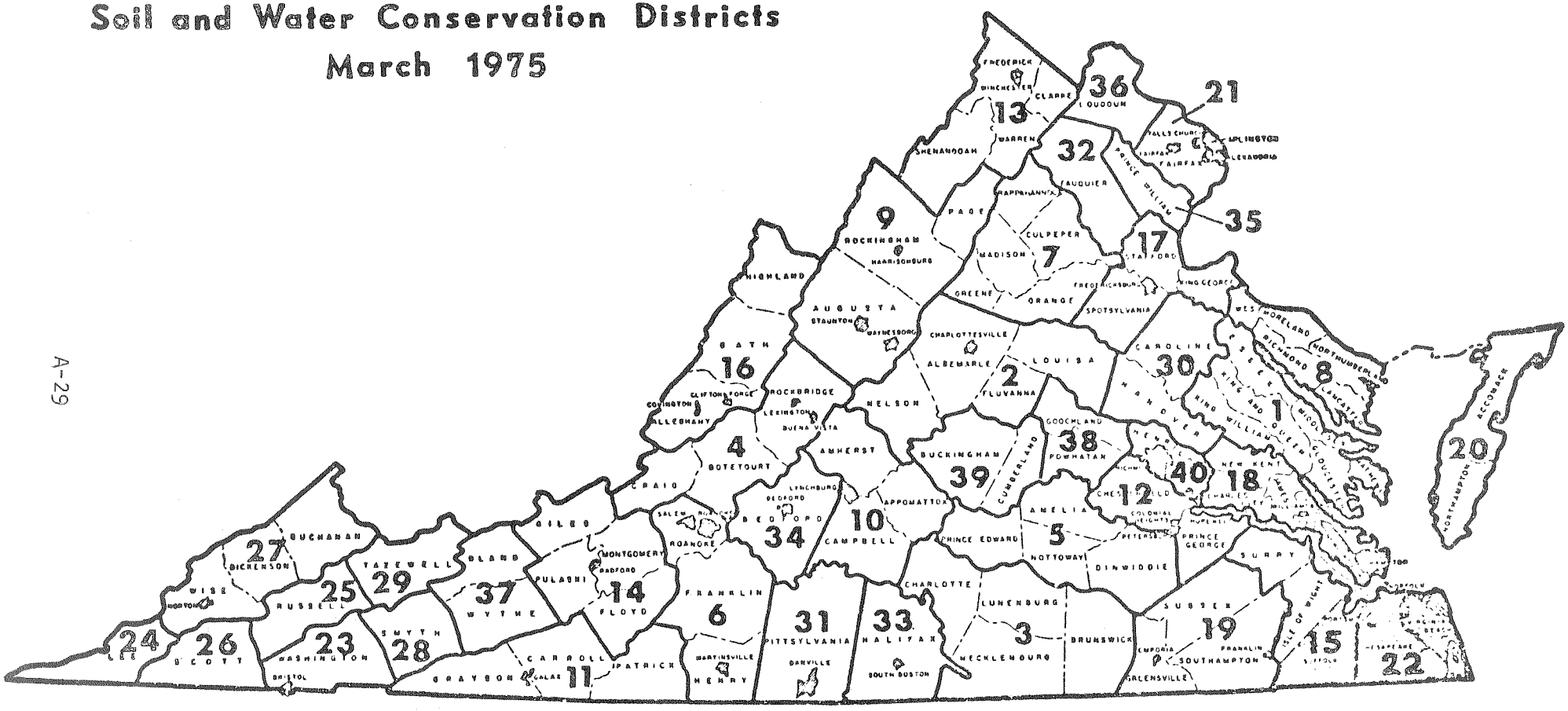
Owner	Parameter	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Alexandria	Flow												
	BOD_5												
	SS		C										
	By-Pass			2				?		5			1
Arlington County	Flow									F			
	BOD_5												
	SS												
	By-Pass			3				2	1	6		1	1
Chesterfield County - Falling Creek	Flow												
	BOD_5												
	SS	C#	C	C#					C#				
	By-Pass			2					1				1
Danville	Flow												
	BOD_5												
	SS			C									
	By-Pass			1	1	1							
Fairfax County - Dogue Creek	Flow												
	BOD_5												
	SS												
	By-Pass												
Fairfax County - Little Hunting Creek	Flow												
	BOD_5												
	SS			C									
	By-Pass												
Fairfax County - Lower Potomac	Flow												
	BOD_5												
	SS												
	By-Pass												
Fairfax County - Westgate	Flow												
	BOD_5												
	SS												
	By-Pass			2						1			1
HRSD - Army Base	Flow	F	F	F		#		F					
	BOD_5												
	SS												
	By-Pass	1	2	6	1			6	1				
HRSD - Boat Harbor	Flow		F	F						F			
	BOD_5		#	#									
	SS	C#	C#	#				C	C				
	By-Pass	3	23	19	11	4	4	15	3	19	9	5	8
HRSD-Chesapeake-Elizabeth	Flow												
	BOD_5			C									
	SS	C	C#	C		C					C		
	By-Pass												
HRSD - James River	Flow	F	F	F	F	F	F	F	F				
	BOD_5		C#	C	#	C#	C#	C#	C#	C#	C		C#
	SS						C#	C#	C#	C#		C#	C#
	By-Pass												
HRSD - Lamberts Point	Flow		F	F				F					
	BOD_5					#	C				C		
	SS												
	By-Pass	4	5	9	2		1	13	1				1
HRSD - Williamsburg	Flow							F	F				
	BOD_5								C#			C	C
	SS	C#	C				C#		C#	C#	C	C#	C
	By-Pass												
Lynchburg	Flow												
	BOD_5											C	
	SS												
	By-Pass												
Petersburg	Flow												
	BOD_5												
	SS			C#							C#		
	By-Pass												
Portsmouth	Flow			F				F					
	BOD_5						C						
	SS												
	By-Pass				2	1		9					
Richmond	Flow												
	BOD_5											C#	
	SS										C#	C#	
	By-Pass			1								1	
Roanoke	Flow		F	F						F			
	BOD_5		C#	C#		C#							
	SS		C#			C#							
	By-Pass	2	5	17	1	4	1	?	1				

Source: State Water Control Board.

Appendix III

Figure III-1

Soil and Water Conservation Districts
March 1975

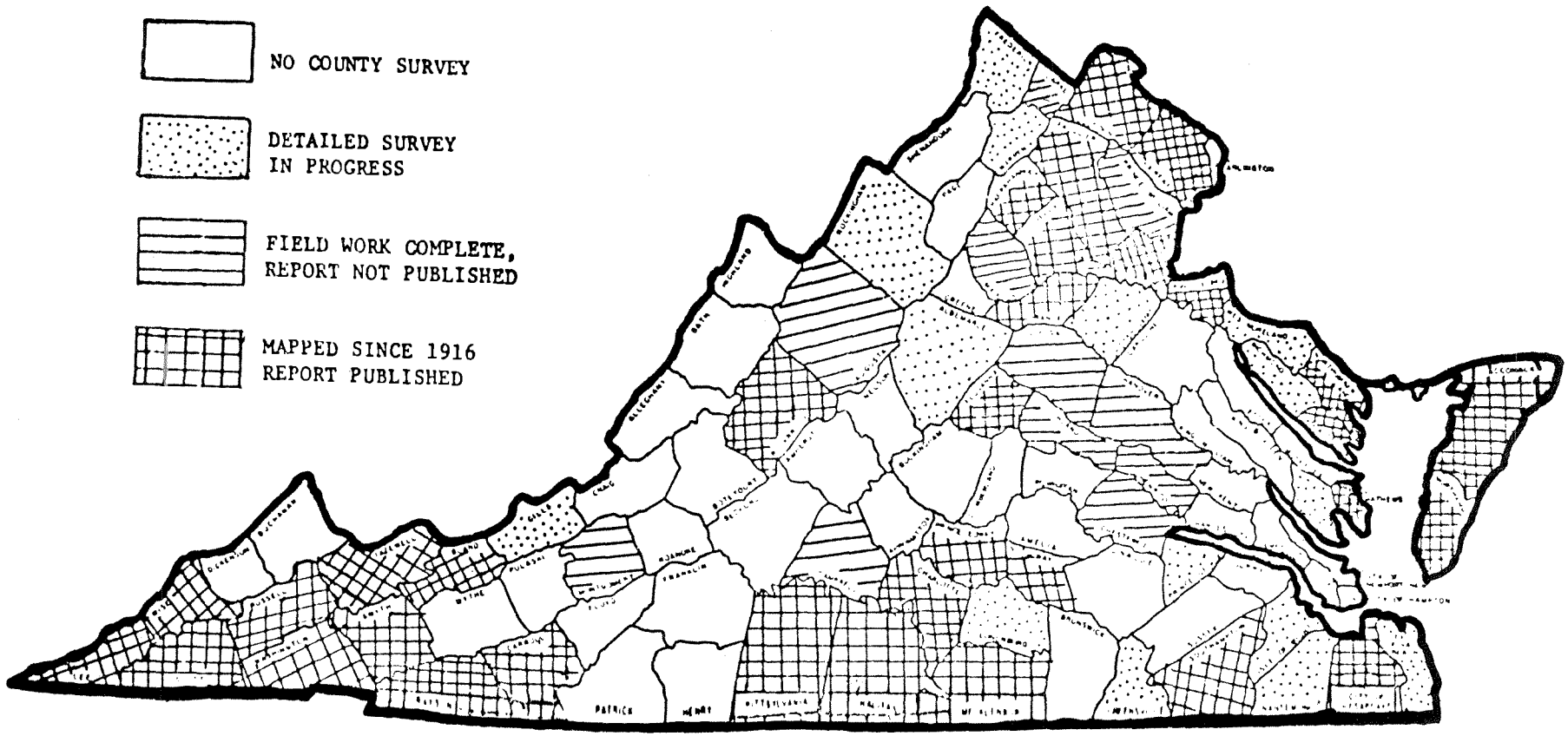


1. Tidewater
2. Thomas Jefferson
3. Southside
4. Natural Bridge
5. Piedmont
6. Blue Ridge
7. Culpeper
8. Northern Neck
9. Shenandoah Valley (Harrisonburg, Staunton and Waynesboro)
10. Robert E. Lee (Lynchburg)
11. New River
12. James River
13. Lord Fairfax (Winchester)
14. Skyline
15. Peanut (Suffolk)
16. Mountain
17. Tri County
18. Colonial (Williamsburg)
19. J. R. Horsley
20. Eastern Shore
21. Northern Virginia
22. Virginia Dare (Chesapeake and Virginia Beach)
23. Holston River
24. Daniel Boone
25. Clinch Valley
26. Natural Tunnel
27. Lonesome Pine
28. Evergreen
29. Tazewell
30. Hanover-Caroline
31. Pittsylvania
32. John Marshall
33. Halifax
34. Peaks of Otter (Bedford)
35. Prince William
36. Loudoun
37. Big Walker
38. Monacan
39. Peter Francisco
40. Henricopolis

NOTE: Cities with SWCD's are listed in parentheses after the appropriate district.

Figure III-2

STATUS OF VIRGINIA SOIL SURVEYS

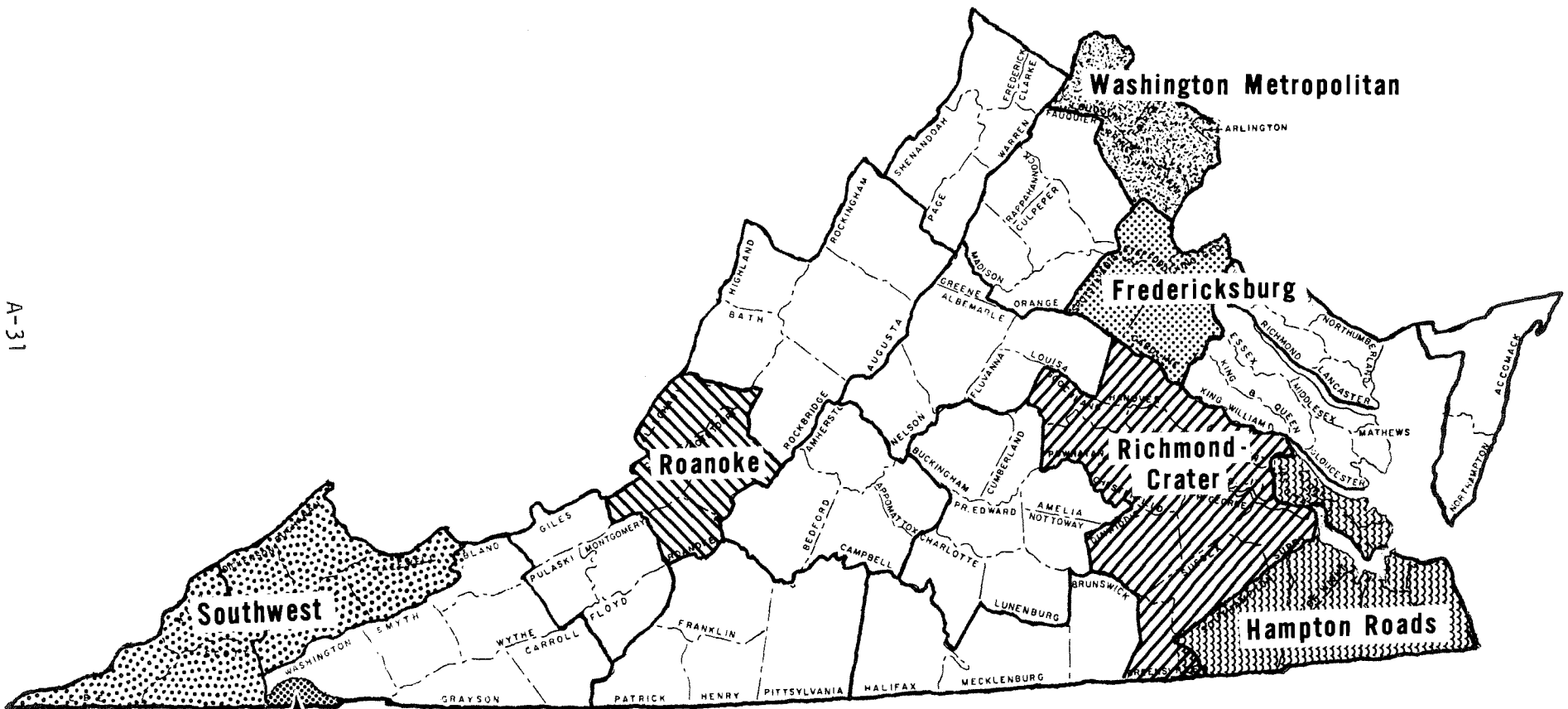


Revised by: D. E. Pettry, Department of Agronomy
Virginia Agricultural Experiment Station,
Virginia Polytechnic Institute and State University, Blacksburg, Virginia,
in cooperation with the Soil Conservation Service, Richmond, Virginia.

Research Division Report No. 42
June, 1975

Figure III-3

208 PLANNING AREAS

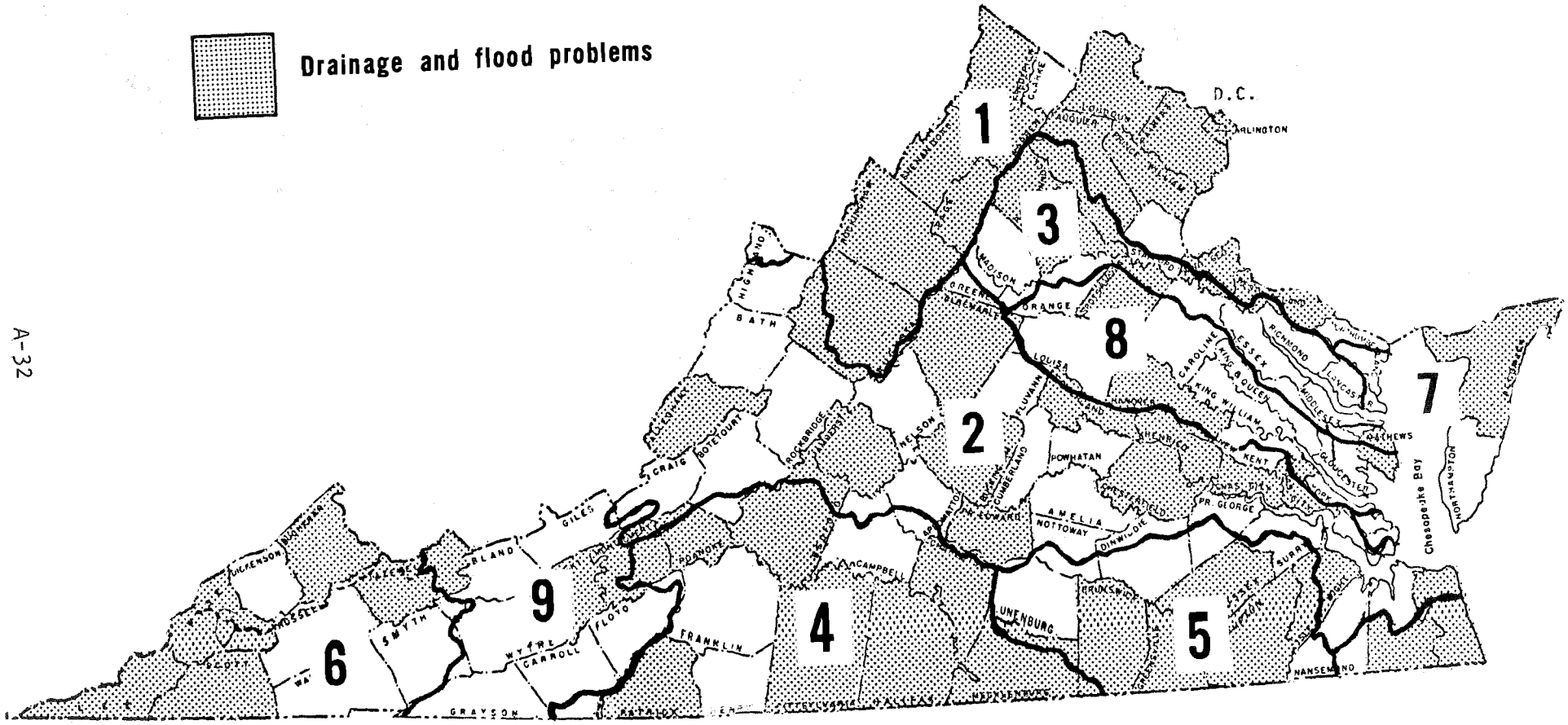


Source: JLARC

APPENDIX IV

Figure IV-1

DRAINAGE AND FLOOD PROBLEMS



Source: JLARC Survey of Local Administrators, 1976

Table IV-1

SOIL CONSERVATION SERVICE WATERSHED PROJECTS
APPROVED OR COMPLETED
(June, 1975)

County(s)	Watershed Name/Area	Structures Constructed	Structures To be Constructed	Estimated Project Cost[a] Federal	Estimated Project Cost[a] Non-Federal
Page	Dry Run	1 single purpose, 1 multi-purpose flood control & municipal water supply.		$ 427,974	$ 266,491
Augusta Rockingham	Lower North River	4 dams	12 dams, 10.5 miles channel improvement	4,562,063	1,756,981
Rockingham	Shoemaker		4 flood control	1,810,400	16,700
Highland, Va. Pendleton & Grant, W.Va.	South Branch		3 dams	7,305,100	3,176,600
Augusta Rockingham	South River	12 flood control	4 flood control, 1 multi-purpose water supply	1,385,347	443,158
Shenandoah	Stoneycreek	1 single purpose and 1 multi-purpose	2 single purpose	984,179	132,953
Augusta Rockingham	Upper North River	2 flood control & 1 multi-purpose	1 structure	1,804,886	386,552
Madison	Beautiful Run	7 flood control	1 flood control	363,344	232,201
Albemarle	Beaver Creek	1 multi-purpose		---	---
Amherst	Buffalo River		2 flood control & 2 multi-purpose	1,494,510	1,061,525
Pittsylvania	Cherrystone	1 flood control & 1 multi-purpose municipal water supply	1 flood control	581,145	289,099
Nansemond, Va. Gates Co, N.C.	Hobbsville-Sunbury	---	---	1,329,033	626,455

Table IV-1 (Continued)

County(s)	Watershed Name/Area	Structures Constructed	Structures To be Constructed	Estimated Project Cost[a] Federal	Non-Federal
Henry	Horse Pasture	2 dams	2 dams and channels	$ 267,631	$ 168,705
City of Chesapeake	Indian Creek	2.25 miles of channel improvements		40,826	76,884
Craig	Johns Creek	4 dams	Channel improvement	554,637	102,757
Henry Franklin	Leatherwood Creek	5 flood control & 14.4 miles channel improvements	Channel improvements	497,189	288,117
Louisa	Little River	1 flood control, 8.8 miles channel improvement	3 flood control	361,364	597,837
Culpeper	Mountain Run	2 single purpose & 1 multi-purpose & 6.1 miles channel improvement	2 multi-purpose flood & water supply & 3.5 miles channel improvements	466,477	553,972
Spotsylvania	Ni River	1 multi-purpose for flood control, sediment & municipal supply		367,275	559,220
Fairfax	Pohick Creek	2 dams	5 dams	1,004,144	4,198,620
Stafford	Potomac Creek	1 flood control & 1 multi-purpose for flood & municipal water storage	5.81 miles of channel improvement	656,089	573,685
Charlotte	Roanoke Creek	13 dams, 47.8 miles of channel improvement	4 dams, 11.9 miles channel improvements	1,658,374	1,485,517
Buckingham	Slate River	1 multi-purpose for flood control & municipal water storage	6 flood control	---	---

Table IV-1 (Continued)

County(s)	Watershed Name/Area	Structures Constructed	Structures To be Constructed	Estimated Project Cost[a] Federal	Non-Federal
Albemarle Hanover Louisa	South Anna River	2 flood control, 2 multi-purpose for flood control, recreation, water supply	23 flood control, 2 multi-purpose, 108 miles of channel improvements	$2,946,787	$2,999,516
Floyd Montgomery Roanoke	South Fork of Roanoke		4 flood control & 6.97 miles channel improvements	---	---
Carrol Co., Virginia Surrey Co. N.C.	Stewarts Creek Lovills Creek		1 multi-purpose	806,814	394,801
Franklin	Upper Backwater	2 flood control	4 flood control	1,138,169	666,324
Tazewell	Upper Clinch Valley	1 multi-purpose for municipal & industrial water supply	2 single purpose 1 multi-purpose	1,600,000	700,000
Madison	White Oak Run	1 multi-purpose for floods & recreation		---	---
Buckingham Cumberland	Willis River	10 flood control	1 flood control	1,462,285	625,712
Rockingham	Gap Run	0.24 miles channel improvement			
Shenandoah	Tumbling Run	2.25 miles channel improvement			
Pulaski	Back Creek	11.0 miles channel improvement			
Prince Edward	Buffalo Creek	9 flood control & 25.48 miles channel improvement			
Appomattox Campbell Charlotte	Little Falling River	3 flood control			

Table IV-1 (Continued)

County(s)	Watershed Name/Area	Structures Constructed	Structures To be Constructed	Estimated Project Cost[a] Federal	Estimated Project Cost[a] Non-Federal
Henry	Marrowbone	1 flood control & 4.65 miles channel improvement			
Buckingham	Muddy Creek	2 flood control & 5.90 miles channel improvement			
Appomattox Campbell	East Fork Falling River	3 flood control			

[a]Includes non-structural costs where applicable.

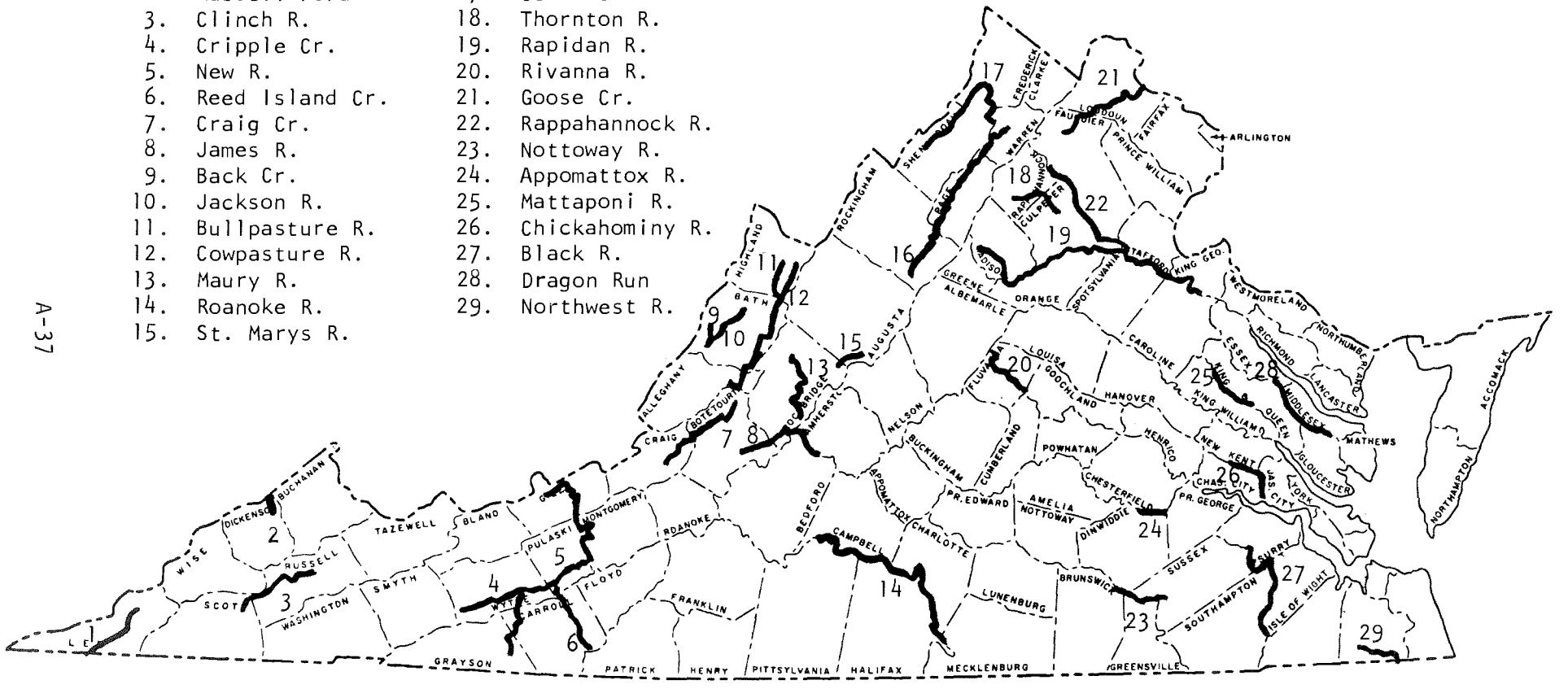
Source: U. S. Department of Agriculture Soil Conservation Service, *Annual Progress Summaries Small Watersheds Projects (PL 534 and PL 566)*, Virginia, June 30, 1975.

Appendix VI

Figure VI-1

SCENIC RIVERS RECOMMENDED AS WORTHY OF PRESERVATION

1. Powell R.
2. Russell Ford
3. Clinch R.
4. Cripple Cr.
5. New R.
6. Reed Island Cr.
7. Craig Cr.
8. James R.
9. Back Cr.
10. Jackson R.
11. Bullpasture R.
12. Cowpasture R.
13. Maury R.
14. Roanoke R.
15. St. Marys R.
16. Shenandoah R., South Fork
17. Cedar Cr.
18. Thornton R.
19. Rapidan R.
20. Rivanna R.
21. Goose Cr.
22. Rappahannock R.
23. Nottoway R.
24. Appomattox R.
25. Mattaponi R.
26. Chickahominy R.
27. Black R.
28. Dragon Run
29. Northwest R.



Source: Commission of Outdoor Recreation, Virginia's Scenic Rivers, (Richmond, Va. 1970), pp. 14-15.

APPENDIX - AGENCY RESPONSES

- State Water Control Board
    - JLARC Response
- Department of Health
- Council on the Environment
- Soil and Water Conservation Commission
- Department of Conservation and Economic Development
- Commission of Outdoor Recreation
- Office of Emergency Services

COMMONWEALTH of VIRGINIA

STATE WATER CONTROL BOARD
2111 Hamilton Street

Eugene T. Jensen
Executive Secretary
Post Office Box 11143
Richmond, Virginia 23230
(804)786-1411

AUG. 20 1976

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and Review Commission
823 East Main Street
Richmond, Virginia 23219

Dear Mr. Pethtel:

I have made a thorough review of the Joint Legislative Audit and Review Commission's report of August 21, 1976 entitled " Preliminary Report on Water Resource Management in Virginia." I note that the report is clearly identified "JLARC Draft - Not Approved" and assume that it is, in fact, a preliminary draft subject to such revision as may be necessary to present a factual and unbiased assessment of water resource management and programs in the Commonwealth.

The JLARC staff undertook a monumental and exceptionally complex task. They have assembled and analyzed an almost unbelievable quantity of material in a relatively short period of time. It is, therefore, not surprising to find errors of omission and interpretation. Also, it is not surprising to find minor errors in organization or the inclusion of occasional unsupported judgemental statements. I have both general and specific comments on the report. Specific comments are attached as an appendix to this letter. My general comments are as follows:

(1) The report is not consistent in its identification of the State Water Control Board and the State Water Control Board's staff. The two are vastly different groups and it is essential that the reader recognize this distinction.

(2) It would be generally desirable to include a list of definitions of terms which are used throughout the report such as "water quality management plan," "water resource plan," "National Pollutant Discharge Elimination System permit," etc. In many instances, the report is inconsistent in its use of these terms. For example, water quality management planning is a sub-part of water resource planning.

(3) The section dealing with water resources management and water resources planning does not present an accurate analysis of the Board's actions in adopting, pursuant to statute, a water resources policy, the Board's actions to resolve the water rights issue, and the Board's effort to move forward in water resource planning. Specific items which need to be incorporated to obtain meaningful discussion include:

a. An absolute need to adopt a water resource policy prior to the adoption of a plan. Planning is really not feasible in the absence of policies. The Division of Water Resources encountered this barrier in their pre-1972 efforts to develop river basin plans in the absence of a Board-adopted policy.

b. The pre-1972 water resource planning efforts were generally limited to the acquisition of a great amount of material descriptive of the Virginia river basins. The New River Plan is technically unimpressive and does not address most of the issues which need to be considered in a water resource plan. The Potomac-Shenandoah report did not provide a meaningful assessment of most of the problems and consequently was never adopted by the Board.

c. Numerous Federal agencies were and are engaged in river basin planning in the Commonwealth. In many instances, a conventional State-developed plan would be simple duplication of Federal expenditures. The Board and staff recognized this problem and, following adoption of the Board's policy, moved towards the development of a James River Basin water resource plan based upon existing State and Federal data.

(4) The water rights issue, riparian doctrine versus prior appropriation, is not discussed in adequate detail and is not related to the overall Board strategy for the development of river basin plans in the Commonwealth. The report should identify and examine the Board strategy for the development of water resource plans which was adopted, consciously, by the Board four years ago. Essentially, the Board's strategy called for early action to comply with the statutory requirement for adoption of a water resource policy.

a. Development and adoption of a water resource policy.

b. Seek action from the General Assembly in resolving the water rights issue, specifically riparian doctrine, prior appropriation or some combination thereof.

c. Develop water resource plans (plumbing plans) on the basis of the adopted policy and legislative action clarifying water rights. Clearly, a plumbing plan cannot be drafted in the absence of information on the ability to move water through interbasin transfer systems. The riparian system of water rights is an after-the-fact process and is totally incompatible with the concept of water resource plan implementation.

d. Coordinate the State planning process with the Federal planning process as set forth in the Water Resources Council guidelines, and with individual projects as they receive funding from the various Federal programs.

e. Seek additional funding and/or proceed on a Basin priority system.

(5) The report does not examine the low-flow characteristics of riparian doctrine which makes no provision for sustained low flow in streams, an item of considerable significance in the fisheries management and conservation fields.

(6) Water quality management planning. The report's discussion of water resource management planning is both incomplete and inaccurate. Specific problems are as follows:

a. The impact of the Potomac Enforcement Conference, a legal proceeding instituted under the provisions of Public Law 89-660, a Federal Water Pollution Control Act, is not discussed. This plan, as approved by the Secretary of the Interior in 1970, has been a major factor influencing the allocation of construction grant monies in the Commonwealth and providing an orderly process for the abatement of wastes in the Virginia portion of the Washington Metropolitan Area.

b. Occoquan Basin and the Occoquan Policy. The Occoquan River Basin is adjacent to the immediate Washington Metropolitan Area. The Occoquan Water Quality Management Plan, adopted by the Board in 1971, provides for both treatment of point source wastes and controls over runoff from associated urban areas.

c. The report does not establish the working relationship between the Metropolitan/Regional plans, the basin plans and the several non-point source strategic decisions that have been made by the Board. A net effect of these various actions has been to provide the Board with continuous information which has been applicable to the construction grants program. The report also does not recognize the rather unique role of the consulting engineers in the process, the complementary role of these consultants in the preparation of needs assessments, and the development of "201" plans for individual projects. In general , it is my belief that the section on water quality management planning presents a totally erroneous analysis of the Board's program in this area. It is also most important that the analysis of water quality management planning recognize the strategic decisions that have been made by the Board in a series of special meetings held to discuss long-range planning issues. Similarly, the Board's actions in these long-range planning sessions should be reviewed in terms of impact on non-point source pollutant programs.

d. The report does not discuss the relationship of the James River "3(c)" study to the entire planning process, or its relationship to the flow of construction grants in the State; i.e., project awards follow the 3(c) plan.

(7) The section dealing with water quality ambient monitoring is probably based on an over-simplified approach to the statistics of water quality sampling. The results of water quality sampling are influenced by many factors other than flow, including temperature, time of day, cloud cover, and, in the coastal areas, stage of the tide. In addition, many of the analytical techniques are not precise and small differences in the results of analyses may be of questionable significance. The problem seems to be one of constructing and operating an ambient water quality system which will be affordable but which will also provide statistically acceptable data on water quality trends. The Board has had a high level task force working on this matter for four years and some progress has been made.

(8) The section dealing with pollutants from non-point sources needs substantial revision. As written, the report suggests that pollutants from non-point sources cause substantial pollution problems in the

Commonwealth. There is little evidence which would support such a conclusion and a substantial body of evidence which indicates that water quality standards are now being met statewide. There are recognized areas in which pollutants from non-point sources are troublesome; for example, the Occoquan Reservoir and the Bryan Park area of Richmond. The Board's strategic decisions with respect to channelization, pesticides and agricultural chemicals, wastes from agriculture, forestry, construction and erosion all have a significant bearing on non-point source pollution control programs, and should be discussed.

(9) It would be desirable that the report recognize that the Board has adopted an orderly approach to the non-point source pollution problem based upon the establishment of a small, non-point source pollution control program in 1975, and a significant expansion of that program in 1976. As the staff became better acquainted with the problem, it developed a series of program issue papers which were considered by the Board, and led to negotiation of a series of interagency agreements aimed at controlling pollution attributable to non-point source pollutants.

(10) It is important that a clear distinction be made between the use of the words "pollutant" and "pollution."

(11) Several studies currently underway in Virginia are generating additional information on the role of non-point source pollutants in the total pollution equation. Results of the recently completed study in Roanoke for example, suggest that urban runoff in that area is not presently causing other than transient violation of water quality standards.

(12) The section on flooding and flood damage would be improved by better recognition of the Board's recommendations to the General Assembly with respect to reservoir safety and flood plain management. Additionally, the report should make a careful distinction between drainage problems and flooding problems. The Board has had a significant role in flood protection in the Commonwealth in the Four Mile Run area (legislation requiring upstream controls and funding of the State's share), Salem Church Dam including studies of cost-effective methods of flood control, flood protection for the Richmond sewage treatment plant, and advice to the Corps of Engineers on the Peters Creek watershed in Roanoke and the adjacent county.

(13) The JLARC report appears to pick up on all the negative aspects of the Water Control Board no matter how large or how small. Very seldom, if ever, does it pick up on anything positive that the Board has done over the past several years to improve water quality within the State. The report also does not speak to programs such as PReP, program management, construction grants, which the agency does well in and has been recognized as a national leader.

(14) The report appears to pick up on negative feelings from staff members and amplifies these negative feelings without any type of factual backing. It should be noted that if staff opinions are to be used they should be thoroughly documented and checked out prior to their publication.

(15) Some of the comments made in the report by JLARC indicate that they have made a much more encompassing interpretation of the Law than the Board has previously. This is particularly true in the water resources area. It is questionable if the powers and duties of the Board are as far reaching and all encompassing as interpreted by JLARC.

(16) The report is obviously very critical of the Board's role regarding water resource planning and in many cases the Board is criticized for their failure to carry out various programs or the objectives of the law as JLARC interprets it. What JLARC failed to realize is that the Board has limited time and limited resources and that priorities must be established by the Board. The established priorities can be questioned; however, it is a physical impossibility for the staff to accomplish all the needs and desires of the Commonwealth with present resources.

In summary, the JLARC is certainly to be commended on their efforts. However, much remains to be done if the report is to present a useful assessment of water resource management programs in Virginia.

Sincerely yours,

Eugene T. Jensen
Executive Secretary

/cs

Attachment

JLARC Staff Note: The JLARC staff response to the SWCB comments is presented on the following page. The SWCB detailed comments are available for review at the JLARC office.

COMMONWEALTH of VIRGINIA

Joint Legislative Audit and Review Commission
Suite 200, 823 E. Main Street
Richmond, Virginia 23219
(804) 786-1258

September 30, 1976

Mr. Eugene T. Jensen
Executive Secretary
State Water Control Board
P. O. Box 11143
4010 West Broad Street
Richmond, Virginia 23230

Dear Mr. Jensen:

We have completed our review of agency responses to the Preliminary Report on Water Resource Management in Virginia. Three copies of the revised report are enclosed for your information.

The technical comments contained in your response of August 20, 1976, have been carefully considered. Many of the changes you suggested have been incorporated in the revised report. In addition, our revisions addressed a number of the general comments made in your transmittal letter and are summarized below according to your original itemization.

(1) A careful review of the report was made to distinguish between references made about the State Water Control Board and the Board staff.

(2) A glossary of terms is being prepared for inclusion in the printed report.

(3) The report was amended to include the Board's strategy for developing water resource management plans.

(6) The section of the report dealing with water quality management planning was revised to better explain the working relationships between the various types of water quality plans. Also, a discussion of the enforcement proceedings in Northern Virginia and their impact on the planning process is presented (pp. 61-67).

(6a,b) The SWCB discussion of reasons for the disproportionate funding of projects in Northern Virginia compared to other parts of the State has been included.

(7) The point is made that the SWCB monitoring network can provide the necessary data to conduct an accurate assessment of water quality over time. However, the evaluation methodology used to prepare the 1975 305(b) report requires modification before definitive statements can be made about the overall quality of the State's rivers and streams.

(8a) The section on nonpoint sources of pollution has been amended, incorporating many of the changes suggested by SWCB. The Board's approach to nonpoint source pollution has been clarified (pp. 91-108).

(12) In the area of flood control, the text was amended to include SWCB participation in the several flood control projects referenced in the technical comments.

(13) Major achievements of the Board have been highlighted in the report where appropriate.

In addition, we have noted the Board's recent activity in regard to the initial public hearings on water management, and the involvement of each SWCB member in specific water resource management responsibilities. These recent actions will be acknowledged in the final report.

We are now preparing the report for distribution to each member of the General Assembly. Your August 20 letter will be included as part of the agency response section. If you wish to amend any of your comments based on our revisions, please let me know as soon as possible. The report should be available within two or three weeks.

Sincerely,

Ray D. Pethtel

Ray D. Pethtel
Director

RDP/bn
Enclosures

AUG 20 1976

COMMONWEALTH of VIRGINIA

JAMES B. KENLEY, M.D.
COMMISSIONER

Department of Health
Richmond, Va. 23219

August 19, 1976

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and Review Commission
Suite 200 - 823 East Main Street
Richmond, Virginia 23219

Dear Mr. Pethtel:

As requested in your letter of July 21, 1976 the draft report on Water Resource Management has been reviewed. I have been informed that Mr. Leone and Mr. Flemming of your staff have discussed the report in some detail with Mr. Adams and Mr. Bartsch of my staff. Therefore, I will not comment upon some of the details and minor omissions but address some of the major areas of concern.

The Department's budget requests for the past several bienniums have included requests for additional personnel and resources for the Bureau of Sanitary Engineering to support the Department's public water supply and its municipal sewage programs. These requests have not been favorably considered. The workload has greatly increased and only the most urgent and high priority work could be accomplished with the limited resources available. The report mentions that the Department's staff did offer this rationale for some shortcoming in the programs but the report did not recognize or indicate that there had not been an increase in personnel since 1968 although the workload increased.

There was much comment made relative to duplication between the State Water Control Board staff and the Department's personnel. It is noted on page 46 that this is estimated to be approximately $20,000 per year which is rather an insignificant amount when the fringe benefits are considered. It is rather impractical to review the designs of sewage treatment facilities without visiting operating facilities to know what works and what does not function properly and how to best handle situations. One of our criticisms of engineers who accomplish many of the designs know little about the actual operation of the treatment plant and as a result their designs are deficient. In our opinion the review should not be done in the sterile engineering office without some knowledge of actual field conditions and operational experience. Our personnel are qualified professionals who have the training and experience to observe and detect problems and solve them on the spot. It should be recognized that in a sewage treatment plant there

are many potential health problems which need the attention of a health professional and our personnel are so trained and oriented. While it may appear to be some duplication it may not be as great as indicated in the draft report and there is justification for this duplicate effort. Before the large expansion of the State Water Control Board staff the general supervision over municipal sewage treatment plants was accomplished primarily by the personnel of the Bureau of Sanitary Engineering. The involvement of the State Water Control Board personnel was minimal.

A major criticism which we see with the report is the perspective with which Water Resource Management has been viewed. From our viewpoint it is an element in two of our environmental health programs (water supply and sewage disposal). Also, our analysis of the other programs mentioned in the draft report indicates water resources is only an element in a larger multifacet program. Therefore, we wonder if water resources is not being overemphasized and given a priority not entirely consistent with its importance as a program element since it is not a prime program. Water supply and human waste disposal are important environmental health programs of the Department. The Department's environmental health programs cover a number or related areas or programs and in our opinion environmental health considerations are more vital to the health and welfare of the citizens of the Commonwealth than just the water resource parts of these programs.

Repeatedly a point is made in the draft report and that is that water resource planning was being accomplished as long as there was a Division of Water Resources in the Department of Conservation and Economic Development, but when this function was placed into the State Water Control Board it virtually stopped because it was overshadowed by the more vigorous and appealing pollution control programs and as a result water resource planning diminished. The report suggests a water resource agency where this same results can occur again and be compounded by the inclusion of public water supply under PL 93-523 (Safe Drinking Water Act). The stronger and more glamorous or appealing program again will overwhelm the other programs and again one program can be emphasized to the point that the other programs are ineffective or ignored. With all the funds and publicity connected with the pollution control effort it can easily be seen how this can and most probably would occur again. This is one of the reasons why we do not concur with your suggested water resource agency concept.

Another point which is not recognized or considered in the report is that sewage or wastewater disposal is a competing use of the water resource with drinking water. The objectives and purposes of the two programs are directly in opposition and to assume that by placing them in the same organization that the competition will vanish is not valid. The interagency rivalry will still exist because of the differences in objectives between wastewater and drinking water programs. The combination of these programs in one organization on the basis of water involvement is not sound. Drinking water and wastewater both employ sanitary engineering techniques and practices but the technical problems are entirely different and

different approaches are used, therefore, we should not be carried away with similar terminology in the two programs and make the assumption that the programs are the same because the two have similar program elements. When they are in the same agency they are operated separately by two different organizational elements.

The assumption is made that an adequate job was being done in the water supply program since there had not been any water-borne epidemics. With the limited resources available the Department has conducted a professional and competent water supply program and the Commonwealth is most fortunate in not having had any water-borne disease outbreaks. The potential for water-borne disease exists at any time safeguards are violated. One activity in which the Bureau of Sanitary Engineering has been engaged is to protect and object when health values would be endangered by activities which would adversely affect a water supply. A good example of this concern and activity would be the Occoquan Reservoir and the Fairfax County Water Authority. The assumption was made in the report that the Bureau was unaware of happenings and discharges on various watersheds because there was no dictated coordination. In fact, this is not entirely true. Through sanitary surveys of systems including the raw water source the Department does have knowledge of various discharges and when a proposed discharge represents a potential endangerment to a water supply a protest is made. Under the combined organization in your study the protest could be stifled.

The State Board of Health has on numerous occasions taken the position that sewage disposal and water supply were health programs and should be under their general supervision and direction. The proposed organization in a separate water resource agency places these programs in a position where there can be no health input. One of the common criticisms of EPA has been the lack of health effects input. EPA now in the water supply program finds itself interpreting and assessing the health effects of chloroform and organics in drinking water. They lack the medical input and credibility to make the public health judgments and as a result their pronouncements are suspect. This same lack of health input would result under the separate water resource agency as proposed in this study. We have noticed this in many state environmental protection agencies. When these agencies are initially formed the transferred trained professionals form a cadre but this capability is soon lost.

The proposed water resource agency would separate the water supply and part of the sewage program from other environmental programs of the Department. As a result there would be a fragmentation of environmental health programs. The Department would be denuded of public health engineering capabilities. The Department's program for the individual and smaller water and sewerage systems requires technical assistance from the Bureau of Sanitary Engineering. This assistance would not be readily available. The sewage program would be more widely divided between two departments with the municipal systems in the water resource agency and the small or individual systems under the Health Department. It is

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and Review Commission

essential to have close coordination between our shellfish program and sewage program. This coordination would be completely lost in the proposed organization. Such programs as solid waste depends upon engineering assistance and consultation and with the proposed organization this close relationship would be lost. Also, the Bureau of Sanitary Engineering personnel in the regional offices are available to provide technical assistance to Local Health Service environmentalists, and the Local Health Service personnel serve as the eyes and ears for the engineering programs bringing to the engineering programs many problems or complaints as they are happening and permitting early solutions. This mutually beneficial relationship will be destroyed by the proposed organization.

There appears to be acceptable organizational changes which could be accomplished and will meet the desires for better water resource planning. In order to avoid the situation mentioned repeatedly in the report of the water resource planning being overshadowed by the regulatory program it appears that a separate water resource planning agency with no regulatory program can best serve this purpose. The report does not discuss the possibility of returning the water resource planning activity to the Department of Conservation and Economic Development and it is believed this is a viable alternative. The report indicates that acceptable water resource planning was accomplished when this activity was in the Department of Conservation and Economic Development. In this position such a water resource planning unit could serve all uses of water without being subservient to any program.

The report indicates that there is a fragmentation of water resource activities and this would be corrected by the proposed organization. This is not correct because there still will remain much involvement of water resource interest or activities in the many state departments and agencies shown on the chart on page 225. This chart does not include the many federal agencies who are engaged in some aspect of water resource planning. Therefore, there will continue to be fragmentation of water resources activities under the proposed organization. The combination of the Bureau of Sanitary Engineering and the State Water Control Board does not eliminate this fragmentation but increases it and fragments environmental health activities and programs. If consolidation is deemed necessary then the Water Control Board with the exception of water resources planning functions should be moved to the State Health Department. This has been done in several states such as Tennessee and South Carolina. There are advantages such as:

- The environmental health programs will be consolidated and strengthened.

- Some consolidation of activities and greater support could be effected in regional offices and Local Health Services.

- The State Board of Health is a policy board and not an operating board. This appears to be one of the objections to present organization.

- A new state agency would be created which would not require support and administrative overhead.

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and Review Commission

Thank you for the opportunity to review the draft report and if I can furnish any additional information do not hesitate to call upon me.

Sincerely,

State Health Commissioner

AUG 20 1976

COMMONWEALTH of VIRGINIA

Council on the Environment

GERALD P. McCARTHY
CHAIRMAN AND
ADMINISTRATOR

903 NINTH STREET OFFICE BUILDING
RICHMOND 23219
804-786-4500

August 19, 1976

Mr. Ray D. Pethtel
Director
Joint Legislative Audit
and Review Commission
823 East Main Street, Suite 200
Richmond, Virginia 23219

RE: Preliminary Report on Water Resource Management in Virginia, July 21, 1976

Dear Mr. Pethtel:

This letter is in reply to yours of July 21, 1976 requesting comments on the subject report. These comments will supplement those I made to you at our meeting on August 13, 1976.

First, please accept my compliments on a generally fine piece of work. I find that the report is valuable in understanding the nature of water resources management in Virginia, and as such, is a useful reference document.

Second, one of the most important points that I would like to convey concerns not so much what your report says, but rather what it does *not* say; namely, the Virginia Environmental Quality Act was passed by the 1972 Session of the General Assembly, and it is my belief that this law is as valid as any other law in Virginia, and perhaps is more important because of its requirement that other laws and policies be consistent with it. This Act was, as it states, enacted in direct furtherance of Article XI of the Constitution of Virginia. I hope that the JLARC report will be rewritten appropriately.

Detailed comments follow:

1. Legislative intent: On page 2 you cite several water supply laws; you should also reference the Virginia Environmental Quality Act, especially with respect to its overall statement of environmental policy.

2. Organization: On page 3 you list organizations that have significant responsibilities for water supply in Virginia, and have omitted the Council on the Environment. Because of the Council's review and comment process for major water resource development projects (through the Environmental Impact Statement Process), I believe the Council should be listed.

3. Riparian Law: On page 22, middle of the page, you talk about the suggestion that the Commonwealth should allocate water rights to a permit system. Please refer to a book entitled, A Model Water Code, prepared by Professor Maloney of the University of Florida that treats the subject in great detail.

4. On page 27 you suggest that a State Water Resource Plan be completed; please refer for an example of this to the State of California's Water Resource Plan.

5. Conservation of Water: On page 28 you suggest that the SWCB should promote water conservation; may I suggest that the word "promote" be changed to "require".

6. Non-Point Sources of Pollution: On page 129, bottom of the page, you say that there is "no legislation assigning coordination and control authority to any one agency." I would agree that no legislation assigns controlling authority to any agency, but would suggest that the Virginia Environmental Quality Act assigns coordinating responsibility to the Council on the Environment. The member agencies of the Council are the principal ones involved in non-point sources of pollution. As Secretary Shiflet has pointed out to you, he has asked the State Soil and Water Conservation Commission to coordinate the State's activities in this regard. On page 131, you refer to the "Task Force on Erosion and Sediment Control". This was a task force of the Governor's Council on the Environment and should be identified as such. On page 133, near the bottom of the page, you write about completing the soil surveys before 1990. I suggest that you add some language to the effect that the latest advanced technology be used in so doing. Otherwise, I am afraid it will be much longer than 1990 before the surveys are completed.

7. With respect to the legislative intent regarding flood prevention and control, on page 158 you quote under the heading of "State Role" a section of the State water control law empowering the SWCB to "speak and act for the State in all relations with the Federal government---"etc. I believe the section also says that the SWCB may do this "except as elsewhere provided in law", and I believe the Virginia Environmental Quality Act could be construed to empower the Council on the Environment to speak on such matters. Particularly, I refer you to Section 10-185(1) regarding the Administrator of the Council's authority to "coordinate all State

communications with federal agencies...". Similarly, on page 188, near the bottom of the page, you suggest that the SWCB and the Council are both involved in the review of projects. Citing the same section of the code, I suggest that a conclusion is in order in that paragraph to the effect that the Council is authorized to coordinate the review of such projects and to make an appropriate response to the Federal agency.

8. With respect to the planning and licensing of power facilities, on page 207 you recommend that the State Corporation Commission (SCC) develop official State positions with regard to all power projects and represent State interest before Federal regulatory agencies. This is a matter that was debated at some length in the Land Use Council Key Facilities Study; and inasmuch as the SCC is effectively beyond the reach of the Governor, I would suggest that you reconsider suggesting that the SCC be empowered to develop official State positions to present to federal regulatory bodies. I believe that this would be more appropriately the function of the Governor's Office or its designee.

9. Under Environmental Review, page 208, you state that "a State position is prepared and presented in the appropriate forum by the Attorney General." The State position is developed by the State Council on the Environment; on occasion it is presented by the Attorney General's Office.

10. Your description of the Environmental Review Process (pages 208-210) is very well done. I concur with the description, conclusions and recommendations stated therein, with one additional thought for your consideration. The Council has for some time thought it appropriate to integrate the Environmental Impact Statement Review Process with the Multiple Permit Coordination Process. I think it would be appropriate to amend State law, either through the "key facilities" bills introduced into the 1976 Session of the General Assembly by Delegate Robert Washington or through an amendment to the State Environmental Impact Statement Law, to require an environmental impact statement for projects defined as "key facilities" in the report of that Committee of the Land Use Council. It would be important in so doing to have a positive statement that such environmental impact statement at the State level not duplicate the requirements of the National Environmental Policy Act, and that if a federal environmental statement is required for a project, that such environmental statement will be deemed sufficient for purposes, that such environmental statement will be deemed sufficient for purposes of meeting the State requirement. The key, however, is in the timing of when the State agencies must have such environmental statements. It would be essential to state that such federally-required environmental statements be made available to the State environmental regulatory agencies prior to their consideration of

permit applications. Currently, the State receives the permit applications long before the more complete environmental statement is available. This situation produces decisions made prior to all information being available about the project. It is my intention that the same information that is required anyway be available to the State at the earliest possible time, not at the latest possible time as is now the case. The suggested amendment would accomodate all interests concerned in an equitable and timely fashion.

11. With respect to power plant siting, on page 213, I suggest that you also investigate the responsibilities and activities of the California Energy Resource Conservation and Development Commission.

12. Under the Chapter on organization and coordination, page 226, the Virginia Environmental Quality Act was enacted in direct reference and furtherance to Article XI of the Constitution. I think it would be appropriate in your discussion of "water resource policy and planning" to note the policy statement in the Environmental Quality Act, particularly its requirement for authorizing and directing that "to the fullest extent practicable, the laws, regulations, and policies of the Commonwealth shall be interpreted and administered in accordance with the policies set forth in (this act)....". On page 227 your discussion continues, and would be particularly improved by noting the policy consistency requirement of the Virginia Environmental Quality Act.

13. On page 231, last paragraph, you state that "the Commonwealth lacks an administrative mechanism to provide a unified focus on land and water resources." I disagree. The Virginia Environmental Quality Act specifically declares it to be the "policy of the Commonwealth to promote the wise use of its air, *water, land,* and other natural resources and to protect them from pollution, impairment, or destruction so as to improve the quality of its environment." (Emphasis added.) The Act goes on to establish the Council on the Environment to implement that policy. There is the administrative mechanism; even if you do not agree that it should be used, may I please request that you acknowledge the fact that that is the law of the Commonwealth, and in my opinion it should be carried out.

I appreciate very much the opportunity to review your fine report and look forward to receiving the final document.

Sincerely,

Gerald P. McCarthy

GPM:dja

cc: Honorable Earl J. Shiflet
Secretary of Commerce and Resources

JLARC Staff Note: Many of the changes suggested by Mr. McCarthy have been incorporated in the text of the report.

AUG 20 1976

Joseph B. Willson, Jr.
Director

Donald L. Wells
Deputy Director

COMMONWEALTH of VIRGINIA

VIRGINIA SOIL AND WATER CONSERVATION COMMISSION

830 EAST MAIN STREET, SUITE 800
RICHMOND, VIRGINIA 23219

(804) 786-2064

August 20, 1976

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and
Review Commission
Suite 200, 823 E. Main Street
Richmond, Virginia 23219

Dear Mr. Pethtel:

We appreciate the opportunity to review and comment on the draft report on Water Resource Management.

On Pages 132, 148, and 154, statements are made concerning the lack of coordination for non-point source pollution control programs. We feel that our efforts are coordinated through the Non-Point Source Coordinating Committee (see attachment). In fact, the Committee is addressing non-point sources not mentioned in the report.

With respect to the last paragraph on Page 158, this agency has statutory responsibilities for the small watershed programs rather than having the responsibilities assigned by the Governor. This authority is stated in Section 21-10(7) and (8) of the Code of Virginia.

On Page 163, second paragraph, the third sentence is incorrect. The sentence should read, "The Commission has three survey party members who travel statewide for the purpose of obtaining field data for project planning."

We commend you and your staff for your efforts in developing this report. It is objective and well written.

Sincerely,

Joseph B. Willson, Jr.
Director

JBW:ba

JLARC Staff Note: The report was amended to include the responsibilities of the Non-Point Source Coordinating Committee.

COMMONWEALTH of VIRGINIA

Office of the Governor

Richmond 23219

Earl J. Shiflet
Secretary of Commerce and Resources

March 10, 1976

MEMORANDUM

TO: Head of: Department of Agriculture and Commerce
Department of Conservation and Economic Development
Department of Labor and Industry
Extension Division of the Virginia Polytechnic Institute and State University
State Water Control Board
Virginia Soil and Water Conservation Commission

FROM: Earl J. Shiflet

SUBJECT: Establishment of a Non-Point Source Pollution Coordinating Committee

There is hereby established a Non-Point Source Pollution Coordinating Committee consisting of the following agencies:

Department of Agriculture and Commerce
Department of Conservation and Economic Development
Department of Labor and Industry
Extension Division of the Virginia Polytechnic Institute and State University
State Water Control Board and
Virginia Soil and Water Conservation Commission

The Virginia Soil and Water Conservation Commission is declared the lead agency with the Director, Joseph B. Willson, Jr., serving as Chairman of the Coordinating Committee.

It shall be the responsibility of the Coordinating Committee to deal with all aspects of the non-point source pollution issue. The Committee will report

to the Secretary of Commerce and Resources on the following: (1) a protocol for dealing with non-point source pollution showing time frame; (2) how the Committee plans to address itself to the Federal and State laws related to NPSP; and (3) policy issues that ought to be addressed.

Periodic progress reports should be made to the Secretary of Commerce and Resources.

The Coordinating Committee is empowered to establish any subcommittees it deems appropriate to deal effectively with non-point source pollution.

EJS:cs

AUG 20 1976

MARVIN M. SUTHERLAND
Director
JERALD F. MOORE
Deputy Director
A. S. RACHAL, JR.
Executive Assistant

DIVISIONS
FORESTRY
MINED LAND RECLAMATION
MINERAL RESOURCES
PARKS
VIRGINIA STATE TRAVEL SERVICE

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
1100 STATE OFFICE BUILDING
RICHMOND, VIRGINIA 23219
(804) 786-2121

August 19, 1976

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and Review Commission
Suite 200, 823 East Main Street
Richmond, Virginia 23219

Dear Mr. Pethtel:

In response to your letter of July 21, 1976, we have reviewed your "Preliminary Report on Water Resource Management in Virginia" with particular reference to Chapter 3 which deals with non-point sources of pollution.

Our comments were given to Mr. Philip Leone by telephone on August 18 and are being confirmed herewith. The suggested changes are indicated by marginal notation and interlineation on the enclosed machine copies of pages 130, 135, 143, 144, 145 and 149.

We appreciate your giving us the opportunity to comment on this useful and important research report.

Sincerely yours,

M. M. Sutherland

MMS/ccb

Enclosures

AUG 1 0 1976

COMMONWEALTH of VIRGINIA

Commission of Outdoor Recreation
Eighth Street Office Building
803 East Broad Street
Richmond, Virginia 23219

ROB. R. BLACKMORE
DIRECTOR

TELEPHONE (804) 786-2036

August 6, 1976

Mr. Ray D. Pethel
Director
Joint Legislative Audit and
Review Commission
823 East Main Street - Suite 200
Richmond, Virginia 23219

Dear Mr. Pethel:

We have reviewed the preliminary report on Water Resource Management in Virginia forwarded with your letter of July 22, 1976. Although we generally agree with the information presented on "Recreation", we are suggesting the attached changes which we believe will assist the reader in better understanding the situation.

I am not familiar with your schedule for completing the report but it seems to me it would be helpful if State Agencies were given an opportunity to review the final draft and submit formal responses at that time.

Sincerely,

Rob R. Blackmore
Director

Attachments

Page S-25 - lines 3 and 4 -- change sentence to read -- The State scenic rivers program was established to preserve selected rivers and streams of the Commonwealth in their free flowing state.

lines 4, 5, 6 and 7 -- change sentence to read -- The Scenic Rivers Act declared that preservation of certain rivers for their scenic values is a beneficial purpose of water resources policy and prohibited impoundment of designated rivers without authorization from the General Assembly.

lines 9, 10, 11 -- change sentence to read -- Designation of a portion of the Staunton (Roanoke) River as a scenic river has been delayed pending completion of a study into the feasibility of its use for power generation purposes.

lines 11 and 12 -- change sentence to read -- The limited success in designating scenic rivers is attributed in part to insufficient local support.

lines 13 through 16 -- delete the sentences of this paragraph starting with the phrase "As a result" and insert as a closing statement the following sentence -- More direct measures may be needed to protect the scenic, recreational, geological, fish and wildlife, historic, cultural and other values of the Commonwealth's rivers.

Page 221 - lines 22, 23, & 24 -- change sentence to read -- The result is a program which identifies and designates scenic rivers, encourages better land use on the part of localities and landowners and establishes that a river is a resource of statewide significance.

lines 26, 27, & 28 -- change sentence to read -- Preservation of certain rivers for their scenic values is now recognized as a beneficial use of water and 29 rivers and streams have been identified (See Appendix VI) as possessing characteristics which qualify them for consideration as scenic rivers.

Page 222 - lines 2 and 2 -- change sentence to read -- A third, the Staunton (Roanoke) River, was provisionally designated in 1975, subject to re-enactment of the designation bill by the 1978 General Assembly.

lines 6, 7, 8, & 9 -- change sentence to read -- Designation of a scenic river in Virginia is a process which begins when the Commission of Outdoor Recreation staff studies a river to determine its

potential for designation.

lines 13, 14, & 15 -- change sentence to read -- To date, COR has conducted seven studies and three designation bills have been introduced in the General Assembly.

line 19 -- delete the words "lack of" and insert the word "limited".

Page 223 - delete lines 5 through 24 and insert the following paragraphs as concluding statements.

Planning for water-based recreation activities appears adequate but would be strengthened by integration into water resource management plans. At the present time there is no overall balance between recreation and other uses of water resources and water resources policies provide little basis for decision making regarding competing uses of water. Comprehensive water resource management plans are needed in order that various water uses, including recreation, may be identified and properly evaluated.

The original scenic rivers concept was based on the hope that the voluntary actions of local governments and private landowners would serve to protect the natural and scenic values of Virginia's rivers.

The State interest in scenic rivers is expressed in the Scenic Rivers Act which provides for the designation of State Scenic Rivers and the naming of an agency to administer designated rivers. It also authorizes COR to acquire real property but without exercise of the right of eminent domain and prohibits construction of dams without authorization of the General Assembly.

There may be a need to re-evaluate the means for promoting the State interest in the Scenic Rivers System.

AUG 18 1976

George L. Jones
State Coordinator

COMMONWEALTH of VIRGINIA

State Office of Emergency Services

7700 Midlothian Pike
Richmond, Virginia 23235
(804) 272-1441

August 16, 1976

Mr. Ray D. Pethtel, Director
Joint Legislative Audit and
Review Commission
Suite 200
823 East Main Street
Richmond, Virginia 23219

Dear Mr. Pethtel:

I have reviewed the Preliminary Report on Water Resource Management in Virginia as requested in your letter of July 21, 1976.

I agree with the conclusions of the Report. However, I recommend the changes listed on the enclosure to update the text and correct minor errors in factual data.

Please accept my congratulations for what I consider to be a most comprehensive analysis of the problems associated with the management of water resources in Virginia.

Sincerely,

George L. Jones

GLJ/ESK/jgl

Enclosure

RECOMMENDED CHANGES

TO

PRELIMINARY REPORT ON WATER RESOURCE MANAGEMENT IN VIRGINIA

1. Change line 1, page 195, to read: "purposes. But, the police teletype network (VCIN) is used by the Office of Emer-".

2. Change second sentence, page 195, to read: "Information is relayed to subscribing local law enforcement offices which are supposed to fan out the information to non-subscribing jurisdictions."

3. Change second paragraph, page 195, to read: "There is a National Warning System with 17 local (planning district) stations in Virginia. It was designed primarily for interstate communication during war emergencies but does lend itself to intrastate communication. However, a "Mini-Nawas" warning and communication system now being developed is planned to have telephone communication in each of the planning districts in the State tied to the National Warning System. The Federal Defense Civil Preparedness Agency (DCPA) will match funds for installation of the equipment, which includes hot lines with voice communication to all of the jurisdictions in the planning district as well as half of the operating expense. Local jurisdictions must pay the other half."

4. Change remainder of paragraph beginning at the top of page 196 to read: "not have emergency action plans, and there is a wide range in the comprehensiveness and timeliness of existing local plans. The balance of the $250,000 planning grant will permit OES to employ three planners through June of 1977 to work with localities to develop plans. This effort will permit completion of approximately two local plans per month. In addition, beginning in January of 1977, OES will obtain a Federal matching grant ($25,000 State/$25,000 Federal funds) on an annual basis to maintain State and local government peacetime disaster preparedness programs. OES feels a major problem is the funding of personnel and administrative costs for local government emergency services organizations. The Defense Civil Preparedness Agency has for many years provided Federal matching funds to State and local governments for civil defense purposes. The dual use of these funds to prepare for national emergencies as well as natural disasters has until this year been established as a policy of the Federal government. However, in the fall of 1975 under pressure to cut spending, the White House Office of Management and Budget adopted the position that

because PL 81-920, as amended, only authorized the expenditure of Federal funds for preparedness for nuclear war, the "dual use" policy is terminated. Since the local governments cannot maintain separate organizations for natural and nuclear war disasters, they can no longer qualify for Federal matching funds to support their disaster preparedness programs. The Office of Emergency Services is attempting to obtain State funds to support local government participation in disaster preparedness programs until such time as the policy to permit "dual use" of Federal funds is restored. Since flood disasters are a major problem in this State, steps must be taken to overcome deficiencies in natural disaster preparedness planning. This should have a high priority by OES and by local jurisdictions.

5. Change sentence beginning on third line, page 198, to read: "In addition, community disaster loans, which under certain circumstances may be forgiven, are also available to jurisdictions that suffer substantial loss of revenue due to the disaster."

JLARC Staff Note: Changes recommended by Mr. Jones have been included in the final report.

JOINT LEGISLATIVE AUDIT AND REVIEW COMMISSION

Professional Staff

Peter C. Clendenin
Mark S. Fleming
Timothy M. Garner
Richard E. Hickman
Kent S. Jamison
Billy J. Kittrell
William E. Landsidle
Russell T. Larson
Philip A. Leone
Ray D. Pethtel
William E. Schuerch
Paul W. Timmreck
Susan L. Urofsky

Administrative Staff

Linda H. Lawler
Barbara G. Nemetz
Sandra Saunders
Missy Spear

823 EAST MAIN STREET—RICHMOND, VIRGINIA 23219 (804) 786-[illegible]