Delaware River Basin Commission

Annual Report 1978

Contents

UPPER SCENIC DELAWARE — Above and opposite are contrasting scenes at Lackawaxen, Pa., on the upper Delaware that is now a national scenic river. The aerial scene shows the 131-year-old Roebling Bridge, once an aqueduct that carried the Delaware and Hudson Canal. The nation's oldest suspension span, it is to be purchased, renovated and preserved by the National Park Service and reopened toll-free to light vehicular traffic. The winter view on Page 1 is looking upstream from Lackawaxen with New York State in the background. Upper river photos by James M. Staples.

COVER — This scene at Lumberville in Bucks County, Pa., shows the Delaware Division Canal, a sixty-mile waterway built 150 years ago to carry coal barges to Bristol from the end of the old Lehigh Canal at Easton. The canal and its shores are now the Theodore Roosevelt State Park. In the distance is foot bridge crossing the Delaware from Lumberville to Bull's Island State Park, N.J. Structure at bottom right is a "feeder bypass," a mechanism to carry water water around lock (out of picture at left). Color photography by Leigh Photographs.

Report designed by Odette P. Taft, DRBC graphic artist/illustrator

Introduction

This is the sixteenth annual report of the Delaware River Basin Commission that was established by interstate-federal compact in 1961 for planning, development, management and protection of the water resources of the four-state river system, including all of its tributaries. The report, covering calendar 1978, is presented respectfully to the more than seven million residents of the valley and their elected representatives in the capitals of New York, Delaware, Pennsylvania and New Jersey and the United States.

For the first time, a reassessment is being made of the provisions of the 1954 U.S. Supreme Court decree that allocates Delaware waters between the basin and its outside service area that is mainly New York City and Northeast Jersey. The review, while sanctioned by and convened at the invitation of the Commission, is being conducted by the five parties to the decree, who are the four basin states and New York City. One of the major developments that gave rise to the decree evaluation was the decision by Congress to, in effect, abandon the long-planned Tocks Island reservoir near the Delaware Water Gap.

Many issues involving aspects of water supply were translated into activities and programs at the Commission this year and receive much attention in this report. These include protecting public and industrial water supplies in the Philadelphia metropolitan area from salinity contamination, assuring detailed environmental reviews on a proposed reservoir in New Jersey to supply water to power plants, and developing a policy promoting water conservation and a program for managing subsurface supplies.

Also included are sections on the comprehensive study (Level B) that is to help guide the Commissioners in their planned revision of the basinwide master plan, the designation of waterways in the basin as parts of the national and Pennsylvania scenic river systems, the new policy for protecting wetlands, and the betterment of upper basin streams from the experimental changes in operating New York City's reservoirs.

The prospects for marked improvement soon of the quality of the long-polluted tidal estuary, one of DRBC's premier goals, are also described.

Another feature is a personal report from the executive director, Gerald M. Hansler.

Year's Review

Delaware Basin continues to reflect environmental trends

The era of changing national philosophy and direction in environmental protection and water resource management has been in full swing for the past several years.

The wave of new federal and state laws reflecting the nation's revolutionized concern for its physical surroundings had taken hold through the 1970s. In fact, the present Commissioners and the new executive director had been in the midst of this new environmental awareness movement in the various public positions in which they had served through the 1970s.

The Delaware Basin had become a microcosm of the water resources trend in the nation, particularly in the shift away from the tradition of building reservoirs to cope with needed water supply and flood protection. And developments reflecting the new trends continued to unfold in the Delaware Basin.

The Commission's three-year "Level B" investigation to help modernize the comprehensive plan that mostly dated to the agency's inception had been organized and gotten into its substantive stages.

Late in 1978, the Congress in effect nullified its own old authorization of the multi-purpose Tocks Island dam. This happened when the Tocks Island, or middle river, stretch of the Delaware was incorporated into the National Wild and Scenic Rivers system. Abandonment of Tocks, the single biggest water resources project ever planned in the Middle Atlantic region, necessitates revision of DRBC's comprehensive plan. But, fortuitously, it comes as the Commission's plan is about to be overhauled through the Level B process anyway.

And about the same time, DRBC's own members decided that recent turns in events called for reassessing the foundations of the region's interstate water management. Pennsylvania sought the interstate re-evaluation in the wake of the congressional action on Tocks Island, contending the Commonwealth's southeastern section would be deprived of expected benefits from the dam. The core of the review is the U.S. Supreme Court decree that apportions Delaware water rights between the basin and its neighboring service area — along with the updated profile of existing and projected uses and needs produced by the Level B study.

Ensuing sections of this report describe the valley's water-related events and activities of the year, many of them in direct response to new trends in resource management.

Organization changes

The only 1978 change in the agency's membership occurred when Daniel F. O'Hern replaced Rocco D. Ricci as both New Jersey environmental protection commissioner and Governor Brendan T. Byrne's DRBC's alternate.

In 1978, Dick Thornburgh was elected governor of Pennsylvania succeeding Milton J. Shapp, who served the two consecutive-term limit. On taking office in January 1979, Governor Thornburgh became the Commonwealth's ex efficio DRBC member.

The new governor announced that he would retain Maurice K. Goddard as his DRBC alternate, thus continuing him in a post he has served in without interruption from the Commission's inception in 1961. His is the only DRBC member or alternate position that has not changed hands several times. Dr. Goddard also continues as the governor's alternate on the Susquehanna River Basin Commission, but he retired as the veteran secretary of Pennsylvania's environmental resources department.

In January 1979, Eldred Rich, assistant environmental conservation commissioner in New York State, succeeded Theodore L. Hullar as alternate DRBC member to Governor Hugh L. Carey. Francis X. McArdle, who is New York City's environmental protection commissioner, was named in 1978 by Mayor Edward I. Koch as advisor to the New York State member. Appointed new advisor to DRBC's federal member was Col. James G. Ton, who heads the Philadelphia district of the Army Corps of Engineers.

Raymond J. DiFrancesco of Ewing, N.J., a certified public accountant who formerly was administrative assistant to the Mercer County comptroller, was named DRBC's chief administrative officer, succeeding Arthur E. Peeck, who retired.

Governor Thornburgh

Mr. Rich

Mr. McArdle

Colonel Ton

Mr. DiFrancesco

Executive Director's Report

DRBC: Catalyst, Buffer and Sometime Reagent

By Gerald M. Hansler

The compact establishing the Commission created considerable authority for this body. However, that authority is latent unless and until unleashed by the five commission members. Historically, the Commission's roles have been comprehensive water resource planning, mediating significant inconsistencies between signatory party programs, and oversight to assure that actions taken by public agencies and project developers conform to the comprehensive plan. In other words, it has not been an active operating agency.

DRBC has been an effective catalyst in addressing major problems this year. It has been the forum for the continued deliberations on the experimental conservation releases from New York City's reservoirs into upper Delaware streams. Canoeists and fishermen have lauded the results so far.

The Commission has been intimately involved in negotiations with the other parties — U.S. Environmental Protection Agency, the states of Maryland and Pennsylvania, the Sierra Club and the City of Philadelphia — in the suit over the city's wastewater treatment plant construction program. Significant elements in negotiations toward a consent decree revolved around the Commmission's rules, regulations and wasteload allocation program.

The Commission was a catalyst in obtaining agreement among parties to the 1954 Supreme Court decree to negotiate in "good faith" a revision to that outdated ruling. This resulted from Pennsylvania's desire to use DRBC to settle issues surrounding the middle Delaware River and water rights — rather than "go to court."

Probably the Commission's most important "buffer" role in 1978 was its pursuit of an equitable drought contingency plan. This is vital because, based on a recurrence of the 1960s drought, the basin lacks the hydrologic capacity to fully support both New York City's diversion allowance and the mandated downstream minimum flow. DRBC's role in seeking an agreement is continuing, and unanimity should result through the drought plan deliberations; the "good faith" negotiations; the Level B process; and putting a drought contingency modus operandi in the comprehensive plan.

Sometimes, the Commission becomes an active party — or a "reagent," if you wish. This was DRBC's role in developing the groundwork for designating the upper Delaware as a wild and scenic river. In fact, the Commission placed that river segment in its comprehensive plan as wild and scenic before official action by Congress. Commission staffers provided assistance to congressional legislative drafters to assure state and local policies will be reflected in the National Park Service's management plan.

Mr.Hansler

It was DRBC that prompted development of a new salinity model capable of predicting chloride movements in the estuary for any stream level of the free-flowing river at Trenton — high, normal and drought. Application of this model was the critical factor in persuading the Commissioners to reconsider the estuary's existing chloride standard and the minimum river flow at Trenton assumed necessary to meet it. Many model "runs" were conducted in 1978 for the Level B study. The model will continue to be useful to the "good faith" negotiations, Level B process and comprehensive plan revision.

DRBC is the "reagent" also for National Environmental Policy Act implementation. It is responsible for an environmental impact statement for the proposed Merrill Creek reservoir, to provide water during low flow periods to assure continued operation of steam-electric power plants. Though the Commission is the "lead" agency for assessing the project's environmental and economic aspects, important assistance is coming from key signatory agencies. New Jersey and the Army Corps of Engineers have contributed much staff time and some contract funds; and EPA and the U.S. Fish and Wildlife Service are close collaborators. Public meetings were held to obtain local views *before* the environmental review began, assuring a complete-as-possible record upon which DRBC's members can decide the proposal's fate.

But all that was last year. What will be the roles and efforts of the Commission for the near future? I am sure they will continue to be as catalyst and buffer or coordinator. But hopefully more use of the "reagent" role will emerge to help solve some of our pressing basin problems — matters which can best be managed on a regional basis.

Several "active" roles loom in the near future. The Commission has been the catalyst in completing Phase I of an industrial exotics waste disposal study. We are continuing in that role for Phase II, to develop a management system for handling hazardous and toxic wastes — those continuously generated, those needing to be reclaimed to cleanse a local environment, and new wastes that will wind up as residues because of stringent waste treatment regulations.

Additional "active role" efforts for the near future are: establishment of protected ground water areas where needed; successful completion of the basinwide comprehensive ground water study so as to manage our water resource as a combined ground water/surface water unit; and continued reconciliation of the differences between signatory party agencies over levels of waste treatment for municipalities and industries on the estuary.

The past may be prologue, but it need not dictate by degree the future roles of the Commission.

Interstate Water Management

"Good faith" negotiations convened at DRBC invitation between four states and New York City

For the first time, official consideration is being given to whether the long-standing allocation of Delaware River water rights, duties and obligations between the basin and the New York City-Northeast Jersey service area outside the basin should be altered.

It was nearly a half-century ago that the U.S. Supreme Court handed down the decree that entitled New York City to divert large volumes of water supply from the Delaware River Basin. The downstream states of Pennsylvania and New Jersey lost their challenge to the scheme, but they won protection of their Delaware water rights when the court required the city to make minimum downriver releases from its reservoir system.

Nearly a quarter-century has passed since the high court revised the decree to enlarge the city's diversion allowance and add an entitlement for urbanized northeastern New Jersey to take Delaware water through the Delaware and Raritan Canal.

Court decree of 1931

In 1931, the court, in an opinion by Justice Oliver Wendell Holmes, established New York City's initial right to reach more than 100 miles to the upper Delaware for good-quality Catskill Mountain water. The ruling envisioned the city's construction of two upper Delaware reservoirs — on the Neversink River, which flows south to the Delaware River at Port Jervis, N.Y., and on the Delaware's East Branch at Pepacton. The decree also established a river master's gauging station at Montague, N.J., just south of Port Jervis, N.Y., to police the mandated minimum streamflow. Neversink and Pepacton reservoirs began operating in the 1950s, construction having been delayed by the Great Depression and World War II.

With growth projections soaring after World War II, the city petitioned for the increased allocation it received from the court in 1954. That entitled New York to divert 800 million gallons daily, or half of its present total daily provisions, through addition of a large third reservoir on the Delaware's West Branch called Cannonsville. The 1954 revision also allowed New Jersey to take up to 100 million gallons through the canal, but, unlike New York, without necessity of making compensating releases. The 1954 ruling also substantially increased the city's downriver release obligation.

Walpack Bend dam

In those years, both Pennsylvania and New Jersey envisioned that a major bistate water supply reservoir would be built at Walpack Bend. This is where four counties — Warren and Sussex in New Jersey and Monroe and Pike in Pennsylvania — converge along the Delaware River and about five miles upstream of what a decade later was to be proposed as the controversial Tocks Island dam.

Pennsylvania has cited that as part of the 1954 decree it was joined by its sister state of New Jersey in supporting construction of the Walpack Bend project.

After 1954 came a series of developments and events crucial to the basin's future:

- The early-1955 start of interstate efforts to create a regional agency to manage the river — and keep the states out of court.
- The August 1955 record flood disaster.
- The Army Corps of Engineers' basin study that recommended in 1960 Tocks Island for water supply — and flood control, recreation and hydropower too.
- And the 1961 enactment of the 100-year Delaware River Basin Compact creating the Commission that was organized the following year.

Recognition of the decree's terms was included as a cornerstone of the 1961 compact, which declares that only during a temporary water supply emergency and with its members unanimous consent may the Commission alter the decree. This happened once during the record drought of the 1960s.

The Commission also involved itself in the decree's operations in 1977 when it enacted a trial downstream

releases program for the New York reservoirs to improve the quality of stream immediately below the three dams. The experimental release program, which also had unanimous consent from the decree litigants, was still in effect as 1979 began. Unlike the 1960s drought relief action, the current program does not alter the basic entitlements to diversions or the Montague streamflow obligations. Rather, it provides an altered distribution of the "bank" of water collected at the three city reservoirs in excess of that needed to accommodate the city's needs and flow minimums.

The Tocks Island plan was so popular when first proposed that it became the centerpiece of the DRBC's then-new comprehensive plan and was quickly authorized by Congress with virtually no reservations. It enjoyed continued official endorsement through the 1960s even when local protests cropped up and when construction first got delayed due to the Vietnam War-diverted appropriations.

But the opposition mounted, and by the early 1970s it was gaining allies among elected officials — first a few congressmen then former Governor William T. Cahill, who withdrew New Jersey's and his own long support.

Tocks Island shelved

By 1975, a DRBC majority recommended against congressional funding to start construction and by 1978 Congress put the Tocks Island reach of the Delaware in the National Wild and Scenic Rivers system. This action was widely interpreted as killing off the reservoir plan despite repeated congressional refusal to repeal its 1962 authorization of the reservoir.

Pennsylvania, in 1978 the last remaining Tocks Island proponent among the basin states, protested that loss of the reservoir would leave a severe deficit in the long-contemplated river streamflow augmentation to aid the Commonwealth's heavily developed southeastern corner. At first, it threatened to go to federal court with a claim that the decree had been violated. In October, Pennsylvania announced that instead it would ask the Commission to call together the five parties to the decree to discuss its adequacy in light of recent events.

In December, with all compact signatories and New York City concurring, a Commission resolution was adopted "inviting" the decree litigants to "enter into serious good faith discussions to establish the arrangements, procedures and criteria for management of the waters of the Delaware Basin consistent with the compact," with a completion target date of October 1, 1979, unless extended. Further, the parties were "invited" to submit "any agreement reached" to DRBC for approval, consistent with the compact. An observer attends the sessions for the federal government, which is not a party to the decree.

"Good faith" pledged

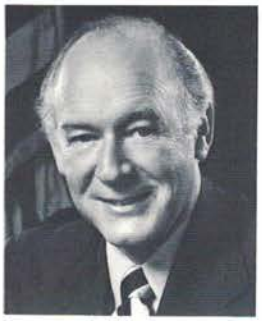
The four governors and New York's Mayor Edward I. Koch complied with a request in the resolution that they "exchange letters agreeing to enter into good faith discussions." The signers included outgoing Governor Milton J. Shapp of Pennsylvania. His successor, Governor Dick Thornburgh, had expressed opposition to Tocks Island during the fall of 1978 campaign, but after taking office he continued the Commonwealth's support of the talks.

Three factors in addition to Tocks Island helped provoke the decree evaluation. They were the issue of altering downstream conservation releases from the New York City reservoirs to improve local streams; the question of fresh water flow volumes needed to protect quality in the estuary; and recognition that the 1960s drought was more severe than earlier water shortages on which the Supreme Court decree was based.

The agreement between the states to try, themselves, to resolve the basin's water management problems avoided putting the solution in the hands of the high court. Also, it averted, at least for now, a new breakdown between the four states that share the Delaware's water resources.

In calling upon the Commission to sponsor the negotiations and ultimately consider adoption of any agreements produced, the states reaffirmed a principal purpose of the basin compact — to promote and preserve interstate comity.

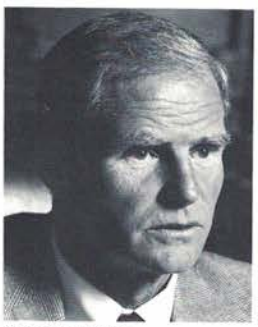
The Commission · 1978


Secretary Andrus


Mr. Tribbitt


Governor Carey


Dr. Hullar


Governor Byrne


Mr. O'Hern


Governor duPont


Mr. Olney


Governor Shapp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United States

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Program Planning

Robert L. Goodell
Operations

Scenic Rivers

Middle and upper Delaware enter U.S. system; Schuylkill is first in Pennsylvania network

Success finally came for the decade-long cooperative effort to assure preservation in its natural state of the 75-mile upper Delaware River where it is the New York-Pennsylvania boundary by making it part of the National Wild and Scenic Rivers system.

Also incorporated by the Congress into the system was the 38-mile middle river segment that borders New Jersey and Pennsylvania within the Delaware Water Gap National Recreation Area.

This scenic river plan was designed to prevent the middle river from becoming a lake as part of the increasingly unpopular Tocks Island reservoir plan.

Enactment of the National Parks and Recreation Act of 1978 means that well over half of the Delaware's non-tidal main stem from Hancock, N.Y., to Trenton, or more than a third of the entire 330-mile river to the Atlantic Ocean, is now a scenic river administered by the National Park Service.

DRBC had been active in the upper scenic river planning from its inception and helped draft that part of the 1978 legislation.

The middle river from Stroudsburg to Milford, Pa., is within the Delaware Water Gap National Recreation Area that would have surrounded the Tocks Island lake and thus will be protected differently than the upper section. The 60,000-acre park, virtually all publicly owned, has five environmental educational centers, a craft village and other features that already are popular visitor attractions.

The upper river area will remain primarily in private hands and will fall under a cooperative management plan calling for local land use controls. Being drawn by the Park Service, state and local governments in Pennsylvania and New York and DRBC, the plan is to safeguard the interests of residents and property owners yet allow visitors to enjoy the scenic and recreation features. Extensive public participation through a citizens advisory council will aid in formulation of the management plan.

The Schuylkill River

The Schuylkill River, the Delaware's largest tributary, became the first waterway in the Commonwealth of Pennsylvania's own scenic river system. Starting as headwaters in Schuylkill County, the river flows for nearly 100 miles through Berks County and by Montgomery and Chester Counties, emptying into the Delaware after passing through Philadelphia. The state legislative action classified most of the river for recreational purposes and calls for local voluntary action to keep or make shoreline areas compatible.

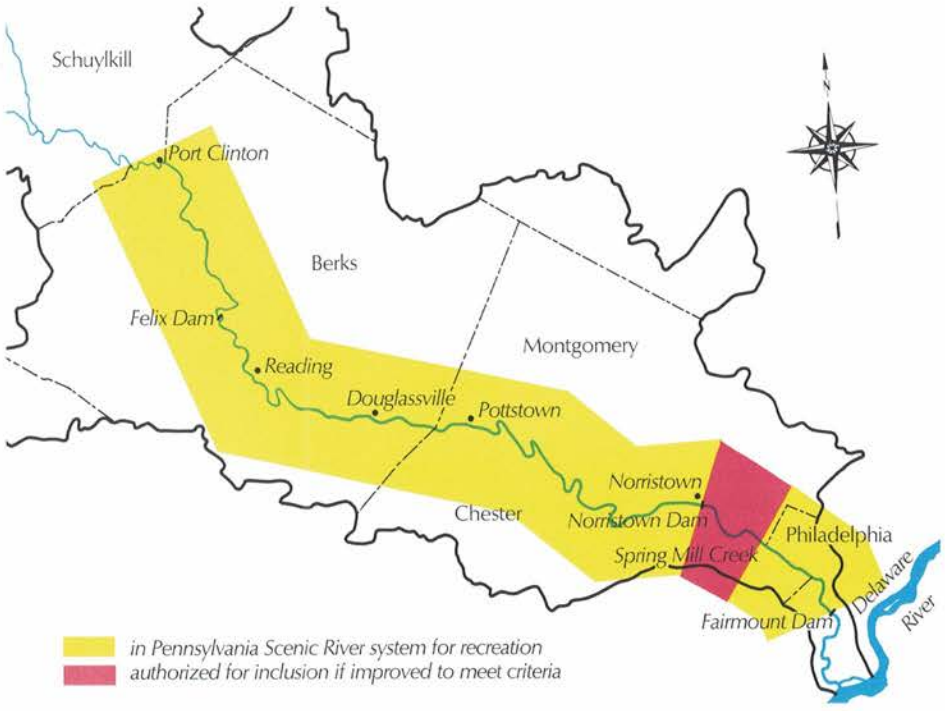
The Commission added to the legal protection of both the upper Delaware and Schuylkill scenic river stretches in 1978 by unanimously incorporating them into its own comprehensive plan prior to completion of legislative action in Washington and Harrisburg. The compact gives the DRBC power to prevent incursions and uses of water where they are incompatible with its plan.

Because the Tocks Island reservoir plan remains in the basinwide comprehensive plan — at least until the outcome of several pending DRBC, federal and state water studies — the Commission has taken no similar action on the middle scenic river issue.

DRBC declined also to make a recommendation to Congress on the middle river due to a legal inhibition. The compact declares that any DRBC decision affecting the U.S. Supreme Court decree apportioning the river's waters between the states must be unanimous. Because the middle scenic river plan is regarded a substitute for the Tocks Island reservoir, which is envisioned in the decree, and since the Commissioners could not agree at that time on abandoning Tocks Island, they said they could make no recommendation.

Before deciding its course on the upper and middle scenic Delaware questions, the Commission held an all-day hearing at Port Jervis, N.Y. Support was nearly unanimous for the upper river plan while endorsement of and opposition to the middle scenic river broke down very much along pro- and con-Tocks Island lines.

Pennsylvania is considering making the Lehigh its second scenic river, and action on this may be taken in 1979 by the Commonwealth and DRBC.



SCHUYLKILL RIVER — The Delaware's largest tributary became the first stream in Pennsylvania's Scenic Rivers system and also the first scenic river in DRBC's comprehensive plan, largely through citizen-government cooperation. A main feature is voluntary local programs to keep shorelines compatible with system's goals.

"Level B" Study

Third year of effort to produce final proposals

The extensive three-year investigation that is to guide DRBC in reformulating its long-range master plan for managing the basin's water resources moved into its final year.

Named the Delaware River Basin Comprehensive Study, and also called "Level B" by federal authorizing law, the study is to culminate in the fall of 1979 with publication of the final report. It will contain the Commissioners' own recommended revisions to DRBC's comprehensive plan—standards, policies, guidelines, programs and projects. Those proposals then are to go out to the public for scrutiny and hearing as a further aid to the Commissioners in deciding how to refashion the agency's comprehensive plan, probably early in 1980.

Parts of the existing comprehensive plan date to 1962 and include the giant Tocks Island reservoir project in the Delaware Water Gap area and other multi-purpose dams that, like Tocks, may not be built. Also, much of the present plan predates the recent crop of state and federal laws and the public environmental concern that they reflect.

In 1975, DRBC's own member governors urged Congress not to proceed with the increasingly unpopular Tocks Island structure. This posed a major void in the old comprehensive plan in terms of delivering large benefits to the region in water supply and flood protection down the Delaware. DRBC's Tocks decision was further cemented late in 1978 when Congress' designation of the lake area as a national scenic river was signed into law by President Carter.

Extensive public participation

DRBC initiated the Level B effort in 1976, engaging study manager David D. Longmaid and a special six-member staff after the federal government approved the Commission's application for a matching grant to conduct the program. The Federal Clean Water Act and Water Resources Planning Act authorize such basinwide water management studies and they are conducted under guidelines of the U.S. Water Resources Council. The council requires strong public participation in each successive stage of the process.

In the final report, the Commissioners are to propose three alternative basinwide water management plans — each consisting of a package of standards, policies, programs and projects. They will be:

- The plan that places most emphasis on preservation of the region's natural and environmental resources.
- The plan most in line with national economic development goals.
- The Commissioners' own recommended most practical program for the basin, drawing on both the environmental and economic development packages.

Impact statement scheduled

In addition, the final report will contain the final environmental impact statement as well as proposed amendments to DRBC's present comprehensive plan.

The final document will be a follow-up and refinement of the draft final report due in mid-year and that is to include the draft environmental impact statement. Formal public hearings will be held on the draft version, in contrast to the series of informal public information workshops on the preliminary report earlier in 1979.

Each year since the study commenced in 1976, the Level B group has taken the latest stage of its findings to the public for open discussion and reaction at a series of workshops at locations throughout the four-state region. The policy of broad public involvement is to continue through the program's conclusion at the end of 1979.

The final proposals are to be built on the preliminary report comprising the following but containing no recommendations.

- A recitation of the background of the study and how changes have evolved in the basin's water resource problems and how the waters have been managed, stemming largely from the changes of the 1970s.
- A description of the basin's present physical and social environment and actual water resource conditions of the four-state region.
- A list of the major water problems identified by the study in the areas of conservation, pollution, streamflow maintenance, water supply, flood loss reduction, fish and wildlife, recreation, energy and navigation. Federal and state agencies and the public assisted in this assignment.
- A presentation of dozens of "management options" dealing with each of these resource areas for the public and the five signatory governments to consider prior to preparation of the final report. Public response is to be sought again on the final reports' contents.

Wetlands Protection

New policy bans encroachments on areas of over 25 acres

DRBC is now empowered to protect the basin's tidal and fresh water wetlands from encroachments.

A new policy adopted in 1978 requires that no activity or project affecting large wetlands areas can proceed without DRBC clearance and further that only in the case of "overriding public interest" will encroachments be permitted.

The protection is designed essentially to preserve wetland areas of 25 or more acres through DRBC's project review process but also covers smaller marshes in some cases.

The policy, part of the comprehensive plan, requires balanced assessment of environmental and economic impact of any function that could adversely affect marshes, swamps, bogs and other wetlands in the 13,000 square-mile river valley.

The DRBC reviews are thus designed to weed out projects with an unjustified negative impact, permitting only those where no feasible alternative exists and where a dominant public interest is demonstrated. Further, allowable projects must be planned and operated to safeguard desirable environmental features.

Signatory reviews continue

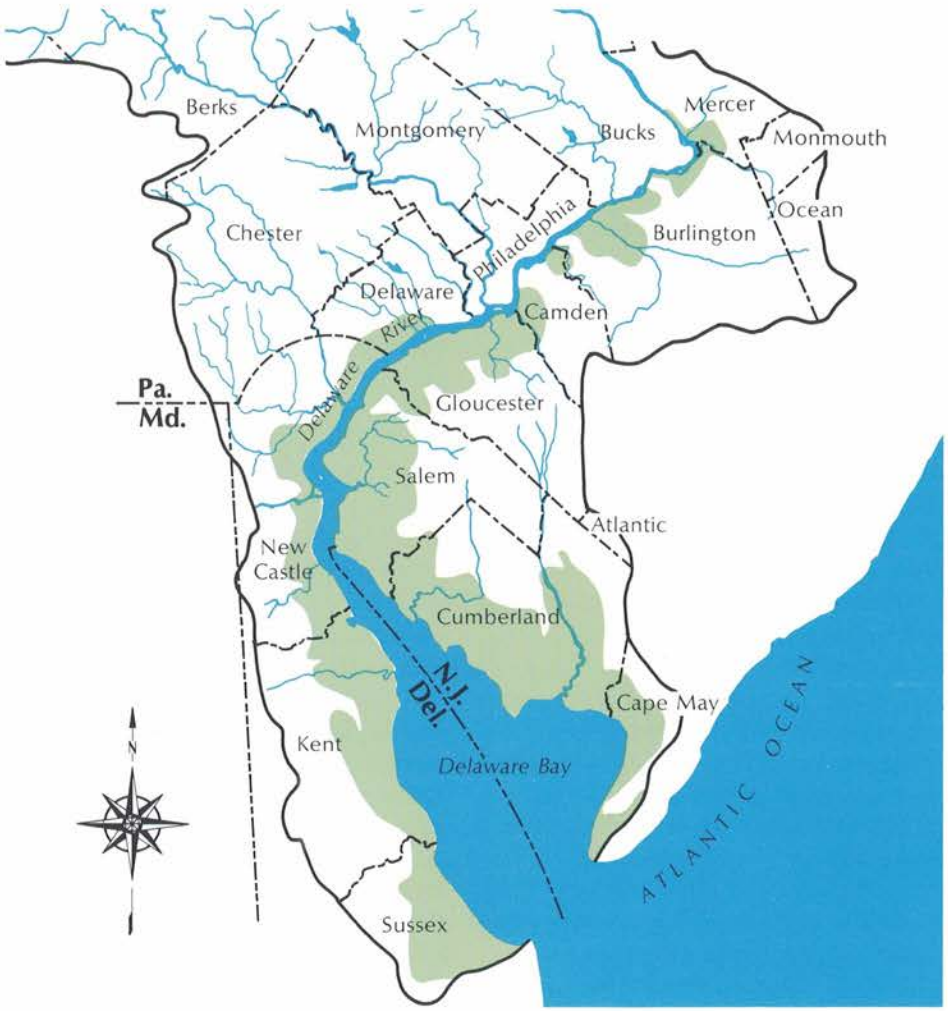
Reviews of activities covering smaller marsh areas still are being made by the Army Corps of Engineers and the environmental agencies of the four basin states, obviating redundant DRBC reviews. DRBC will screen projects involving less than 25 acres only where they are of "major regional or interstate significance" and there is no state or federal jurisdiction, or where the DRBC policy is not adequately reflected in a wetlands decision by a signatory agency.

New York State has a new fresh water marsh protection program and New Jersey is developing one as part of its coastal zone management activities.

The Commission's policy describes wetlands as valuable habitats for plants, waterfowl and animals; as a vital source of nutrient-producing vegetation important to nature's food chain; and as a resource that is important for storing flood water and runoff and absorption of sediment. Each of these benefits suffers when loss of wetlands occurs from uncontrolled draining and filling. Irreversible losses of tidal wetlands acreage in recent decades are estimated at more than 25 percent in New Jersey and more than six percent in Delaware.

Most of the valley's remaining marshlands are along the shoreline of the tidal lower bay in Cape May, Cumberland and Salem Counties of New Jersey and Kent, Sussex and New Castle Counties of Delaware, but innumerable smaller patches are scattered throughout the four-state region's nontidal interior.

Best known of the limited wetland resources in Pennsylvania is Tinicum Marsh near Philadelphia International Airport. Others are found in nontidal areas that include the main Delaware upstream of Trenton and the river's many tributaries, including the Basherkill in the Catskill Mountains of New York.



WETLANDS— Tidal marshes are shown in green and are concentrated principally along the bay in New Jersey and Delaware. DRBC's new policy protects these and also innumerable patches of fresh water wetlands in the basin's interior that are not shown.

1978 Accomplishments and Activities

Energy. Continuing its close surveillance of water-using utilities, the Commission received from the region's power companies a new master siting study describing new and expanded electric generating facilities projected through 1993. This is the fourth siting study developed since the Commission first called for the reports eight years ago.

Environmental Reviews. Environmental analysis work began on an electric utility reservoir proposal in Warren County, N.J., developed at DRBC direction, to supply water to compensate for evaporate losses from generating stations in time of drought. DRBC finished an impact analysis on a giant chemical receiving and storage terminal proposed for development along the upper estuary in Burlington County, N.J., and later abandoned.

Wetlands Protection. A new environmental protection policy was enacted to prohibit most encroachments on tidal and fresh water wetlands. The program is designed to assist, supplement and oversee existing state and federal permitting activities.

Upper Basin Farm Wastes. DRBC endorsed and participated in a special new study of agricultural non-point pollution sources on the river's West Branch upstream of New York City's Cannonsville reservoir in Delaware County, N.Y. One of seven agricultural watersheds in the nation selected for a model implementation program, this federal-DRBC-New York effort seeks to solve a local problem through existing programs.

Conservation. Enactment of the fifteenth annual water resources program, which lists the region's short-range water goals, committed DRBC to support enactment of conservation measures by the basin states, including bans on toilets that use excessive water. This builds on the water conservation promotion policy and water metering regulations already on the Commission's books.

Water Quality Status. For the fourth successive year, DRBC compiled an inventory describing current water quality, degree of improvement, status and costs of point-source abatement, and nature of non-point sources. The report covers the 330-mile main Delaware River from Hancock to the ocean.

208 Studies. The Commission continued its interstate coordinating work on 13 areawide waste treatment management plans conducted throughout the four-state basin by state, county and regional planning agencies.

Salinity. DRBC completed development and began use of a mathematical model on ocean salinity intrusion in the Delaware estuary as it relates to fresh water inflow from upstream. The model also is usable to study impacts on estuary salinity from the large diversions of water supply from the upper Delaware to New York City. DRBC also is cooperating in the new study by the Army Corps of Engineers to assess salinity's economic impacts on the lower river region and determine the extent of flow regulation needed to control it.

Industrial Waste Residuals. DRBC neared completion of the first phase of a program aimed at establishing a basinwide management plan for the collection, treatment, recovery, reuse and disposal of industrial waste residuals. In this data-gathering phase, a survey has been conducted among the 2,600 industries for information on quantities and types of problem wastes being generated, their characteristics and methods of disposal. This knowledge is to help DRBC project the magnitude and nature of the residual problem by industry groups, laying the groundwork for the second phase, which is to produce the management plan.

Recreation Maps. DRBC began revising for 1979 publication its canoeing maps of the 200-mile nontidal Delaware main stem from Hancock to Trenton. Nearly 30,000 sets have been sold since the maps were first published in 1966, mostly to canoeists using the northernmost 100 miles of the river. A major contribution to the map revision work came from whitewater canoe group volunteers who evaluated the river's rapids for DRBC based on the International Canoe Federation scale of river difficulty. In this first grading of the river's rapids consistent with American Whitewater Association requirements, each segment was paddled and evaluated at least twice, and more difficult sections up to eight times. Revision and republication of the maps is timely as a safety aid since canoeing is increasing sharply on the middle and upper Delaware, which have just become part of the National Wild and Scenic Rivers system.

Drought Contingency. A special task group was created to develop technical options to help DRBC apportion short-supply waters to accommodate minimum needs of both in-basin users and New York City in the event of a severe drought such as that of the 1960s. The assignment is to be completed in 1979. Emergency operating criteria and conservation measures as well as long-term operations are being studied. Comprising the task unit are the DRBC, the river master and parties to the 1954 U.S. Supreme Court decree on interstate allocation of Delaware waters, including New York State and New York City.

Hydrology Coordinating Committee. This advisory group comprising the five signatories continued its assignment to establish uniform operating criteria under which the basin's resources will be managed. Its 1978 work also included a report on determining basinwide 100-year flood frequency statistics at all key stream gauging stations for use in the federal flood insurance program.

Level B. The special staff engaged to conduct the Delaware Basin Comprehensive Study, a special federally funded project aimed at modernizing the Commission's comprehensive plan, neared completion of its data collection and analysis work. Next to come was preparation of the preliminary and final reports. The final report, scheduled for publication in the fall of 1979, is to produce the Commissioners' own proposals for guiding the region's water management future.

Ground Water. After three years of efforts in Washington, DRBC won congressional approval and funding this fall for a three-year program beginning in 1979 to analyze basinwide ground water problems and develop a management program in conjunction with the basin's surface water resources.

Interstate Water Apportionment. The Commission accepted the Commonwealth of Pennsylvania's proposal that it invite the parties to the U.S. Supreme Court decree to assemble and reassess the permanent diversions, releases and obligations between the basin and the out-of-basin service area including Northeast Jersey and New York City. The review was arranged in the wake of the 1978 congressional decision to designate the middle Delaware a wild and scenic river rather than proceed with development of the Tocks Island reservoir project. Pennsylvania contended that construction of a major main stem reservoir such as Tocks Island was envisioned in the court's decree action.

Upper Basin Stream Protection. The Commission supervised the first full year of trial procedures for operating New York City's three Upper Delaware reservoirs. The revised reservoir releases produced the healthiest local stream conditions yet experienced below the dams, as shown by New York State's companion program of monitoring the impacts through limnological surveys. New York State fishermen, conservationists and canoeists lauded the program.

Scenic Rivers. DRBC supported and assisted the federal efforts and those of New York and Pennsylvania that resulted in the recent congressional designation of the upper Delaware's 75 miles from Hancock to Sparrow Bush, N.Y., just upstream from Port Jervis, as part of the National Wild and Scenic Rivers system. Preparation of draft legislation and planning coordination to insure participation in the scenic river management scheme by local levels of government both involved DRBC. The upper Delaware scenic river plan also was incorporated into the Commission's own comprehensive plan along with scenic river designation of most of the Schuylkill River in Pennsylvania, the Delaware's largest tributary.

Water Quality Standards. The basin's pollution control standards were amended to conform more realistically to conditions relating to intermittent streams, total dissolved solids and color of industrial effluents. Contributing to these decisions, as with all those dealing with improved pollution control, was DRBC's water quality advisory committee, comprising experts from signatory state and federal agencies.

Water Code. A new one-volume water code was published presenting DRBC's standards and policies on water quality, reducing flood damages, underground waters, environmental and project reviews, watershed management, regional waste treatment, water supply sales, conservation, priorities of water use, fish and wildlife, wetlands protection, hydroelectric power, recreation and allocation of water resources.

Upper Basin Streams

Results lauded from trial NYC reservoir releases

The experiment for improving the upper Delaware Basin's major waterways by altering the releases downstream from New York City's three big water supply reservoirs has proved beneficial, particularly for the New York streams. Flows have been increased and made more uniform in the upper Delaware bordering New York State and in its principal tributaries in the Empire State.

The reaction has been overwhelmingly favorable among local residents, fishing enthusiasts and recreationists who have been heard from. Fishermen report the program has added more than 20 miles to the region's trout streams.

The program was worked out under DRBC auspices by agreement between New York City and the four Delaware Basin states, and with concurrence of the river master, then put into effect in mid-1977 by unanimous action of the Commission.

In exchange for taking half its water needs from the Delaware, New York City is obligated by the U.S. Supreme Court to make compensating releases from its Cannonsville, Pepacton and Neversink reservoirs to guarantee that the river's flow is kept at a minimum level at Montague, N.J., to protect the interests of the states downstream.

The city had met that obligation, but, according to some, its downstream releases were not adequate to assure healthy sustained flows in the nearly 180 stream miles of the upper Delaware, its East and West Branches, and the Neversink River that lie between the reservoirs and Montague.

The result was an increasing outpouring of complaints from local officials and sporting, fishing, recreation and environmental interests that the streams had become degraded.

New York State picked up their cause and sought to have the city revise its reservoir release policy. Under the policy, water was being piped to the city mostly from two reservoirs and released downstream in the mandated quantities from the third.

Parties agree to program

The downstream states concurred with the city's contention that, by requirement of the court, all of them would have to agree to any change. The Commission was called in to mediate and assist in producing a solution. After months of negotiations, a two-year renewable trial program was forged and adopted by DRBC.

The agreement was to redistribute the "bank" of water stored in the reservoirs in excess of the amount needed to meet the downstream requirement and supply the city. A network of 22 monitoring stations was established by New York State and showed that the local streamflows were augmented year-round.

Summer thermal stress in the streams for various distances downstream from the dams were relieved for the 1977 season and the excellent results were repeated in 1978. The volume of downstream conservation releases from all three impoundments was at least doubled in the summer and increased four-fold in the cold months. And the mid-summer conservation releases down the West Branch were boosted 14 times.

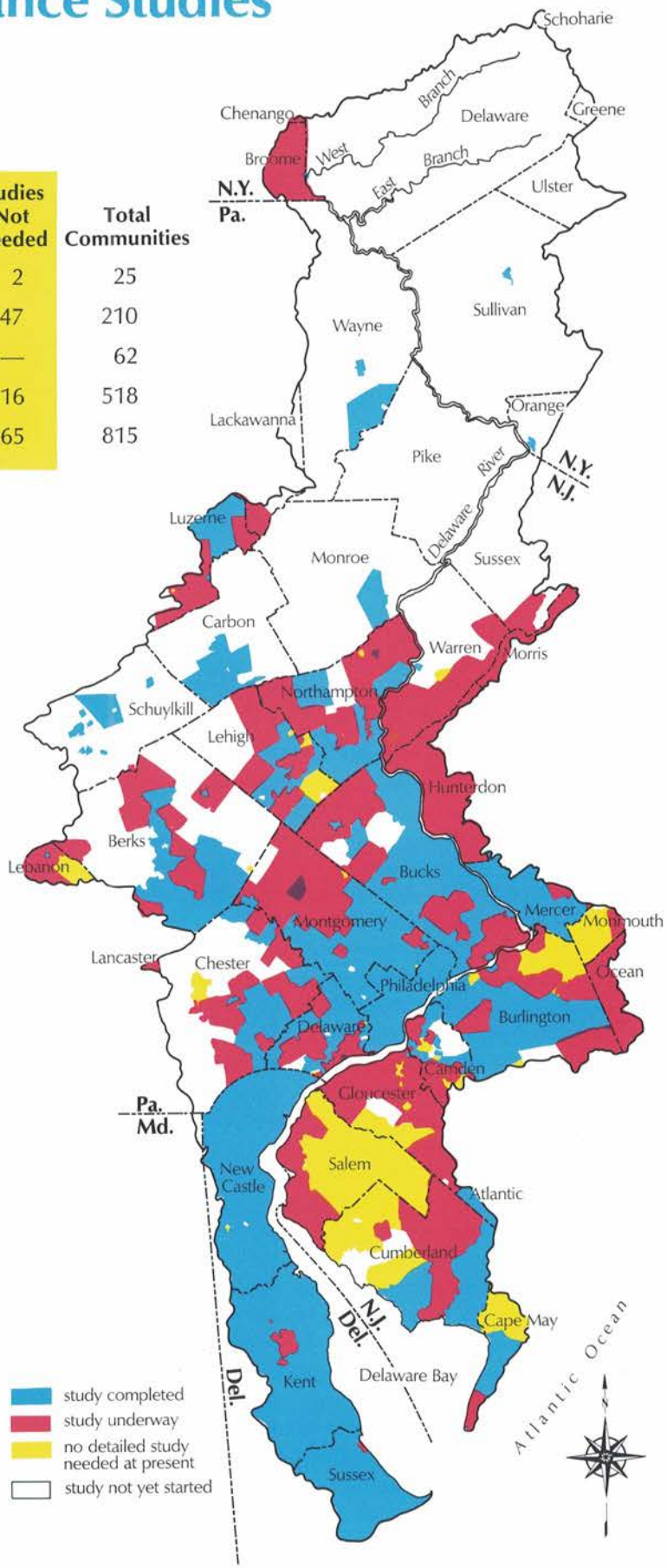
A late-summer mini-drought in 1977 was blunted. Frequency of thermal stress days was down 60 percent on the East Branch in the Harvard-Centerville area, while no change occurred in a neighboring stream not associated with the program. Thermal stress days were totally eliminated on the West Branch. Similarly, undesirable stream heat conditions were cut 75 percent on the Upper Delaware near Long Eddy and 70 percent on the Neversink near Thompsonville. Duration was cut as well as frequency. The fishery habitat in the region experienced strong beneficial results, including enlargement of the trout segments.

Meanwhile, both New York City and the downstream states were not deprived of the water the high court entitled them to.

Technical hydrologic and monitoring studies by New York State to evaluate the program indicated a 12-month extension would deserve consideration at the end of the two-year trial period in 1979.

Status of Flood Insurance Studies

	Studies Completed	Studies Under Way	Studies Not Yet Started	Studies Not Needed	Total Communities
Delaware	13	6	4	2	25
New Jersey	45	86	32	47	210
New York	3	3	56	—	62
Pennsylvania	159	125	218	16	518
Total	220	220	310	65	815



The National Flood Insurance Program is designed to offer casualty coverage that is otherwise unavailable to owners of flood-prone property. The program also provides the tools for local communities to adopt land-use controls that are one of the most effective means of cutting flood damages — by limiting structural activity on flood plains that are inundated periodically. Insurance becomes available in a community after it shows its intent to enact controls. Then comes a flood insurance study to disclose the frequency and boundaries of local flooding, which must be known before adoption of floodland restrictions. The map and table show the extent to which insurance studies have been completed or initiated in the four-state Delaware Basin. A vast majority of residents of high-risk areas are now covered by completed or progressing studies. The federal government finances the one-year studies, and DRBC has supervised 138 of them since 1974. There is a new emphasis in the national program toward technical assistance and monitoring the effectiveness of the program in the enrolled communities.

Water Supply

At DRBC, these are days of extra-heavy emphasis on the many issues that fall under the agency's broad responsibilities in the field of water supply.

In the Delaware Basin this extensive subject breaks down into a variety of subtopics nearly as broad as the whole field of water resources management. Naturally they overlap, and most of them touch also on DRBC's companion responsibilties in the area of water quality management. Inevitably, water supply and pollution control go hand-in-hand.

Typical of the tough water supply matters for which the commission is now seeking solutions are these:

> **Adequacy of streamflows, use of water to support energy systems, propriety and location of reservoir proposals, conservation to reduce demands, intelligent use and yet protection of underground reserves, prevention of contamination of fresh water supplies from sea salts, and analysis of important water-distribution proposals.**

Salinity Control

No question facing the Commission is more basic — or complex — than that of deciphering the extent to which intruding salts from the Atlantic Ocean threaten to contaminate ground and surface waters along the tidal Delaware River.

These waters are the source of public drinking supplies for millions of residents of the Camden-Philadelphia area. And a large part of the drinking water concern is the danger from sodium to persons with heart and other health problems.

Two salinity investigations are now advancing, and DRBC's members are expected soon to enact a standard establishing the minimum volume of fresh water that must flow from upriver to prevent salinity incursion beyond some safety point to be selected.

This is key to Delaware Basin water management, since on it—more than anything — will hinge future policies and decisions on how to assure there will be adequate fresh waters to ward off the sea salts.

Hard decisions must be made from these and other options:

> Developing reservoirs to hold the needed waters in readiness (entailing decisions on how many dams there should be, how big and where they should be located); pumping ground waters into the river; fostering conservation measures as an alternative to storage; establishing priorities of use for drought periods; setting more controls on power plants and other major water users; and banning new out-of-basin exports; or a feasible mix of these.

Companion to protecting public supplies is preventing disruption from excessive salinity of the many water-using industries along the lower river region that has one of the world's heaviest concentrations of manufacturing activity.

Old 3,000-cfs goal reviewed

It long has been assumed that a fresh water flow of not less than 3,000 cubic feet per second (cfs) from upriver must enter the tidal estuary where it starts at Trenton if there is to be adequate salinity control.

Mathematical studies show that during the 1960s drought a 3,000-cfs flow would have held the "salt front" of 250 parts per million (ppm) chlorides seaward of the mouth of the Schuylkill River at Philadelphia — based on depletive uses at the time. Recent studies, using an improved model and a projected depletive use total for the year 2000, have shown that to hold the salt front at or below the mouth of the Schuylkill at all times there must be a flow considerably greater than 3,000 cfs at Trenton. It could turn out to be impractical to hold the salt front below the Schuylkill.

The mouth of the Schuykill is a safe 17 miles from the Philadelphia water intake at Torresdale, but it is only about five miles below the lower limit of the river's infiltration of the Camden area's wells.

Recently, the "magic" 3,000 cfs figure that has been the basis of so much water planning in the past, including the long-stalled Tocks Island reservoir proposal, has come under serious challenge, usually but not always from opponents of that reservoir plan.

Extensive scientific and planning work is now in progress to give the Commissioners the information they need to modernize their policies and programs.

Model tracks salt movement

The salinity movement is being tracked through the use of a computerized mathematical model developed by consultants for the Commission. And an economic analysis is under way by the Army Corps of Engineers to measure the economic effects that salinity has on industrial and public water users along the river. The Corps' report, which is to be a major consideration for the Commissioners, is due in 1979. Congress authorized both studies in 1976 at DRBC's urging and funded them in a later session.

Also, the forthcoming 1979 report of the DRBC's comprehensive (Level B) study that is to help it modernize its basinwide master plan will deal with the salinity issue.

Late in 1978, DRBC and its consultants concluded two years' work developing the mathematical model of the estuary and bay that permits testing of various assumptions on fresh streamflows vs. effects of salinity in the estuary.

Preliminary model runs were made immediately to show what might happen in the event the record drought of the 1960s were to recur. They indicated that a minimum fresh streamflow of about 2,700 cfs at Trenton would be adequate to hold the maximum chloride count in the river at Torresdale to 60 ppm. This would be an instantaneous reading and well above the sustained salt concentration that could be expected, thus not a health threat from sodium.

Computer to be used permanently

The computer runs are to be finished in 1979, but the model will remain available as a permanent tool for testing effects on salinity from any proposed changes in, say, out-of-basin depletive use, conservation and reservoir proposals or operations.

In the 1960s, flows at Trenton would have dropped almost to 1,000 cfs without DRBC's relief program. DRBC used its emergency powers to arrange for special releases from many reservoirs to increase the streamflow and thus protect the Camden-Philadelphia area. The emergency program was widely credited with keeping high salt concentrations out of the area's public supplies. Notwithstanding the emergency reservoir releases, there is some evidence that salinity in Camden's well water increased from infiltration of sea water into the principal aquifer serving the area during the drought.

Merrill Creek Reservoir

Geologic, archeological, historical, dam safety and other environmental aspects of the Merrill Creek reservoir that a group of electric utility companies proposes to construct in Warren County, N.J., are undergoing thorough investigation by DRBC. The project is planned because DRBC directed the companies to provide their own cooling-water storage.

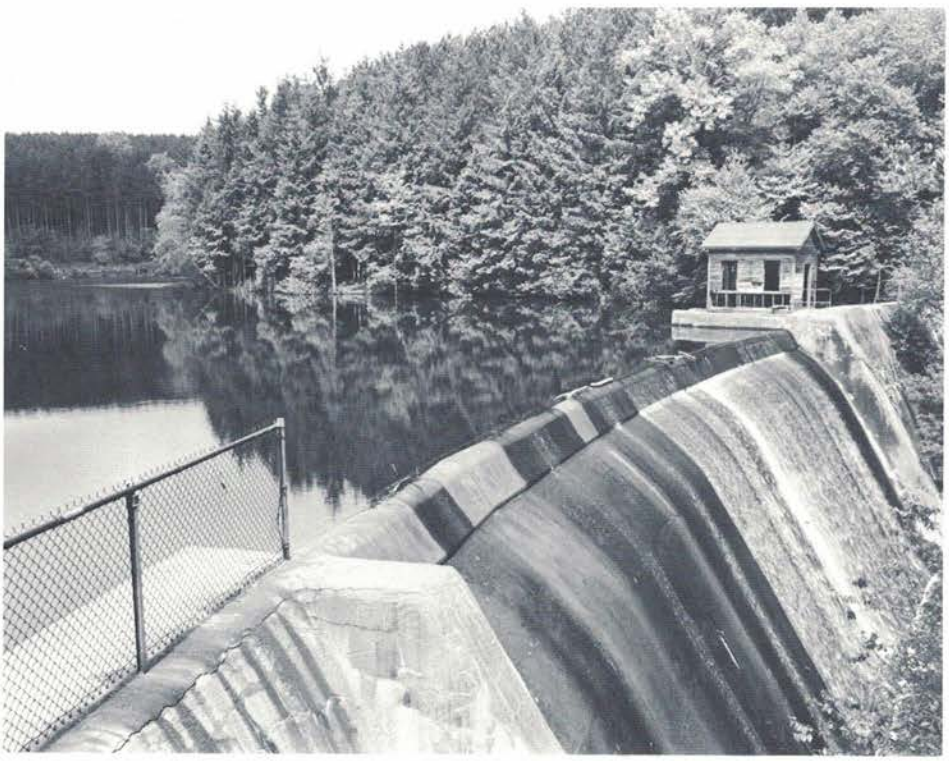
Meanwhile, the crescendo of opposition that developed when the facility was first proposed promised to remain sustained to the end. It will be 1980 before DRBC can complete its review process and make a permit decision.

Shortly after getting the utility proposal a year ago, DRBC formally committed itself to prepare an environmental impact statement. But, before starting, the Commission went to the area's residents for suggestions on the scope of the review.

Two marathon public meetings in the project area formally brought out in the open the wide range of complaints and apprehensions. The first was a public information session called by a local official at which DRBC and other agencies described their regulatory and review roles and responded to citizen inquiries. The second was a DRBC session aimed exclusively at getting the public's views on issues to be reviewed.

Local suggestions received

Suggestions were made by the score and fell into several basic categories — DRBC policy, safety and other technical aspects, local impacts such as effects on property values and relocations, and alternatives to Merrill Creek.



MERRILL CREEK — This landscape in Harmony Township, Warren County, N.J., would become part of reservoir that a group of power companies plans to build to store cooling-water for use during droughts.

So in addition to the usual environmental impact study, it was decided that side-issue investigations should be conducted. DRBC hired three separate consulting groups to make the environmental impact, archeological-historical and geotechnical studies, the latter to explore geological, seismic and soils questions growing out of fears expressed that the dam would be unsafe.

The draft environmental impact statement and companion studies are to be published in 1979. But it will be 1980 before the Commission can act on the reservoir application, considering that the draft statement will be circulated for comment and revised into the final, which also must go out for public response. Stream encroachment and dam safety clearances also must be issued by New Jersey and the Army Corps of Engineers if the project is to proceed.

Merrill Creek would supply water to downriver power plants in time of drought, including nuclear facilities under construction at Limerick on the Schuylkill River and Hope Creek on the lower Delaware. Seven members of the Delaware River Basin Electric Utilities Group are the project applicants, principally in behalf of Philadelphia Electric Co. and Public Service Electric & Gas Co. of New Jersey.

Water would be pumped to the reservoir from the Delaware a short distance away and piped back to the river in dry spells to compensate for evaporation from cooling operations at power plants downstream. Thus, the lower river would not be deprived of fresh water needed to hold off intruding sea salts during droughts.

Power plant restrictions

The Merrill Creek proposal stems from conditions imposed in decisions on several generating stations whose water-using aspects have been approved by DRBC. Unless the plants' water losses are replenished from either public or utility-owned storage during droughts, the Commission dockets said, the utilities might have to curtail generating operations.

In 1976, when it appeared unlikely that the federal Tocks Island reservoir would be built, the Commission directed the utilities to plan their own. Merrill Creek was their choice. It would require relocation of fewer families than other sites studied, but this did not stem the area's aversion. Warren County voters turned thumbs down on Merrill Creek by a more than 4-1 margin in a November 1978 advisory referendum, much as they had done years earlier on Tocks Island.

There had been a possibility that immediate need for a Merrill Creek might be averted if the long-authorized federal Trexler dam in Lehigh County, Pa., could get a go-ahead from Congress. But that possibility was killed off when a non-binding Lehigh County referendum produced a similar turndown of that project in November 1977, sending the utilities to their Merrill Creek plan.

Power Plant Siting

The dozen electric utility companies that operate in the four-state basin region further scaled down future generating projections from their staggering initial forecast of seven years earlier.

DRBC requires the utilities to inform it through periodic publication of power plant master siting studies of their future energy production plans as an aid to advance water planning. In their latest report, the companies predicted in June 1978 that they will have to build four new plants and expand four others in the ensuing 15 years. These facilities would boost the companies' total capacity — in and out of the basin — from 37,000 megawatts (mw) in 1978 to 58,300 mw by 1992 in order to meet the combined total summer peak load that is forecast to increase from 27,000 mw to 45,500 mw.

In the three earlier siting reports, however, the companies had forecast production peaks of 67,100 mw by

Recent Reductions in Electric Power Projections

	Increase formerly projected for 1986	Increase formerly projected for 1989	Increase Now projected for 1992
Nuclear plants planned in-basin*	11	4	2
Other water-related plants planned (in-basin)	15	5	5**
Planned water-related capacity (in-basin) — presently 11,725 mw***	32,947 mw (increase over 1971)	10,225 mw (increase over 1974)	20,038 mw (total) 8,313 (increase over 1978)
Average consumptive water use (at site)**** (presently 52 cfs)***	564 cfs (increase over 1971)	180 cfs (increase over 1974)	216 cfs (total) 164 cfs (increase over 1978)

* Existing (1978) water-related plants in-basin total 26, including one nuclear

** Fuel source for one plant undetermined

*** Includes Salem nuclear unit #2

**** Not reduced by replacement factor for plants located in estuary or bay below mouth of Schuylkill River

1988 and 72,000 mw by 1986. The new projections represent doubled output in 20 years, but even this is a sharp cutback from the growth rates foreseen earlier — of doubling each 15 years starting in 1975 and doubling each decade from 1971 on.

Eight plants described

The eight plants in the 1978 study include three nuclear installations, all of which have had DRBC water-use approval for several years. They are the Limerick plant below Pottstown, Pa., on the Schuylkill River and Hope Creek plant on Artificial Island in Lower Alloways Township, N.J., both being built. The basin's only nuclear plant in service is Salem, also on Artificial Island.

And of the four fossil-fueled units called for in the new study, three would be additions to existing operations, all along the Delaware. The type fuel still was undetermined for the eighth projected plant, to be located on the Chesapeake and Delaware Canal in Delaware.

The 1978 plans, particularly those involving nuclear energy, represented a further dramatic reduction from the number of projects contemplated in the original study in 1971, when the companies intended to build 16 new plants, 10 of them nuclear, and also expand 10 of the then-existing water-using non-nuclear generating stations (one to include nuclear expansion of non-nuclear plant).

The 1971 siting study foresaw an increase of 564 cubic feet per second (cfs) in water loss from the basin through evaporation due to cooling operations. However, the plants listed in the new study would add only 164 cfs to the current water loss of 52 cfs from power production.

The reduced projections for the region's future energy demands are seen as fortuitous in terms of effects on water resources, considering the recent — and growing — trend toward unacceptability of reservoir projects.

Water Conservation

Two years ago, the Commission added to its comprehensive plan a formal policy committing it to include regulatory and incentive measures for promoting conservation in the water supply planning process.

Conservation is being factored in as an important part of the comprehensive (Level B) study that will conclude in 1979. This reflects the realization that available techniques must be instituted to cut withdrawals through more efficient and economical use, and that water in the Northeast is no longer an inexpensive and inexhaustible commodity notwithstanding the large annual water crop.

DRBC convened a conservation conference in October of industrial, government, academic and environmental experts to consider the reasons for and methods of reducing water use. Also, the Commission appeared before a New York State legislative panel in support of conservation measures proposed for New York City and elsewhere.

DRBC's fifteenth annual water resources program, adopted in October, stated that conservation measures in the basin could cut substantially the broadbased withdrawals of underground as well as surface supplies and, in addition, conserve energy used to draw, purify, distribute and, finally, depollute them. The report said the staff would commence studies in 1979 to assess the impact of such savings on depletive water uses and their relation to instream water demands, and also to set priorities among competing water uses during droughts.

The documents also urged the four basin states to adopt statewide conservation measures to make "the most effective use of water exported from the basin" as well as in-basin use to cut per capita demands. DRBC noted that most water exported from the basin does not serve multiple purposes, it is used only once, often goes unmetered, and is dumped into saline waters. It also supported legislation banning high-use water closet installations and called for adoption of a national policy authorizing federal grants to rehabilitate old city water systems.

Ground Water

The Congress responded affirmatively in 1978 to DRBC's request for funds to investigate the quantity and safe yield potential of ground waters in the Delaware Basin — also their quality. The results are to help the Commission develop a total management plan and implementation program for the region's underground resources.

Gradually in the years since the Commission was formed in 1962, problems have arisen in both the ability of the subsurface supplies to meet the demands on them and in keeping them in their once-high state of purity. Examples are the contamination that has turned up in the Raritan-Magothy aquifer that is a major water supply source along the tidal Delaware, particularly in the Camden County area, and the drying up or lowering of many wells from overuse in the Triassic red shale formation that serves five counties — Mercer and Hunterdon in New Jersey and Bucks, Montgomery and Chester in Pennsylvania.

As opposition to surface storage projects mounted during the 1970s, DRBC authorized withdrawals by more and more applicants for ground water. Recently, about one in four planned wells has attracted complaints from neighboring property owners that their own might be affected. Further indicating that a water shortage may have developed.

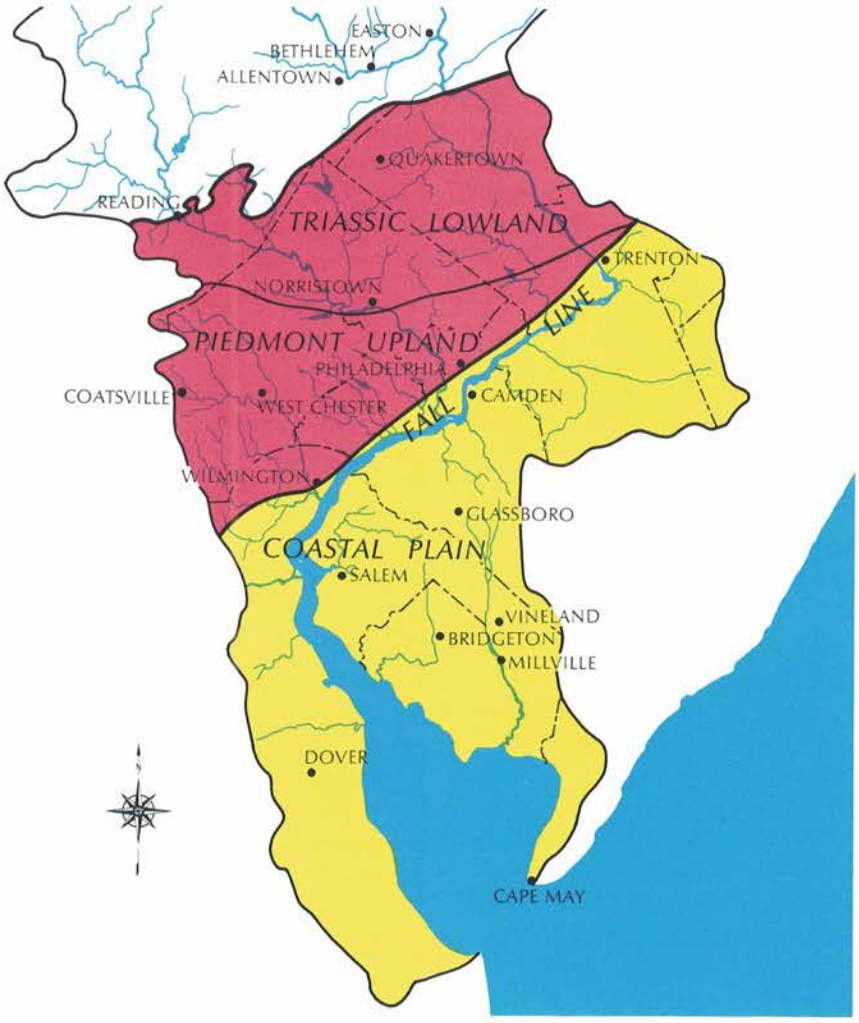
The $1.1 million in funds appropriated for ground water study are to begin flowing to DRBC from the U.S. Water Resources Council in 1979. The investigation will take about three years and the total cost will be $1.5 million, with $400,000 in matching work contributions coming from the Commission.

"Protected areas" explored

In its 1978 water resources program the Commission said that due to the developing shortages "the stage has been set for the Commission to determine if a protected area should be declared and whether special conditions should be prescribed for the use of ground water within that (Triassic) area."

DRBC's enabling compact authorizes such a declaration for a shortage's duration. The Commission's remedial alternatives include a moratorium against large withdrawals and reduction of the 100,000 gallon-a-day exemption from its reviews.

In the mid-1960s, the Commission did exercise its special drought powers by declaring a water supply emergency under which the Delaware's water shortfall was shared by regions both inside and outside the basin that use its waters. That action concerned only surface waters. Through 1978, DRBC had not yet resorted to the more localized protected-area authority. Although this authority is available over both surface and subsurface resources, the current concern is over underground supplies only.



GROUND WATER INVESTIGATION — DRBC's new basinwide study of subsurface water problems will concentrate on heavy-use areas shown here. Shortages are developing in the Triassic Lowland, and quality-quantity problems are found in the Raritan-Magothy aquifer along the northwestern edge of the Coastal Plain where it is the principal water source for Burlington, Camden, Gloucester, Salem and New Castle Counties.

River Conditions

The river system itself experienced a generally uneventful, if normal, year — thankfully.

Not once did the volume of water passing Trenton, which is the head of tide, fall below the 3,000-cubic-feet-a-second minimum streamflow objective for preventing excessive sea salts from intruding too far into the Philadelphia area. And the highest water level measured along the Delaware fell far short of a flood threat. Precipitation and streamflows for the year barely exceeded the average, notwithstanding Trenton and some other basin locations having gone through their coldest weather in two decades and their snowiest year ever — nearly 53 inches. But it takes about 10 inches of snow to equal an inch of rain, and this region's annual precipitation average is about 40 inches.

Despite the absence of flooding on the main Delaware, there were serious overflows in tributary sections of the basin twice in January 1978. On January 9, two-to-three inches of rain on top of a heavy snow blanket brought rapid rises throughout the basin. Elevations of four feet above flood stage were recorded on the Beaver Kill at Cooks Falls and the Delaware River's East Branch at Fishs Eddy, both in New York. The Lehigh River at Lehighton, Pa., and the Schuylkill at Philadelphia both overflowed their banks. Two weeks later, more heavy rainfall and snow-melt caused tributary overflows on Neshaminy Creek, Brandywine Creek and Schuylkill River, all in Pennsylvania, and Assunpink Creek at Trenton, each cresting between one-to-two feet above flood level.

Because of the heavy January flows, the new Blue Marsh dam on Tulpehocken Creek, a Schuylkill River tributary west of Reading, Pa., put in its first flood protection service. It held back about five billion gallons of runoff until the danger had passed.

Water Quality

Estuary gains foreseen as cities' plants improve; Industries complying

Full-scale upgraded operation of the City of Philadelphia's southwest sewage treatment plant is scheduled for late-1979.

The wasteload reduction to be achieved at this plant is the largest of any in the Delaware estuary reclamation program that began in the 1960s. And it is hoped that it will bring the biggest improvement yet experienced to the long-depressed lower river.

Construction and testing of the new facilities at the old plant, located on the Delaware between the Schuylkill River and International Airport, are nearing completion. Removal from the plant's effluent of organic pollutants that consume the river's oxygen will reach almost 90 percent, more than double the previous effectiveness.

Much progress in the organic waste treatment operations along the lower Delaware has been recorded in recent years, particularly in the pollution control performance of the region's industries and of the centralized operation of the City of Wilmington and New Castle County. Virtually all the estuary industries had upgraded to meet their organic wasteload allocation requirements by mid-1977, the federal deadline. And there was a measurable benefit to the river in 1975 after the modernized sewerage facility came on line in Wilmington.

But before cleanup of the lower river shows the quantum jump long sought by DRBC and others, the total performance of all three big Philadelphia plants must be advanced to a high secondary level. The southwest facility will be the first completed. The northeast facility, the city's biggest, and the southeast plant, situated below the Walt Whitman Bridge, both are in various stages of design and construction, with high quality operation scheduled for the early 1980s.

Chester plant completed

Construction of another important sewerage plant, Delaware County's new facility at Chester, was completed during the year and full operating effectiveness is expected there in 1979 also. Domestic wastes from the densely populated eastern part of the county are to be piped for full treatment to Philadelphia's southwest plant when it is finished. DRBC promoted the Delaware County-Philadelphia connector, which is already built and ready.

Other big municipal waste discharges on which progress is being made slowly are those of Camden County and Trenton. Two plants are in design to serve Camden County's concentrated and intensely developed communities, and a third may be added. Design is about completed on overhauling the old Trenton sewerage facilities, and a number of storm water overflows will be eliminated by major sewer construction that is tied to completion of Route 29 along the river.

Another large water quality-related problem along the estuary that is nearing solution is disposal of the more than 300 tons of sludge produced daily at Philadelphia's three plants. The city is investigating alternate acceptable sludge treatment-disposal systems that will enable it to stop ocean dumping in 1981 in accordance with a U.S. Environmental Protection Agency order.

Storm water assessed

A new mathematical model of the 85-mile estuary from Trenton to Delaware Bay has been developed to help DRBC assess the water's assimilative capacity and also reevaluate the more than 80 estuary wasteload allocations that stem from earlier modeling work in the 1960s. The model is being used also in the effort to control land-runoff pollutants. The new tool has been verified for dry weather flow and will go into full service after storm water verification of that model is realized. This is scheduled to occur on completion of studies by the Delaware Valley Regional Planning Commission to produce more accurate estimates of urban storm water pollution. The review of existing allocations and water quality standards is to take place in 1980.

The major nontidal portions of the Delaware system upriver from Trenton remain in good condition. A mathematical model of the free-flowing river has been developed and is ready to help analyze serious pollution problems if they threaten.

Initial plans from 13 federally mandated "208" areawide wastewater management studies covering all 13,000 square miles of the basin are now finished or nearing completion, and six have gone into the continuing planning phase. DRBC's contribution to the studies has included technical assistance and guidance on interstate policy; coordinating development of the new mathematical model of the estuary, and analysis to assure compliance with basinwide policy.

Financial Summary*

Budgetary

Revenues	Budgeted	Received
Delaware	$ 114,400	$ 114,400
New Jersey	297,190	297,190
New York	91,435	91,435
Pennsylvania	352,800	352,800
United States	163,750	163,750
Total from Signatories	1,019,575	1,019,575
EPA Grant	246,142	246,142
Special Projects	59,625	59,625
Project Review Fees	39,449	44,386
Contractual Services	15,525	15,525
Interest Income	7,500	7,643
All Other	13,428	19,624
Total	$1,401,244	$1,412,520

Expenditures	Budgeted	Expended
Personal Services	$ 862,992	$ 864,379
Special and Contractual Services	278,338	281,144
Other Services	25,155	25,133
Supplies and Materials	29,263	29,241
Space	128,237	128,225
Communications	41,140	40,927
Travel	17,415	17,118
Maintenance and Replacement	6,655	6,197
Equipment Purchase or Rental	21,200	20,780
Fringe Benefits and Other	126,900	126,803
Total	$1,537,295	$1,539,947

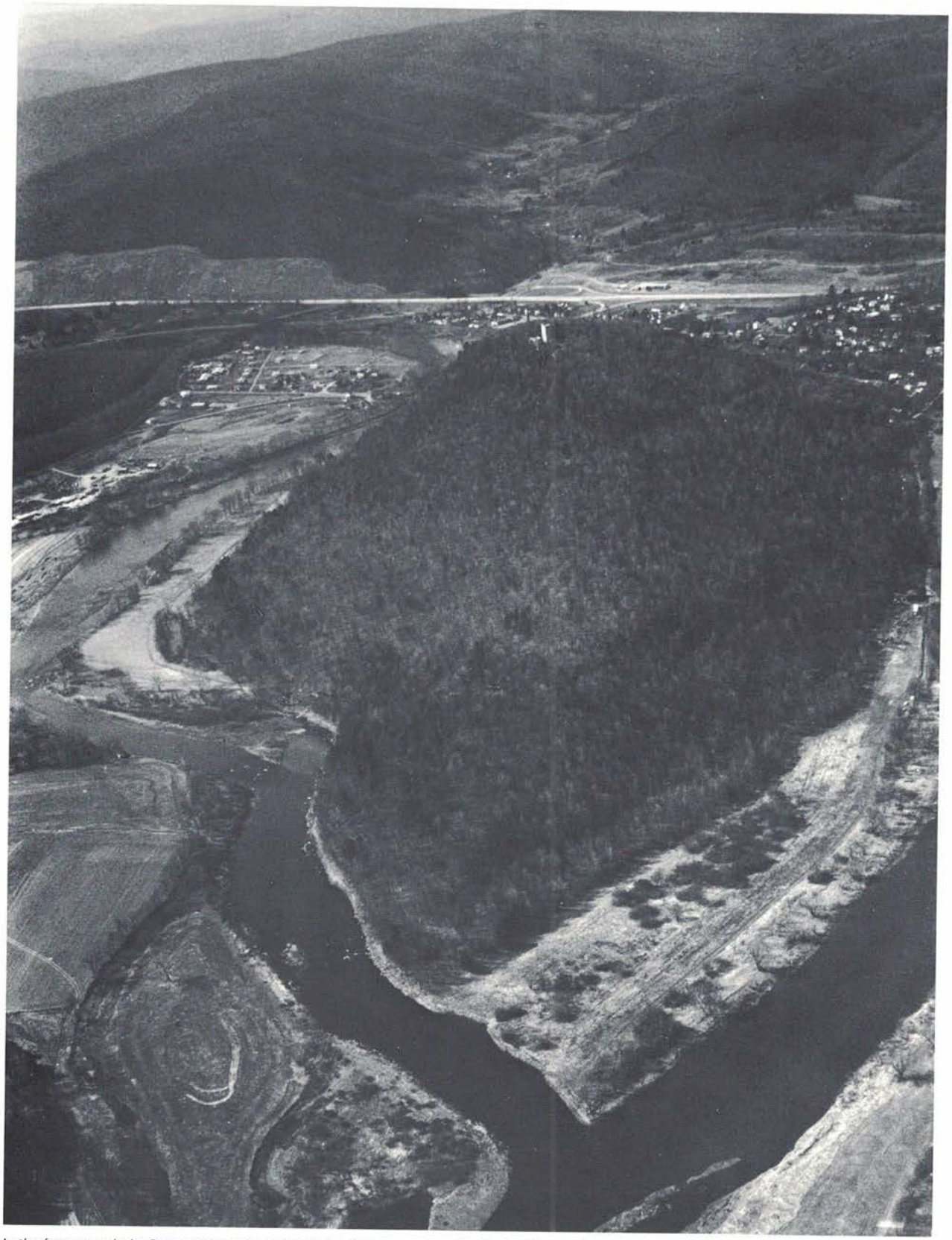
Non-Budgetary**

Special Programs and Projects	Fund Balance July 1, 1977	Revenues	Expenditures	Fund Balance June 30, 1978
Tocks Island Region Environmental Study	$ 3,146	$ 0	$ 0	$ 3,146
Tocks Island Fish Research	1,390	1,500	2,570	320
Thermal Study	5,891	0	1,498	4,393
Flood Plain Contract — HUD	0	(14,210)	(14,210)	0
Flood Plain Contract — Delaware	0	5,383	5,383	0
Study of Salinity Intrusion	18,871	30,000	47,814	1,057
Calibration and Inter-governmental Coordination Studies	0	11,633	11,633	0
Study on Sludge Disposal	0	18,092	18,092	0
"Level B" Study	40,685	848,000	341,861	546,824
New Jersey Personnel Contract	0	34,816	34,816	0
Water Supply Storage	468,789	383,180	25,433	826,536
Flood Plain Contract — Pennsylvania	0	75,167	75,167	0
Study of Exotic Wastes	0	67,613	42,379	25,234
Total	$538,772	$1,461,174	$592,436	$1,407,510

* Fiscal Year ended June 30, 1978.

** Revenues from sources outside current expense budget.

The records of the Commission are independently audited each year as required by the Compact.



In the foreground, the East and West Branches of the Delaware merge just below Hancock, N.Y., and Rt. 17, in the distance, to form the main stem of the river that flows 330 miles to the Atlantic Ocean. The confluence also is the upstream end of the newly designated national scenic river. Separating the branches is Point Mountain, topped by the tower of an abandoned chapel and mausoleum.

Delaware River Basin Commission
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