

IMMEDIATE WATER POLLUTION CONTROL NEEDS
ROANOKE RIVER BASIN
VIRGINIA AND NORTH CAROLINA

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
MIDDLE ATLANTIC REGION
CHARLOTTESVILLE, VIRGINIA
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Regional Center for Environmental Information
US EPA Region III
1650 Arch St.
Philadelphia, PA 19103

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I. INTRODUCTION

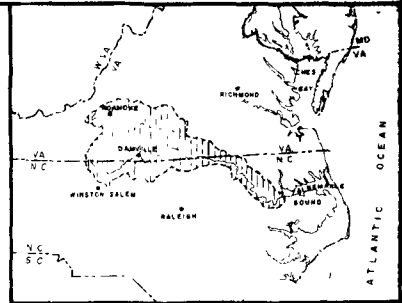
The water resources of the Roanoke Basin and the water quality are important factors in the growth and development of the basin. Multi-purpose reservoirs, waste treatment construction, stream monitoring, and special studies have been promoted in the basin to protect the basin's water for beneficial uses. The water quality control activities in the basin have been beneficial; however, problem areas are still present which need correction.

The objectives of the Roanoke River Basin Immediate Pollution Control Needs Report are to indicate the present quality problem areas, methods of correcting the problems, estimated costs of carrying out the programs, and any special areas which need additional study.

The information contained in this report is based on the best information currently available on the water quality conditions of the basin. No special engineering studies or investigations were made for the development of this report. This basin is not within the area covered by a comprehensive project.

The report was prepared in accordance with Section 3(a) of the Federal Water Pollution Control Act. This section provides for the preparation and development of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary condition of surface and underground water.

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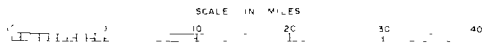
LOCATION MAP



LEGEND



IMMEDIATE WASTE TREATMENT
NEEDS AS OF APRIL, 1967



IMMEDIATE WATER POLLUTION CONTROL NEEDS
MIDDLE ATLANTIC REGION

ROANOKE RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
MIDDLE ATLANTIC REGION CHARLOTTEVILLE, VA.

II. SUMMARY OF IMMEDIATE POLLUTION CONTROL NEEDS

Pollution of the waters of the Roanoke River Basin can cause damage to propagation of fish and wildlife, municipal and industrial water supplies, and recreational uses. The following tabulation presents a summary of the municipal and industrial waste treatment at present and what action is needed. Flow regulation, Federal and State programs, and special studies are also presented.

| Waste Source Municipal | Waste Treatment | | Map Location |
|---------------------------|----------------------|---------------------------|-----------------|
| | Present Treatment | Need | |
| Stuart, Va. | None | Secondary | 1 |
| Martinsville, Va. | Primary | Secondary | 3 |
| Danville, Va. | Primary | Secondary | 4 |
| Bassett, Va. | None | Secondary | 2 |
| South Boston, Va. | Primary | Secondary | 5 |
| Altavista, Va. | Secondary | Additions | 6 |
| Walnut Cove, N. C. | Septic Tank | Secondary | 9 |
| Eden Sewerage District | None | Secondary | 10 |
| Henderson, N. C. | Secondary | Pickle Waste Treatment | 11 |
| Town of Plymouth, N. C. | None | Secondary | 13 |

| Waste Source Industrial | Waste Treatment | | Map Location |
|---|----------------------|-----------------------------------|-----------------|
| | Present Treatment | Need | |
| Federal Paper Board and Paper Company Roanoke Rapids, Va. | In-plant Control | Secondary | 12 |
| Albemarle Paper Company Roanoke Rapids, N. C. | In-plant Control | Secondary | 12 |
| Weyerhouser Paper, Inc. Plymouth, N. C. | In-plant Control | Secondary (Under construction) | 13 |
| E. I. DuPont | In-plant Control | Secondary | 3 |
| Dan River Mills (2 plants) | In-plant Control | Secondary | 4 |
| A & P Tea Company South Boston, Va. | None | Connect to Municipal System | 5 |
| Riverdale Sanitation Company South Boston, Va. | None | Connect to Municipal System | 5 |
| Pannill Knitting Company | None | Secondary | 1 |
| Bassett Mirror Company | In-plant Controls | Secondary | 2 |
| Bassett Industries (6 plants) | In-plant Controls | Secondary | 2 |
| Bassett-Walker Knitting Company | In-plant Controls | Secondary | 2 |
| Stanley Furniture Company | In-plant Controls | Secondary | 2 |
| Burlington Industries, Altavista, Va. | Secondary | Expansion | 6 |
| Burlington Industries, Brookneal, Va. | Primary | Secondary | 7 |
| Roanoke Electric Steel Company | Holding Ponds | Secondary | 8 |

Flow Regulation

Corps of Engineers

Study of Roanoke River Basin tentatively scheduled for FY 1969.

State Programs

States of North Carolina and Virginia

Expand and strengthen water pollution control programs.

Other Pollution Control Practices

City of Roanoke and Salem, Virginia

Repair and replace defective sewer lines to reduce infiltration and sewage overflow.

States of North Carolina and Virginia

Establish effluent monitors and instream sampling stations in reaches receiving industrial wastes.

Special Studies

Federal Water Pollution Control Administration, Virginia and North Carolina

Continue study of taste and odor problems in the Smith River.

Federal Water Pollution Control Administration, and Corps of Engineers

Continue study of low dissolved oxygen conditions in Kerr Reservoir.

Federal Water Pollution Control Administration, Corps of Engineers, Virginia and North Carolina

Initiate study to determine the effect of nutrients discharged to the Kerr Reservoir.

Federal Water Pollution Control Administration, and Virginia

Initiate study to determine effects of treated waste and nutrients on the aquatic life in the Smith Mountain Reservoir.

III. IMMEDIATE CONTROL NEEDS

Considerable progress has been made in the improvement of water quality in the Roanoke Basin in the past ten years through the construction of municipal and industrial waste treatment facilities. The construction programs have resulted in abatement of the more easily solved pollution problem and the remaining areas of need required special study, planning, monitoring and plan implementation.

The most significant water quality problems in the Basin are taste and odor problems near Spray, North Carolina, and low dissolved oxygen conditions immediately below the John H. Kerr Reservoir. Other problems of a localized nature may exist near the outfalls of municipalities and industries which provide less than adequate treatment; however, the extent of these problems are not readily defined for this Basin. No engineering studies or special investigations were conducted to provide this information.

The following list of needs should be considered in the development of a comprehensive river basin plan for the Roanoke Basin; however, because of the limited information available the needs should not be considered absolute or all inclusive.

WASTE TREATMENT

There are 31 municipalities in the Basin of which 23 provide secondary treatment, four primary and four provide no treatment. All the municipalities discharging directly to interstate streams have secondary treatment with the exception of three which have primary and one with no treatment.

The communities which have less than secondary treatment and discharge into interstate waters should initiate a program for the construction of adequate treatment facilities or, through the appropriate State agency, submit a report which evaluates the stream reaches affected by the discharge and indicates that the present treatment will provide for water quality enhancement commensurate with proposed present and future water uses. Consideration must be given to future water uses, economic growth, and industrial development of the Basin.

FLOW REGULATION

Provisions for flow regulation have been incorporated in the FPC License provision for the Smith Mountain, Gaston and Roanoke Rapids Reservoirs. To date the required releases have been made and water quality maintained. Needs for additional flow regulation have not been determined; however, a joint study with the Corps of Engineers is tentatively scheduled for FY 1969.

STATE PROGRAM

There is a need for the States of Virginia and North Carolina to strengthen and expand their respective water pollution control programs. The major elements of the State plans which are to be evaluated and strengthened are water quality monitoring, coordination of waste treatment construction program with water quality implementation plan, plant operator training, river basin planning, and enforcement.

OTHER POLLUTION CONTROL PRACTICES

There are seven major industries in the basin which have private treatment facilities and the effluent from these plants is discharged into or directly effect interstate waters. The remaining industries discharge to municipal treatment plants. All the industries which do not discharge into municipal systems provide treatment facilities, inplant controls, or controlled discharges.

The five industries listed in the Summary provide inplant controls and/or controlled discharges in lieu of treatment facilities. These industries should initiate programs for the construction of adequate treatment facilities. The type of treatment facility constructed must provide for water quality enhancement commensurate with proposed, present and future water uses.

Waste effluent monitors and instream sampling stations should be provided at each industry having a direct discharge to a receiving stream.

Both the Cities of Roanoke and Salem have infiltration problems which are attributed to old sewer lines that have deteriorated and allow storm and ground water to enter them. In the older sections of Roanoke combined sewers frequently overflow during period of heavy rains. Both of these conditions result in sewage overflow and allow untreated waste to enter the Roanoke River.

SPECIAL STUDIES

Taste and Odor - The joint study between North Carolina, Virginia, and the Federal Water Pollution Control Administration concerning the taste and odor problems in the Smith River should be continued. Currently steps have been taken to determine the constituents causing the taste and odor problem.

Kerr Reservoir - The joint FWPCA and Corps of Engineers study of the low dissolved oxygen condition in the Kerr Reservoir is currently being expanded and should be continued until remedial measures can be developed.

Nutrients - A study of nutrients in the vicinity of the wastes discharged from the municipalities of Henderson, North Carolina, and Roanoke, Virginia, should be initiated to determine the effects of nutrients on the Kerr and Smith Mountain Reservoirs.

IV. COST

The estimated cost of pollution control measures listed as immediate needs in Section II are tabulated below:

Cost Summary

| | |
|--|--|
| Waste Treatment | \$4,300,000 |
| Flow Regulation | To be studied |
| State Programs | Currently being prepared by the States |
| Other Pollution Control Practices Effluent monitors for specific industries | Not available |
| Correct infiltration problems | \$3,000,000 |
| Special Studies | \$ 140,000 |

The waste treatment cost is for municipal systems only and does not include cost for industrial treatment facilities. At present there is not sufficient information on waste strength, volumes and characteristics to estimate the cost of adequate treatment.

V. RECENT PROGRESS IN POLLUTION CONTROL

FEDERAL CONSTRUCTION GRANTS

The Federal Water Pollution Control Administration and the State Water Pollution Control Agencies through the construction grants programs have stimulated the expenditure of \$15,439,000 (eligible cost) for the construction of waste treatment facilities within the Roanoke Basin. This represents \$8,867,000 expended in the State of Virginia and \$6,572,000 in North Carolina since 1957. A total of 23 projects for Virginia and 13 projects for North Carolina were constructed with the assistance of the grant program for that period.

STATE AGENCIES

The North Carolina State Stream Sanitation Committee prepared a comprehensive pollution abatement plan for the Roanoke River Basin in 1957, and has subsequently updated the plan and is currently carrying out the implementation plan. In 1960, eleven industries in the North Carolina portion of the basin had no treatment facilities and at present all industries have adequate treatment or control devices.

The State of Virginia has conducted stream surveys of the Roanoke River and major tributaries, and initiated action for abatement of pollution in the basin.

Both States are presently developing water quality standards and implementation plans for interstate streams located in the basin. The documents will be submitted to the Federal Water Pollution Control Administration prior to July 1, 1967.

STUDIES AND COMMITTEES

A study entitled "Investigation of the Lower Roanoke River Basin, Virginia and North Carolina" was prepared by FWPCA in 1962. The effects of power releases from the John H. Kerr and Roanoke Rapid Reservoirs were evaluated to determine the effects of low oxygen level releases on downstream water uses. In accordance with the recommendation of the report, water quality sampling was expanded and an automatic monitor station was established below the Kerr Reservoir in 1966 by FWPCA. Current plans are underway to intensify the sampling program.

The Steering Committee for Roanoke River Studies was formed in 1955, with the objective of developing a comprehensive plan for the lower Roanoke River to protect all legitimate water uses. The Committee is comprised of representatives of the following:

Federal Water Pollution Control Administration
U. S. Army Corps of Engineers
U. S. Bureau of Sport Fisheries and Wildlife
North Carolina State Stream Sanitation Committee
North Carolina Department of Conservation and
Development
North Carolina Wildlife Resources Commission
Southeastern Power Administration
Albemarle Paper Incorporated (Halifax)
Weyerhouser Incorporated (N.C. Pulp Co.)
Sport Fisherman
Public at Large

Through the efforts of the Committee submerged weirs were constructed in the Roanoke Rapids and Gaston Reservoirs to improve the oxygen content of power releases. Minimum release schedules were established to protect downstream water uses.

The Federal Water Pollution Control Administration in cooperation with the States of North Carolina and Virginia is assisting in the study of the taste and odor problem in the Smith River.

VI. BACKGROUND

PERTINENT BASIN CHARACTERISTICS

The Roanoke River rises in the Great Valley of southwest Virginia. It flows southeasterly across the Piedmont Plateau, entering North Carolina near Clarksville, Virginia and Roanoke Rapids, North Carolina. In North Carolina, the river continues southeasterly to empty into Batchelor Bay, an arm of Albemarle Sound. The drainage area is approximately 9,820 square miles, of which about 6,300 are in Virginia and 3,520 are in North Carolina.

The principal tributaries to the Roanoke River are the Dan, Mayo, and Smith Rivers. All of these streams are interstate streams and drain a large area of Virginia before entering North Carolina. The Dan River rises in Patrick County, Virginia, and flows in a southeasterly direction to enter North Carolina in Stokes County. The river leaves North Carolina near Leaksville and flows through Danville, Virginia, then re-enters North Carolina near Blanche. The Dan River again leaves North Carolina near Milton and joins the Roanoke near Clarksville, Virginia.

The precipitation which is relatively uniform over the drainage basin averages approximately 43 inches annually. The driest year of record was 1930, when the annual precipitation in the basin was 27.36 inches. The wettest year occurred in 1937, and the annual precipitation reached 54.34 inches.

General streamflow characteristics of the lower Roanoke River have been in a state of change since August 1950, when the Philpott Dam on the Smith River first influenced the downstream flow pattern. The John H. Kerr Dam, Roanoke Rapids Dam and Gaston Dam were completed in 1952, 1955, and 1963, respectively, and their operation has resulted in full regulation of the lower Roanoke.

There are seven major stream gaging stations in the basin. The 7-day once in ten-year flows for three gaging stations are presented below. This is the design flow recommended by North Carolina and Virginia for evaluating treatment needs for meeting the water quality standards.

| <u>Location</u> | <u>Drainage Area</u> (sq mi) | <u>7-day once in 10-year Flow</u> (cfs) |
|---------------------------------|---------------------------------|--|
| Dan River at Leaksville | 1,150 | 225 |
| Smith River at Spray | 538 | 144 |
| Roanoke River at Roanoke Rapids | 8,410 | 1,009 |

In general the water quality in the basin is good with the exception of the low dissolved oxygen conditions at the Kerr Reservoir. The water quality at WPSS Station No. 91 at the Kerr Dam is indicated below:

Water Quality - Kerr Reservoir
1965

| | |
|---------------------------------------|----------------|
| Dissolved Oxygen (Reservoir) | 4.0 - 9.6 mg/l |
| Chlorides | 3.0 - 8.0 mg/l |
| Turbidity | 25 units |
| Hardness | 18 - 36 mg/l |
| Dissolved Oxygen (tailrace Aug. 1966) | 0.9 mg/l |

Land use in the basin is primarily agricultural; the principal cash crops are tobacco, cotton and peanuts. In addition to agriculture, manufactured and forest products are important to the economy of the area. Manufactured products include textiles, pulp, paper, building materials and furniture.

The total population of the basin in 1960 was 935,000 persons, of which 497,000 were rural. The rural population is expected to decrease and municipal will increase markedly.

PRESENT WATER QUALITY PROBLEMS

Taste and Odors - Taste and odor problems have occurred in the Smith River at Spray, North Carolina for the past ten years. The sources of the problem are located upstream and involve the communities of Martinsville, Basset, and Stanleyton in addition to furniture and textile plants. During early investigations the problem was thought to be from phenols; however, subsequent studies have indicated the phenol concentration was not of sufficient levels to create the problem.

Recent studies by the State of Virginia have indicated a relationship between the taste and odor problems and releases from the Philpott Reservoir. It was thought that contaminants may build up in the receiving stream during the weekends and on the following Monday power releases flush the contaminants downstream.

The sources of the contaminants have not been located but could be attributed to inadequate municipal or industrial treatment.

Dissolved Oxygen - Discharges from the John H. Kerr Dam are devoid of dissolved oxygen during the late summer period as a result of thermal stratification and low-level power intakes. During 1966 the minimum dissolved oxygen level in the tailrace was recorded at 0.9 mg/l. The Gaston and Roanoke Rapids Reservoirs, located downstream, have submerged weirs which permit the discharge of higher quality water during periods of thermal stratification. The minimum dissolved oxygen level in the Roanoke Rapids tailrace during the summer of 1966, was 4.9 mg/l.

The relationships between low oxygen discharges at the Kerr Dam, density underflow, and oxygen levels at Roanoke Rapids have not been determined.

Smith Mountain Lake - Since the completion of the Smith Mountain Dam in 1964, various water quality problems have developed in some areas of the Lake. In the spring of 1966 an extensive fish kill occurred and was traced to a parasitic organism called myxos that sometimes attacks fish which are in a weakened condition. The Lake is also beginning to experience algae and siltation problems.

The Virginia Water Control Board is currently working with FWPCA to obtain support for a special research study of the various problems developing in the Lake.