NEAR REAL TIME WATER RESOURCES DATA FOR RIVER BASIN MANAGEMENT

Richard W. Paulson
U. S. Geological Survey
Harrisburg, Pennsylvania

24 January 1973

Type II Progress Report for Period 1 July 1972--31 December 1972

Prepared for:

Goddard Space Flight Center
Greenbelt, Maryland 20771

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15. Supplementary Notes

16. Abstract

Twenty Data Collection Platforms (DCP) are being field installed on USGS water resources stations in the Delaware River basin. DCP's have been successfully installed and are operating well on five stream gaging stations, three observation wells, and one water-quality monitor in the basin. DCP's have been installed at nine additional water-quality monitors, and work is progressing on interfacing the platforms to the monitors. ERTS-relayed water resources data from the platforms are being provided in near real time, by the Goddard Space Flight Center, to the Pennsylvania district, Water Resources Division, U.S. Geological Survey. On a daily basis, the data are computer processed by the Survey and provided to the Delaware River Basin Commission. Each daily summary contains data that were relayed during 4 or 5 of the 15 orbits made by ERTS during the previous day. Water-resources parameters relayed by the platforms include dissolved oxygen concentration, temperature, pH, specific conductance, well level and stream gage height, which is used to compute streamflow for the daily summary.

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Type II Progress Report
ERTS-1

a) Title: Near Real Time Water Resources Data for River Basin Management
ERTS-1 Proposal No. MMC #190

b) GSFC ID IN340

c) Statement of any problems impeding the investigation

We continue to have difficulty interfacing most of the water-quality monitors to the DCP's. At almost all water quality monitor locations the DCP's have been installed and are functioning well but the interfaces continue to give us problems. We are calling upon consultation services from the Survey's Gulf Coast Hydroscience Center to clear up the interface problems.

d) Accomplishments

We have begun, on almost a daily basis, to release near real time water resources data from the basin to the Delaware River Basin Commission. The near-real-time teletype link from the GSFC has been established, during the reporting period, to the Pennsylvania district of the Water Resources Division. Using remote terminal access to the Survey's computer center in Washington, DCP data are processed and formatted into a daily basin water resources summary. An example of the summary is attached. Note that discharge at the gaging stations, which is computed from gage height, is also provided.

e) Significant scientific results

We have begun to simulate an operational system of relaying water resources data from a small number of U.S. Geological Survey field instruments, which are a small subset of the large number of stations the Survey operates across the United States. It should be possible to demonstrate, in the coming months, whether the DCS mode of relaying data can be a viable alternative to conventional telemetry.

f) Published articles

Abstracts for two papers are attached. The abstracts are presently being processed for Director's approval. The abstract for the paper "Preliminary Analysis of ERTS-Relayed Water-Resources Data in the Delaware River Basin" is to be submitted to the NASA-sponsored ERTS-1 Symposium, March 5-9, 1973. The abstract for the paper "The Use of the Earth Resources Technology Satellite for Relaying Hydrologic Data in the Delaware River Basin" is to be submitted to the American Water Works Association for presentation at their annual conference to be held in Las Vegas, Nevada in May 1973. The Delaware River Basin Commission's annual report for 1972, which contains imagery and a brief description of our cooperative work with ERTS, is also attached. This progress report has been delayed by the late arrival of the DRBC annual report.

JD

g) Recommendations concerning operational changes

We have requested of J. Earle Painter, of NASA-GSFC, that the near-real-time teletype link to the Pennsylvania district from the GSFC be transferred from Philadelphia, Pa., to Harrisburg, Pa. The prime reason for this is the close proximity of the Harrisburg office to the National Weather Service's River Forecast Center (RFC) in Harrisburg. The floods of Hurricane Agnes of last June have demonstrated, rather dramatically, the need for real-time streamflow data for flood forecasting. We plan to establish a close liaison with hydrologists of the RFC for providing ERTS-DCS data from the Delaware River basin stations to the RFC. This transfer will not affect our present close liaison with the Delaware River Basin Commission.

h) Changes in Standing Order Form

Made by mail to ERTS User Services on 25 October 1972.

i) ERTS Image Descriptor Form

None

j) Change in Data Request Form

None

k) Status of Data Collection Platforms

All DCP's are in working order. Three DCP's were repaired during the period. Replacement of two programmer cards and one transmitter card was involved.

USGS DELAWARE RIVER BASIN-DATA COLLECTION SYSTEM EXPERIMENT
WATER RESOURCES SUMMARY
JANUARY 10, 1973

WATER QUALITY STATIONS

TIME	S.C. UMHOS	D.O. MG/L	TEMP F/C	PH
DELAWARE RIVER AT REEDY ISLAND				
10:15:37EST, JANUARY 9,1973	600	11.8	35/ 1.5	6.5
11:56:12EST, JANUARY 9,1973	1120	11.6	36/ 2.0	6.5
19: 2:51EST, JANUARY 9,1973	1320	11.6	36/ 2.0	6.5
19: 6:11EST, JANUARY 9,1973	1320	11.6	36/ 2.0	6.6
8:33:32EST, JANUARY 9,1973	2160	11.7	35/ 1.5	6.5
20: 9:50EST, JANUARY 9,1973	2760	11.8	35/ 1.5	6.6
21:48:32EST, JANUARY 9,1973	600	11.7	35/ 1.5	6.6
23:34:11EST, JANUARY 9,1973	480	11.8	35/ 1.5	6.5
8:39:48EST, JANUARY 10,1973	2120	11.8	34/ 1.0	6.6

SURFACE WATER STATIONS

TIME	GAGE HEIGHT FEET	DISCHARGE CFS
DELAWARE RIVER AT MONTAGUE		
10:12:30EST, JANUARY 9,1973	7.44	8034
11:55:43EST, JANUARY 9,1973	7.40	7910
8:32:32EST, JANUARY 9,1973	7.53	8313
20:10:14EST, JANUARY 9,1973	7.35	7755
20:17:25EST, JANUARY 9,1973	7.36	7786
21:50:52EST, JANUARY 9,1973	7.39	7879
8:39:18EST, JANUARY 10,1973	7.35	7755
DELAWARE RIVER BELOW TOCKS ISLAND		
10:16:42EST, JANUARY 9,1973	13.51	40490
19: 0:45EST, JANUARY 9,1973	13.51	40490
8:32:29EST, JANUARY 9,1973	13.51	40490
20: 9: 7EST, JANUARY 9,1973	13.51	40490
21:55:22EST, JANUARY 9,1973	13.51	40490
DELAWARE RIVER AT TRENTON		
10:16: 2EST, JANUARY 9,1973	10.65	16122
20:11:18EST, JANUARY 9,1973	10.43	14603
21:49:19EST, JANUARY 9,1973	10.44	14652
8:41:26EST, JANUARY 10,1973	10.60	15779
LEHIGH RIVER AT BETHLEHEM		
10:14: 8EST, JANUARY 9,1973	3.92	2512
11:57:32EST, JANUARY 9,1973	3.92	2512
20:11:58EST, JANUARY 9,1973	3.99	2624
21:48:24EST, JANUARY 9,1973	4.00	2640
SCHUYLKILL RIVER AT PHILA.		
10:14: 5EST, JANUARY 9,1973	6.67	3779
11:57:17EST, JANUARY 9,1973	6.67	3779
8:34: 4EST, JANUARY 9,1973	6.68	3829
20: 7:58EST, JANUARY 9,1973	6.67	3779
21:49:24EST, JANUARY 9,1973	6.67	3779
8:37:24EST, JANUARY 10,1973	6.63	3565

GROUND WATER STATIONS

TIME	WELL DEPTH FEET
SALEM CITY NUMBER 1	
10:15:54EST, JANUARY 9,1973	23.51
11:59:28EST, JANUARY 9,1973	23.50
8:37:28EST, JANUARY 9,1973	23.49
20: 9:22EST, JANUARY 9,1973	23.46
21:50:16EST, JANUARY 9,1973	23.48
23:37:43EST, JANUARY 9,1973	23.49
8:41:38EST, JANUARY 10,1973	23.49
PENNS GROVE NUMBER 24	
10:13:37EST, JANUARY 9,1973	19.74
11:56:23EST, JANUARY 9,1973	19.73
8:32:35EST, JANUARY 9,1973	19.74
20: 9:56EST, JANUARY 9,1973	19.71
21:49:48EST, JANUARY 9,1973	19.71
23:36:47EST, JANUARY 9,1973	19.71
8:40:24EST, JANUARY 10,1973	19.72
SHELL CHEM. CO. NUMBER 5	
10:14:49EST, JANUARY 9,1973	36.49
11:55:27EST, JANUARY 9,1973	36.60
8:32:31EST, JANUARY 9,1973	36.49
20: 6:55EST, JANUARY 9,1973	36.43
21:48:47EST, JANUARY 9,1973	36.60
23:34:45EST, JANUARY 9,1973	36.65
8:40:43EST, JANUARY 10,1973	36.49

THESE DATA WERE RELAYED BY THE ERTS OBSERVATORY AND ARE PROVISIONAL.
THE SYMBOLS -- INDICATE DATA WERE SUSPECT AND WERE DELETED. THIS
SUMMARY WAS PREPARED BY THE CURRENT RECORDS CENTER IN PHILADELPHIA
USING REMOTE TERMINAL ACCESS TO THE GEOLOGICAL SURVEYS 360/65
COMPUTER IN WASHINGTON, D.C. CALL 215-597-7357 FOR FURTHER

PRELIMINARY ANALYSIS OF ERTS-RELAYED WATER-RESOURCES DATA IN THE DELAWARE RIVER BASIN

By

Richard W. Paulson

Preliminary analysis of ERTS-DCS data from water-resources stations in the Delaware River basin indicates that the Data-Collection System is performing well. Data-Collection Platforms have been successfully interfaced with five stream-gaging stations and three ground-water observation wells and are being interfaced with 12 water-quality monitors in the basin. Data are being relayed during four or five ERTS orbital passes per day, which is within the design specifications of the ERTS-DCS.

VI

THE USE OF THE EARTH RESOURCES TECHNOLOGY SATELLITE FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN

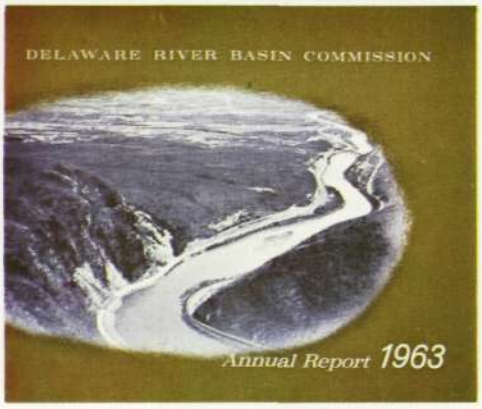
By

Richard W. Paulson

The Geological Survey, in cooperation with the National Aeronautics and Space Administration, the EROS Office of the Department of the Interior, and the Delaware River Basin Commission, is conducting an experiment to test the feasibility of relaying hydrologic data operationally from water-resources stations in the Delaware River basin, using the Earth Resources Technology Satellite. The 20 stations in the basin, which include stream gages, water-quality monitors and observation wells, are instrumented with small battery-operated radio transmitters, which are called Data Collection Platforms (DCP). The DCP's transmit data to the satellite several times a day when the satellite's polar-orbital-track passes near the eastern part of the United States. Upon reception of a DCP message, the satellite immediately downlinks the data to a NASA receiving site at Goldstone, Calif., or the Goddard Space Flight Center (GSFC) in Greenbelt, Md. The data are routed to the Geological Survey's Current Record Center in Pennsylvania, through the GSFC, for processing and distribution to user agencies. The experiment will help to define whether the satellite relay of earth-resources data is a viable alternative to conventional landline telemetry.

VII

1972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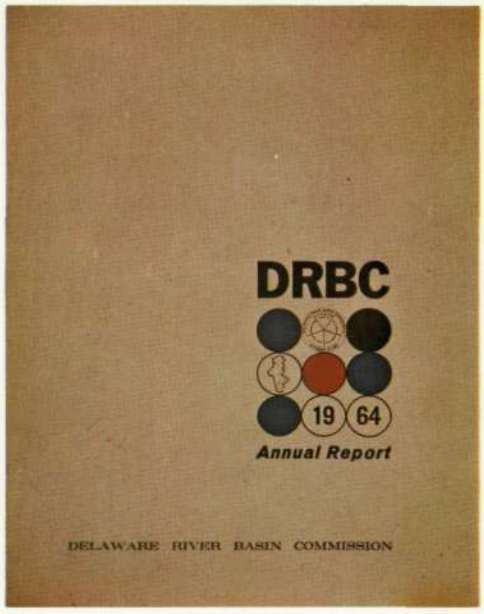
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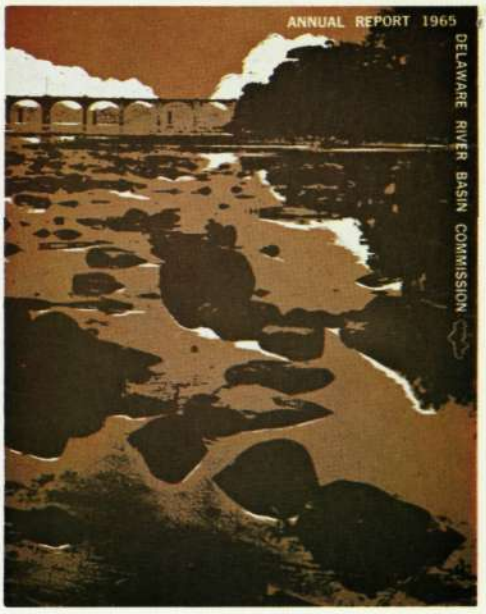
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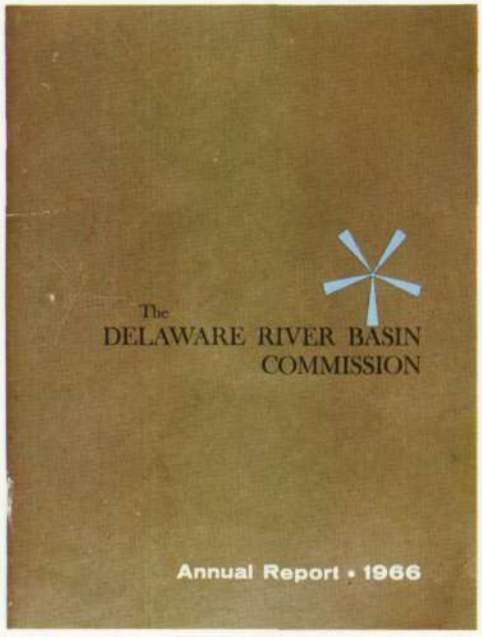
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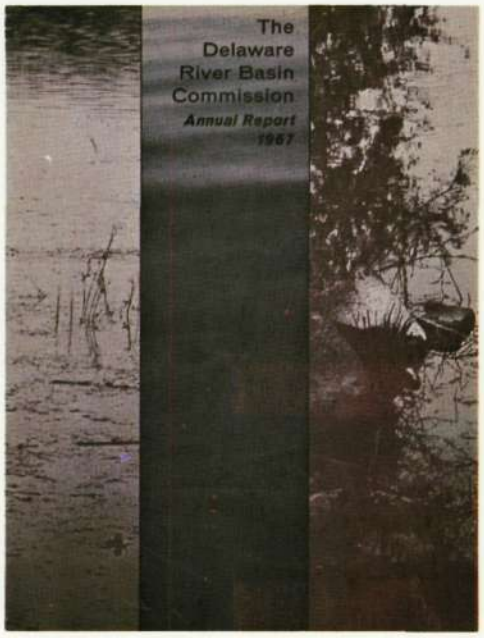
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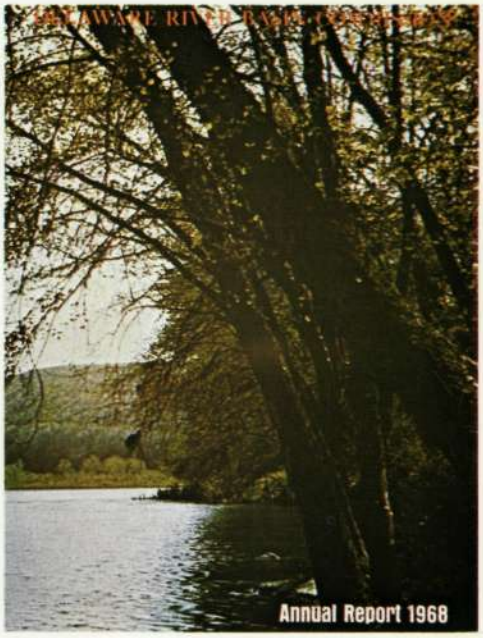
1967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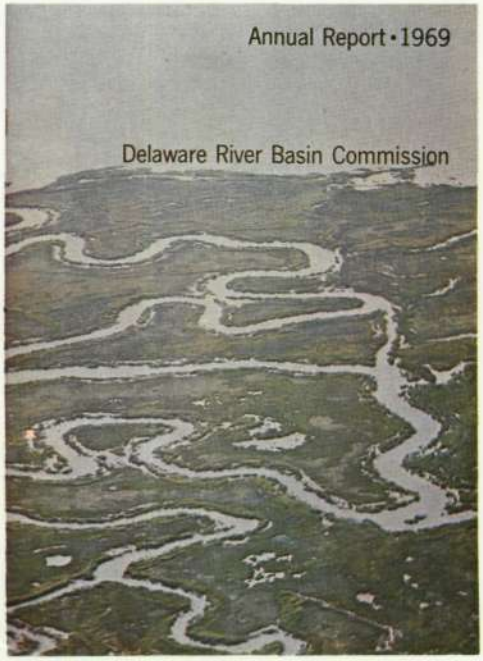
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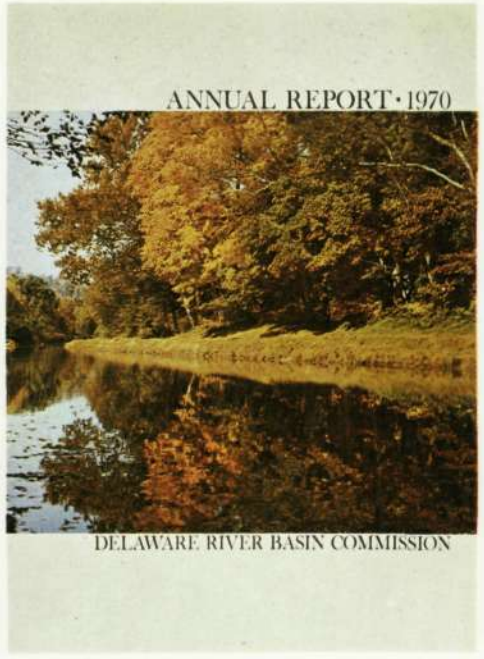
Delaware River Basin Commission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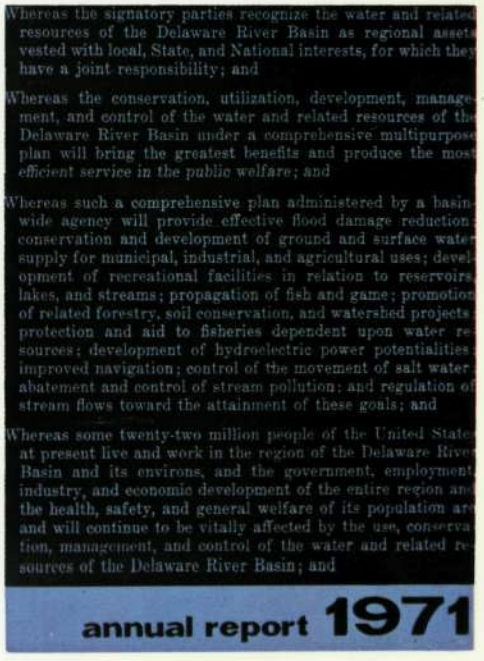
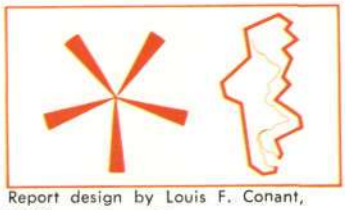
DELAWARE RIVER BASIN COMMISSION


Whereas the signatory parties recognize the water and related resources of the Delaware River Basin as regional assets vested with local, State, and National interests, for which they have a joint responsibility; and
Whereas the conservation, utilization, development, management, and control of the water and related resources of the Delaware River Basin under a comprehensive multipurpose plan will bring the greatest benefits and produce the most efficient service in the public welfare; and
Whereas such a comprehensive plan administered by a basin-wide agency will provide effective flood damage reduction; conservation and development of ground and surface water supply for municipal, industrial, and agricultural uses; development of recreational facilities in relation to reservoirs, lakes, and streams; propagation of fish and game; promotion of related forestry, soil conservation, and watershed projects; protection and aid to fisheries dependent upon water resources; development of hydroelectric power potentialities; improved navigation; control of the movement of salt water; abatement and control of stream pollution; and regulation of stream flows toward the attainment of these goals; and
Whereas some twenty-two million people of the United States at present live and work in the region of the Delaware River Basin and its environs, and the government, employment, industry, and economic development of the entire region and the health, safety, and general welfare of its population are and will continue to be vitally affected by the use, conservation, management, and control of the water and related resources of the Delaware River Basin; and
annual report 1971


Delaware River Basin

A hilltop view of a railroad crossing over the Delaware in the prospective Scenic River area.



Report design by Louis F. Conant, DRBC graphic artist.

Pictured on the opposite page is a composite of spectacular photographs of the Delaware River Basin area taken by the National Aeronautics and Space Administration's new Earth Resources Technology Satellite (ERTS) from an altitude of more than 500 miles.

The Delaware River Basin is benefiting from operation of the orbiting laboratory under experiments to determine the usefulness of satellite-relayed data important to water resources management.

In a cooperative program between the U.S. Geological Survey, the Interior Department's EROS program and DRBC are two experimental uses of ERTS. The first is to see if the space relay is the best method for water agencies to collect data transmitted from 20 USGS stream gauges, water quality monitors and wells in the four-state region. Second is to decide if a series of four spectra of photographic images that ERTS is sending every 18 days, including the one pictured, provides useful information to resources experts on water, vegetation, soil and minerals.

Contents

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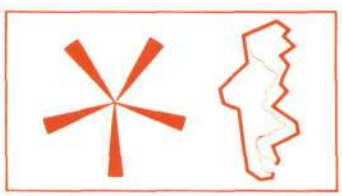

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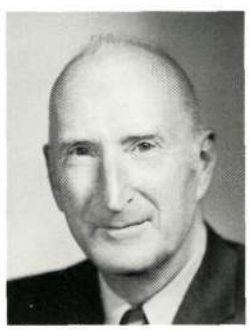
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Grist mill at Erwinna, Pa., along the Delaware's main stem.

Introduction

This is the 10th Annual Report on the progress attained under the Delaware River Basin Compact between Pennsylvania, New York, New Jersey and Delaware and the United States.

It covers not only the activities of the Delaware River Basin Commission during the year ending June 30, 1972, but also summarizes highlights of the Compact and Commission since their inception late in 1961.

Three times this year flood tragedies struck the Delaware Valley — and each harder than any time since the record overflow of 1955. They resulted from a pair of tropical storms that traversed the valley in September 1971 and from the lethal remains of Hurricane Agnes in June 1972. Inflicting the worst natural disaster ever in Pennsylvania, Agnes ripped the main stem of the Schuylkill, biggest tributary to the Delaware, and left even more wreckage and misery in the Susquehanna River valley.

On the positive side, the year produced a new unit in the DRBC organization to concentrate on environmental protection. It marked new progress in the never-ending fight against water pollution in the river and its tributaries and also toward many other goals.

To the satisfaction of some and disappointment of others, the construction of the Tocks Island reservoir was again delayed. New Jersey said it needs the benefits from the large multiple-purpose project, authorized for the upper Delaware, but complained about prospective impact and imposed several conditions to be met before the development may continue.

The report is submitted respectfully to the seven million citizens of the valley and to their elected state and national representatives.

Decade in Summary

The first decade has come to a close on what is the original equal partnership between a group of states and the United States Government on a regional problem — protection, planning, development and management of a major river valley's resources.

The interstate-federal Delaware River Basin Compact was hailed widely as a promising model for dealing with water and other problems in regions where the nation and groups of states have common stakes. Several efforts to apply the partnership experiment to other regions and other subjects have been and are still being made. They have progressed only in the same field of river basin management.
The Susquehanna River Basin Compact, an updated version of the Delaware experience, became law in 1970, and a similar plan is being pushed for the Potomac.
The Susquehanna and Delaware Compacts have three signatories in common — New York, Pennsylvania and the United States. A federal-tristate transportation pact for the Philadelphia region failed to win the needed support from one party, however.

The Commission looks back at a constant trail of new ground, for, of necessity, much that has been done had been untried previously, at least across state lines, due to the new approaches provided by the Compact.

Over the decade, the Commission has enjoyed plaudits from many public and private groups, particularly in local areas that felt they benefited from its sometimes innovative work. Resource experts have stood back to analyze its effectiveness and found some commendable regional and comprehensive approaches while being generous also with criticisms and suggestions. The most frequent shortcoming cited has been DRBC's inability to afford to do what they felt should be done.

DRBC engaged the environmental arm of a major university to make a critical review and it found the agency had taken major strides toward filling the essential role of planner and manager of the basin. It also cited a program in force dealing with "the basin's most acute problem: water pollution of the estuary." But it added that DRBC should pause to assess urgent long-range needs and "redeploy" to meet them, and called for major policy and program changes, particularly to improve its responsiveness to the ecological concerns of the 1970s.

A number of the recommendations have been carried out or adapted to, within cost restrictions. DRBC's new environmental unit is a direct outgrowth of the review. Other suggestions would require expenditures currently beyond the means of DRBC, or impose direct influence over land use to a degree that would require five-party legislative amendments of the Compact.

If DRBC's honeymoon with segments of the general public was over, it could be ascribed in largest measure to the agency's long identification with the Tocks Island reservoir plan that recently became anathema to many environmentalists. Their complaints sometimes concerned other issues too, such as the validity or the cost of the project's intended water supply, but invariably they were direct offshots of Tocks Island.

Has the Compact produced the desired management over the basin's many interacting water problems? Has DRBC been the intended central coordinating force for a limitless assortment of resource projects, programs, plans, policies and research?

A final verdict on the ultimate success of the Compact — and the Commission — does not yet appear discernible, and it may be optimistic to expect that there ever could be a consensus. The verdict, indeed, could be different for one than the other.

Could any basin commission really resolve the competition between industry and recreation, water supply and pollution, reservoirs and flowing streams, groundwaters and septic tanks, environmental protection and urban development, fisheries and waste disposal, canoes and motorboats?

Incompatibility of rival water uses and complexity of issues defy the absolute and permanent resolution that is so often demanded. At least in a region where all the competing issues are present, patient mediation and compromise may be the only prescription for fashioning that elusive narrow line that separates intelligent development from unreasonable exploitation.

The drafters of the Compact knew many coming problems and public opinion shifts were unforseeable but hoped the Commission could be responsive nonetheless.
To differing degrees, it has been responsive. Yet, despite little pressure for changes in the Compact, many of those most intimate with it think it needs some.

A major test of the Compact's adaptability may be in store soon. A decade of labor has gone into establishing a program of adopting pollution control standards, establishing discharger shares of stream waste assimilative capacity, and working out related abatement schedules. Now the program must come under re-analysis in the wake of a new national pollution control policy that will change the administrative rules and eventually outlaw nearly all discharges to streams. Some redeployment is inevitable.

The dominant and common feature of the following policy actions and programs that stand out as significant in a review of the decade's activities is their regional — and usually interstate — character:

B


Hon. S. W. Tribbitt


Mr. Baxter


Mr. Guarino

Drought. Emergency authority was invoked to control and limit private and public water use and out-of-basin diversions and to protect water potability in Metropolitan Philadelphia and Camden in the mid-1960s, averting otherwise severe public hardship and certain long and costly U. S. Supreme Court litigation.

Water cost-sharing. Acting for the states, DRBC became the single party responsible for control and wholesaling of supplies from a network of federal reservoir projects. It also agreed to reimburse the Federal Government the cost of the reservoirs allocable to water supply.

Water quality uniformity. Through DRBC, cooperative policies at differing government levels and in different jurisdictions have been effected, and common groundrules now apply to polluters on opposite sides of the river in different states.

Estuary cleanup. DRBC took the results of a massive federal scientific study of the tidal river and transformed them into the most far-reaching reclamation of any American estuary, and crossing three state boundaries to do it.

Pollution spills. An effective report-and-warning system has been coordinated whereby downstream users learn of spills in time to shut their intakes. Construction of the nation's largest cross-country petroleum pipeline was halted until DRBC's rupture control safeguards were met.

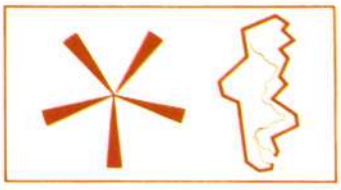
Regional waste solutions. Leadership by DRBC produced regional, and in one case interstate, plans to protect water quality in sub-sections of the basin.

Water yield. The Commission organized and completed a four-state reevaluation of the basin's water yield capability in the wake of the drought, producing information critical to planning future needs.

Groundwater. Controls were established over rich and abundant subsurface resources, extending protection into some parts of the basin for the first time.

Flood plains. Mapping projects showing flood histories of several high risk areas were undertaken by DRBC with the U. S. Geological Survey, adding to the large store of facts needed to cut damages through land use regulation. And a project was launched to standardize flood area delineation in the four-state region.

Reservoir site preservation. DRBC put an important future project in its Comprehensive Plan for New Jersey and thus was able years later to require elevated construction of an interstate highway through the site to preserve the resource.



Power plant siting. For the first time on a river basin scale, preparation and publication of comprehensive reports on power plant siting and water effects were mandated to better enable DRBC to allocate water among rival uses.

Scenic and historic values. A historic small watershed in Pennsylvania was protected by DRBC from being bisected by a high-power transmission line and highway after incorporation into the Comprehensive Plan. DRBC participated in a federal-state effort to preserve as a national Scenic and Recreational River the 75-mile upper Delaware from Port Jervis to Hancock.

Interstate stream sharing. A DRBC-devised formula averted a serious bistate dispute on sharing the waters of Brandywine Creek, whose headwaters serve Pennsylvania but which also supplies most of Wilmington's potable supplies.

Recreation. Acting for New Jersey and Pennsylvania, DRBC reconstructed the century-old dilapidated low dams at Lambertville and New Hope, restoring a popular bistate recreation "lake" on the Delaware. Ten-to-a-set boating recreation maps of the 200-mile free-flowing Delaware, the only canoeists' guide of its kind for any river, were designed, published and more than 17,000 sets distributed.

Fisheries. Through its technical advisory committee, the Commission developed a comprehensive 10-year fishery research program for the bay and river and conducted a variety of other shell and fin research projects.

Gov. Shapp is Chairman

At DRBC's 1972 reorganization meeting, the first held in the nation's capital, Governor Shapp of Pennsylvania assumed the chairmanship from Governor Peterson of Delaware and was succeeded as vice chairman by Governor Cahill of New Jersey. Philadelphia's new Water Commissioner, Carmen F. Guarino, took over the chair as Advisor to the Pennsylvania member. His predecessor in both capacities was Samuel S. Baxter, a respected and veteran figure in the water resources field.

In January 1973, the Basin Commission will get a new member from Delaware as Governor-elect Sherman W. Tribbitt is inaugurated chief executive of the First State.

The Delaware, where both water resource problems and programs to control them are so extensive, has been selected as one of the American rivers to be studied by a group of Russian water quality scientists and administrators in 1973. The arrangement was made through the President's Council on Environmental Quality as part of a broad cooperative U. S.- U. S. S. R. environmental program.

Agnes

Hurricane flooding devastates Schuylkill; river conditions good otherwise

Since the record drought of the mid-1960s came to an end more than five years ago, flooding in the Delaware River Basin has worsened progressively — and ominously — from mild to serious to disastrous proportions.

As the drought emergency was called off early in 1967, spring flooding struck some tributaries in the Camden-Philadelphia metropolitan area, and this picture was repeated in 1968, the first full year of drought recovery. Then several straight days of rain in August 1969 inflicted $10 million in damage to towns in the Poconos, Catskills, and Pennsylvania coal region, with loss of life averted only by dramatic rescues and evacuations. A half-year later, in the spring of 1970, the Delaware main stem got its nearest miss since 1955 when spring rains and thaws raised the level at Trenton to within two feet of flood stage.

The devastation left by a pair of tropical storms — Doria and Heidi — that struck only three weeks apart at the end of the summer of 1971 was the valley's worst in 16 years. The victimized area was confined mostly to counties surrounding Philadelphia on both sides of the Delaware, but the casualties were staggering — 18 persons dead and $40 million in public and private property damaged, with Norristown and Chester hardest hit. The one-two storm punch was reminiscent of tandem hurricanes that hit within days in 1955, but fortuitiously a fortnight further apart.

Then came the third tropical storm in 10 months, this one the moisture-packed remains of Agnes, the season's first hurricane. On June 22, 1972, Agnes forged northward through eastern Pennsylvania, leaving behind some 10 inches of rainfall, almost a fourth of the area's normal precipitation for an entire year.

The result was the worst natural disaster in Pennsylvania's history, with property damage exceeding $1.5 billion and more than 50 dead statewide. Hurt worst was the Susquehanna Valley, the Delaware's next-door neighbor to the west. Wilkes-Barre, Harrisburg and other undefended communities there were ravaged, although flood control structures were credited with preventing virtual wipeout of Williamsport and Sunbury.

The torrents delivered like devastation, if on a smaller scale, along the Schuylkill, the Delaware's biggest tributary. Streets were transformed to building-lined streams in Reading, Pottstown, Phoenixville, Birdsboro, Pottsville, Conshohocken, Norristown, Manayunk, Royersford, Bridgeport, Schuylkill Haven, Port Carbon, Port Clinton and other communities as the Schuylkill overflowed its banks by as much as 10 feet higher than ever before.

It was easily the Schuylkill's worst flood, with thousands of families forced to evacuate their homes and public and private property damage totals exceeding $150 million. Loss of but a single life, a Philadelphia policeman on a rescue operation, was recorded on the Schuylkill. Overflowed oil from storage ponds at an industrial processing operation just upstream of Pottstown smeared shores and property for 20 miles to Norristown, forcing that city's water treatment plant to close.

In the Schuylkill, a valley without a single major flood control reservoir, Agnes struck the least defended of the Delaware Basin's large tributaries. Ironically, crests from Reading downstream would have been seven feet lower and damage tolls 44 percent less had Blue Marsh and Maiden Creek reservoirs been in existence. The former is about to go into construction and the latter is slated for subsequent development, both on upper Schuylkill tributaries.

Several small dams on local Schuylkill tributaries were credited with holding down damages at Tamaqua.

Lehigh and Brandywine Valleys

In the adjacent watersheds to the north and south, the Lehigh and Brandywine, existing dams held down damages from slightly smaller rainfall totals.

As noted in an Allentown Morning Call story under a headline, "2 Dams and Impoundments Limit Disastrous Flooding," the Lehigh Valley was effectively defended by many flood control facilities. Among them were the new Beltzville reservoir and the older Francis Walter dam and highly effective local protection works at Allentown and Bethlehem. In 1969, Jim Thorpe, another Lehigh Valley community, was hard hit by downtown flooding from Mauch Chunk Creek only days after a flood control dam went into construction, but this time the facility was ready.

The Times-News of Lehighton cited the protection that neighboring communities, among them Jim Thorpe and Tamaqua, received from flood works on six Delaware tributaries in the Lehigh and Schuylkill Valleys and concluded: "The value of the dams has been demonstrated again. They've already paid for themselves several times over in the destruction they have prevented."

The Brandywine Valley Association, the nation's oldest volunteer watershed protection group, stated that damages were reduced greatly along Brandywine Creek from a partially completed series of flood control structures. The largest dam, on Marsh Creek, even though it is still in construction, held back 100 million gallons (300 acre-feet), a tenth of its future flood water capacity.

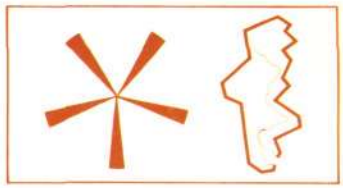
Anti-dam groups contend that major flood control structures should be spurned in favor of regulating flood plains. DRBC has supported a policy of combined structural and non-structural means to reduce damages, taking the position that non-structural measures alone, in effect, strand those communities already situated on flood plains.

The Year's Conditions

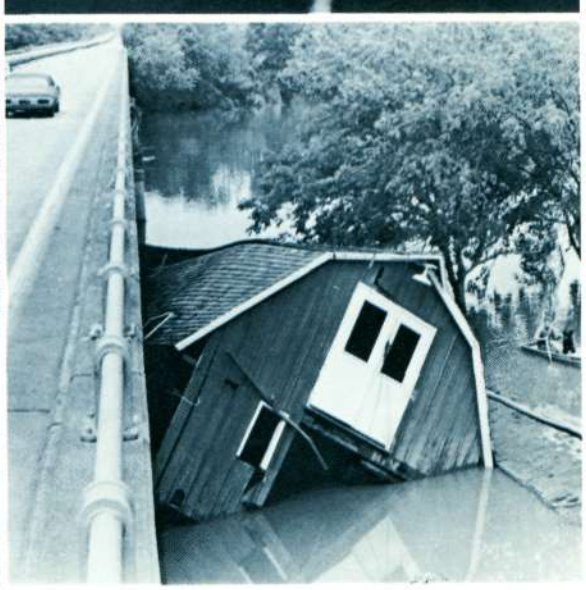
Due to the three tropical storms, precipitation and Delaware River streamflows for the year covered by this report were 40 percent above the norm. The three New York City reservoirs in the Catskills overflowed by April and groundwater tables were excellent year-round.

As usual, however, the Delaware's midsummer reduction in flows would have been even greater without the releases from the New York water supply lakes in accordance with the U. S. Supreme Court decree on interstate sharing of the river.

Fishermen, gourmets, and pollution control agencies welcomed reports that the annual runs of shad were good, both upstream in the spring of 1972 and downstream the previous fall. The heavy salt concentrations were held well downriver, and, for still another year, oxygen content in the estuary's heaviest polluted stretch was better.

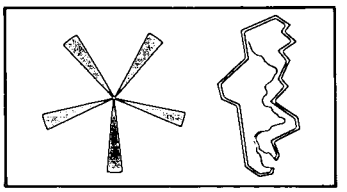


Photographs show a variety of scenes along the Schuylkill River during flooding from Hurricane Agnes.



Water Quality

Tidal cleanup on schedule with 97% of wasteload under orders



The Commission adopted for the Delaware River estuary in 1967 perhaps the most comprehensive water quality standards in the nation and set a 10-year goal on attaining the objectives envisioned.

In 1972, with half that decade elapsed, the program of cleanup in the tidal river is progressing on schedule and the target apparently is within grasp in the next five years.

Of the nearly 100 municipalities, sewerage authorities and industries that discharge organic wastes to the 85-mile estuary from Trenton to below Wilmington, 40 have been brought into compliance with the standards and implementing regulations through 1972.

In terms of total wasteload, about one-eighth is now being treated to mandated specifications prior to discharge. This proportion will jump steadily yearly through 1976, with 100 percent compliance shortly thereafter.

The City of Philadelphia and large industries require more time — and money — to upgrade their waste treatment than smaller polluters. Philadelphia is aiming at full compliance operation of two of its three giant sewerage plants in 1976. The third, located in Northeast Philadelphia, will be upgraded in steps; the existing plant by 1975 and a new adjoining facility subsequently so that the full Northeast operation will be fully upgraded early in 1977. The Northeast plant, currently providing biological treatment, is discharging the best effluent of the city's three.

There appears to be a continuing if gradual trend in the tidal river towards improved oxygen content. Besides a reduction in the length, occasions and intensity of low oxygen (sometimes zero), the river has experienced for two consecutive years sharply improved migrations of American shad, an old Delaware favorite and a reliable water quality indicator.

How the Cleanup Works

Here is how the Commission's estuary cleanup program, unique among important American rivers, works:

The 1967 standards established these intended uses: Water supply for public consumption after treatment (where not precluded by salinity); agricultural and industrial use; wildlife, fish and other aquatic life; recreation and navigation, and controlled waste disposal where compatible with other uses.

The regulations, adopted in 1968 and based on findings by a federal computerized model study of the river, require that the stream oxygen consumption by waste dischargers be reduced from the two million pounds produced daily at raw load level to 322,000 pounds, thus accommodating the uses. The 322,000 pounds, minus 10 percent reserve for new waste sources, was divided among four estuary zones, and further allocated among individual dischargers. Each discharger's allocation then became the basis of an abatement schedule, worked out in cooperation with the respective state, under which treatment must be upgraded to levels of about 90 percent removal of organic pollutants, compared to 50 percent average treatment at the time. As the estuary's total produced wasteload increases, dischargers' treatment levels must be further improved to hold the tolerable maximum discharge to the river at 322,000 pounds.

Abatement Schedules

During the year, abatement schedules were approved for 13 more dischargers, bringing the total under cleanup orders to 80. The schedules of a half-dozen others were revised to reflect changing technical or production conditions. The 80 organic waste abatement schedules in force at year-end meant that 97 percent of the oxygen-consuming wasteload in the estuary is under orders.

In addition, six estuary polluters whose dischargers are in toxic, metallic or some other inorganic form were brought under cleanup schedules, with full compliance in 1972 by all but one.

While the abatement schedule process assures an effective pollution control program for existing sewerage and industrial facilities, the Commission's project review function keeps check on new and expanding installations. Of the average 200 public and private projects of many types screened annually by the Commission for possible harm to water resources, about half involve water quality protection.

Inorganic Waste Controls

The Commission broadened its water quality program this year by tightening control over pollution from non-organic sources.

The agency has had actual numerical controls over organic pollutants that deprive the stream of vital oxygen since 1967. But rules relating to equally troublesome inorganic substances limited their release to the streams only in general immeasurable terms, often to the frustration of dischargers who sought better guidance.

In response, the Commission adopted a comprehensive set of "interpretive guidelines" setting numerical ceilings on discharge of metals and other toxic substances, pesticides, oil, hot water, suspended solids, floating materials and odors.

Non-tidal Streams

The quality of the non-tidal main stem of the Delaware above Trenton and of the river's free-flowing tributary

Waste Dischargers
Brought Under Abatement Schedules - 1972

Discharger	Allowable Discharge*	Full Compliance by
Upper Penns Neck Sewerage Authority, N. J.	230	June 1975
City of Salem, N. J.	395	June 1975
Pearsall Corp., Harmony Twp., N. J.	***	September 1971
Rohm & Haas Co., Bristol, Pa.	2,750	January 1973
Rohm & Haas Co., Philadelphia, Pa.	**	January 1973
Stepan Chemical Co., Fieldsboro, N. J.	15	December 1973
Paulsboro Products, Inc., Paulsboro, N. J.	**	June 1972
National Park Municipal Utilities Authority, N. J.	100†(1)	December 1972
Paulsboro Borough, N. J.	255†(1)	December 1972
City of Woodbury, N. J.	570†(1)	December 1972
Gloucester County Sewerage Authority, N. J.	2,830	February 1973
South Christina temporary sewage treatment plant, New Castle County, Del.	130	September 1972
GAF Corp., Gloucester City, N. J.	3,430†(2)	July 1973

* Allocation of carbonaceous (first-stage) oxygen demand in pounds per day
** Discharge to estuary is inorganic
*** A non-tidal discharge not under allocation
† Allocation withdrawn
(1) Incorporated into Gloucester County Sewerage Authority
(2) Discharge to be eliminated by recycling

streams remains, on the whole, excellent. As input to a program to insure that this condition is preserved, the Commission is developing basic water oxygen information from Easton to Trenton. This data will enable the Commission to institute on this reach, when needed, a wasteload allocation system similar to the tidal river's. As with the estuary, this work involves a mathematical model of the river.

For the second consecutive year, abatement schedules mandating sharp improvement of waste treatment by dischargers to the non-tidal Delaware were imposed.

Basinwide Planning

A recent federal law requires that there be prepared for each river a basinwide water quality plan to include detailed local and regional plans. To help produce the required document, the Commission established a Pollution Control Planning Task Force representing signatory environmental and planning organizations and the Delaware Valley Regional Planning Commission and the Wilmington Metropolitan Area Planning Coordinating Council. The final product is to consist of physical facilities, regulatory measures and supporting administrative and financial programs, with due regard for relationship with solid and gaseous waste problems.

Regional Systems

Many metropolitan suburban areas that have mushroomed in the post-World War II era have been plagued by deteriorating water environment resulting from hodge-podge development of small independent sewage treatment plants. Such plants, often operated by untrained personnel, generally sprang up without regard to effect on neighboring towns with similar problems, producing intense pollution of small streams.

Efforts to step up remedies to this common local environmental dilemma are progressing in many parts of the basin through difficult and costly — yet economical — development of regional plants and interceptor networks serving many towns.

Good progress was recorded this year on several such problem areas — including Gloucester, a fast-growth South Jersey county of easy commuting distance to Camden and Philadelphia.

The Gloucester County Sewerage Authority is completing construction of a regional treatment plant and interceptors to communities throughout the county, allowing phasing out of at least 17 scattered small plants and thus restoring local water quality to acceptable levels.

The industrial-urban concentration along the heavily worked Delaware estuary is depicted vividly in this Philadelphia area waterfront scene.

Similar regionalization for Camden County, where the problems are even more intense, is in its earlier stages. A new authority will upgrade the existing Camden City plant and link it with suburban towns through a pipeline network, all of which is scheduled to be in operation in about three years.

Across the river, in Delaware County, just down the river from Philadelphia, a major regional sewerage remedy moves ahead. Scattered sewerage facilities and inadequate treatment in this area over the years have dropped the quality of a half-dozen Delaware River tributaries to levels that local citizens no longer found tolerable. Through arrangements that Pennsylvania and DRBC worked out with local groups, the County and the City of Philadelphia, a comprehensive regional solution has been blueprinted. Wastes from the eastern, or upstream, portion of the county will go to the big regional plant now being upgraded in southwest Philadelphia, while those from western, or downstream, Delaware County will be processed to high levels at a new plant in Chester, which also will receive some wastes from adjoining areas in Chester County.

Deepwater

In 1969, DRBC initiated studies to bring to 30 miles of Delaware River shoreline in Gloucester and Salem Counties a South Jersey regional system for collecting and treating industrial and, to a lesser extent, municipal wastes. A large, modern treatment plant at Deepwater, near the Delaware Memorial Bridge, was part of the consideration.

The results, produced last year, indicated the project was feasible, both physically and economically. The Commission expressed its willingness to finance and build the plant then turn it over to a participants non-profit association to operate. After tentatively lining up a necessary number of dischargers to join the system, the Commission turned to the New Jersey and Federal Governments to arrange for grant assistance under their respective laws. Early in 1972, the Commission was advised that a minimum of six months would pass before grant eligibility could be established.

Concerned over the prolonged inactivity during the Deepwater study in upgrading waste treatment in this region — often through no fault of the dischargers — the Commission decided further delays could not be tolerated and withdrew from the Deepwater proposal. The study data was made available to the Gloucester Authority as well as to dischargers that participated in the studies and officials in Salem County if they move on their own with some form of the regional scheme.

Individual dischargers were advised to act immediately to comply with estuary standards under their own abatement programs, which are now in effect.

Surveillance-Monitoring

Stringent new pollution laws and programs necessitate greater surveillance, monitoring and laboratory activity. The staff was directed by the Commissioners to design a watchdog and data-collection proposal, on which work was progressing at year-end. This would supplement the five-year-old surveillance program being carried out for the Commission on a contractual basis on the tidal river by the States of Pennsylvania, New Jersey and Delaware, including periodic 80-mile boat runs to collect and analyze channel water samples.

Tocks Island

The fate of Tocks Island, the dramatic and vigorously challenged reservoir and park project that would be the single greatest influence over the water resources future of the four-state region, was an uncertainty as 1972 drew to a close.

Governor Cahill told his fellow members at the annual meeting of the Delaware River Basin Commission in May that he was seriously concerned that Tocks would exacerbate his state's problem of uncontrolled growth and more specifically that allied roadbuilding and sewerage needs would impose too much cost burden on the Garden State. He said he would establish a formal New Jersey position over the summer and report back.

In his later policy announcement, in September 1972, the Governor said New Jersey realizes the benefits from Tocks would be great and further that alternative means of producing them were unavailable, particularly water supply. However, he said he must tentatively withdraw support from the project pending satisfaction of a list of New Jersey conditions relating to park visitor load, shared road costs, waste treatment, flood plain and other land use regulation, and loss of local ratables.

Analysis and negotiation of agreements on the New Jersey conditions were scheduled for completion and review by Governor Cahill and his fellow Basin Commissioners early in 1973. Meanwhile, with preconstruction work largely completed, the Army Corps of Engineers stands ready to start building.

The long-authorized — and long-delayed — multiple-purpose project slated for development on the main stem of the Delaware just upstream of the Water Gap had been looked upon for more than a decade by the federal and state governments and basin community generally as the single facility that could go furthest in providing balanced management of the river system.

It would produce more than half the water supply for home and industry to come from all the installations combined in the basin's Comprehensive Plan. It would eliminate most of the flooding damage for 100 miles to below Trenton. It would permanently shut the door to repetition of the salt water intrusion threat of the 1960s drought and, at the same time, assist in the downstream pollution control program. With the companion Delaware Water Gap National Recreation Area, it would provide the largest inland and water-based recreation attraction in the East. Tied to the project would be a large private pumped storage generating station to help meet increased energy demands.

But to the growing number of voices crying out for preservation of the natural environment, Tocks is something else indeed. It represents to them the undesirable transformation of the gently flowing upper Delaware into a vast public works project whose benefits, questioned by some, would accrue to distant communities and which would attract hordes of urbanites in search of country outings.

Rising protests by environmental groups and individuals that the project would produce irreparable ecological damage coincided with the early administration of the National Environmental Policy Act of 1969, thus subjecting Tocks Island to ecological review of unprecedented depth.

Complaints that there would be excessive water surface drawdowns, fisheries damage and lake pollution as well as inadequate flood control and water supply benefits went to the President's Council on Environmental Quality, the policy advisory group established under the Act. The Council analyzed environmental information supplied by the agencies and conducted numerous working meetings with their representatives to check the contentions by the project's sponsors that it would be environmentally sound.

Meanwhile, the Basin Commission was completing preparations for its early-1972 adoption of a regional waste plan designed to protect the Tocks lake from pollution by detouring collected sewage to a treatment plant downstream of the dam. The sewerage study had been initiated by DRBC in 1966.

The Environmental Council, apparently having resolved that lake drawdowns, fisheries protection and other problems are controllable, centered its further inquiries on the pollution issue.

The Council commended the regional approach of the Basin Commission's plan, but said it wanted further assurances from the Governors of New Jersey, New York and Pennsylvania that they concurred with DRBC's program and that those states would carry out their end of the lake protection programs in cooperation with the Federal Government. In addition, the Council asked if New York State would launch a high priority program to control pollution from farms. It is feared that nutrients from dairy and poultry wastes are potential sources of excessive eutrophication (algae blooms) in the Tocks lake.

It was the request of the Environmental Council for pollution control assurances from the states that forced the Tocks Island issue to DRBC's annual meeting table. There Governor Cahill reported his concerns and said he could not at that time give the assurances requested. Delaware and New York

stated they would follow the lead of New Jersey, a principal benefiting state, and await the outcome of the issues raised by Governor Cahill before deciding on the assurances. New York reported also that it would have problems with the CEQ suggestion that top priority be attached to its nutrient program in view of pressing water quality problems elsewhere in the state. Pennsylvania and the United States indicated readiness to proceed with the project if the other states agreed.

The position taken by Governor Cahill was espoused by environmental opponents to Tocks notwithstanding contrast between their complaints that the project would produce disastrous environmental effects and New Jersey's concentration on cost burdens for state and local government.

These were Governor Cahill's conditions to reinstating his support of Tocks Island:

> *Enactment by his state of controls over use of flood plains; elimination of the New Jersey side of the river from the Tocks regional sewerage system; control of nutrient runoff in the areas upstream of Tocks; enactment of state land use controls in counties around Tocks; federal payments of half or more of the cost of needed access roads; reduction of the planned park visitor load to about four million yearly from 10½ million; and federal consideration of payments in lieu of taxes to local government.*

Appropriations

For fiscal 1973, the White House requested $14.8 million for the reservoir, about half in construction funds to be spent after environmental clearance. The Congress approved the request, directing however that the entire amount be spent only on land acquisition pending acceptance of the project by the President's Council.

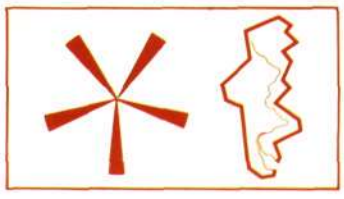
On the separate matter of financing the park, Congress moved to increase the original authorized cost from $37,412,000, all of which has been spent, to $68 million. Without this action, the Federal Government could not continue buying the still-unacquired half of the parklands needed. Meanwhile, an operating and maintenance appropriation of $1.9 million was approved for 1973.

Tocks Water Quality

This was a year of fervent activity on protecting the water in the Tocks Reservoir from pollution. Six years earlier, the Basin Commission, with the aid of a sizable federal grant, had begun an investigation — the Tocks Island Region Environmental Study — aimed at assuring good quality of the lake, and in 1970 the results had been publicized.

Public hearings conducted this year in the Tocks region on three phases of the broad subject attracted only minimal-to-moderate interest from local citizens aside from several government officials and a few persons with strong views on the Tocks Reservoir itself. The public hearing topics were: The contents of the full report, which offered five physical

Overhead view of a model of the Tocks Island dam.



alternatives for handling the waste problem in the tri-state region; the recommendations of a companion study by Syracuse University on how to organize and operate the program; and finally, the Commission's preferred scheme — Alternative V — calling for a lake-circling interceptor and treatment plant below the dam.

Testimony at the poorly-attended first hearing, on the full report, generally supported some integrated regional solution to the liquid waste problem. At a later hearing on the single treatment plant, Tocks opponents lined up against and Tocks supporters in favor of the proposal, which was sharply questioned also by government officials concerned over local costs.

The Basin Commission later incorporated into its Comprehensive Plan the single-plant scheme, modified to allow future alterations as the need develops and to exclude the Stroudsburg area and sections of Warren County (N. J.), whose wastes will be handled independently and could not threaten the reservoir in any event, since they reach the river below the dam.

The Commission estimated the capital cost of the interceptor and plant required to keep wastes out of the lake at $53 million, with about 75 percent financed by federal and 10 percent by state grant programs. DRBC would pay the remaining local share from user charges.

The Commission also formally committed itself to build and provide for operation of the regional system unless local or state authorities themselves assumed the responsibility by July 1, 1972, which they did not. This was in line with a Syracuse University recommendation that the Commission build and run the system in the apparent absence of any other entity equipped for the job.

It was the DRBC's modified Alternative V plan that Governor Cahill criticized, stating that New Jersey preferred to have its population centers in the region served by local plants.

By far, the largest single unresolved concern about the Tocks project appeared to be its protection against excessive eutrophication, or algae, that could detract esthetically from the lake.

The fear is that algae-causing nutrients, mostly from farm wastes in sections of New York State and, to a lesser extent, Pennsylvania, might reach the reservoir in sufficient volume to produce algae blooms. The Corps of Engineers had received a professional opinion that such a condition might occur if controls are not imposed.

The Basin Commission is formally committed also to control the problem if there is one. To determine this, it has been conducting farm inventories for two years of the numbers of animals and methods and acreage used in agricultural waste management practices.

This is part of a broader DRBC program that also encompasses sampling of surface waters and effluent from municipal and industrial waste treatment plants that also are nutrient sources.

The program will be expanded sharply if the Federal Government approves a requested grant to underwrite costs of establishing monitoring stations and developing a nutrient control program in cooperation with federal and state agencies.

Another 1972 development has been the fashioning of an ecological simulation model of the Tocks Island Reservoir under contract for the Corps of Engineers to determine the eutrophic effects, if any, of existing and various potential combinations of nutrient inflows to the lake. Preliminary findings confirm the view of DRBC and Corps experts that the algae bloom threat is controllable if, as would be the case under Governor Cahill's conditions, the limited wastes discharged to the reservoir are subject to advanced treatment.

Also, DRBC embarked on a program that could lead to the use of spray irrigation to dispose of treated sewage in parts of the Tocks region by arranging for a soils survey of a 450-square-mile area, including portions of six counties that drain into the 37-mile-long lake. Nutrients sprayed on land benefit forest and agricultural growth. If spray irrigation proves workable in the area, it could eliminate need for some costly sewer lines and still keep algae-causing nutrients out of the lake.

Power

The Commission conducted a hearing and reserved decision this year on the application by a group of New Jersey utility companies for permission to build the long-proposed hydroelectric facility at Tocks Island. It would use surplus nighttime power to pump Tocks water to a small upper reservoir on Kittatinny ridge, dropping it back downhill through turbines to produce extra peakload energy. A similar installation on adjacent property has been in operation for six years, using water from a small tributary east of the ridge rather than the Delaware.

Authorizations for incorporating such a power project into the Tocks complex had been approved by DRBC in 1968 and Congress in 1970, but the application for implementation must be processed by DRBC and the Federal Power Commission. The outcome of the power application, of course, is linked to the fate of the Tocks Reservoir.

Schuylkill River

A report on problems and remedies on the Delaware's largest tributary

Largest of all the scores of tributaries of the Delaware is the Schuylkill River. Although situated entirely in Pennsylvania, it drains nearly 1,900 square miles, or 15 percent, of the land in the four-state Delaware River Basin. An even larger proportion, 20 percent, of the Delaware Valley's seven million citizens lives in the Schuylkill watershed.

The Schuylkill Valley extends farther west than any other part of the basin before ending at the Susquehanna divide in the outskirts of Lebanon. From its headwaters in Schuylkill County, the river winds some 135 miles enroute to the Delaware at the Philadelphia Navy Yard.

Forming as a tiny stream just above Pottsville, deep in the anthracite mining area, it holds a steady southeasterly course as it passes by Reading, Pottstown, Royersford, Spring City, Bridgeport, Norristown, Conshohocken and Manayunk, becoming tidal eight miles from the Delaware as it crosses Fairmount Dam. Legend has it that the first European navigator to come upon the Schuylkill, Arendt Corssen, gave the river its name — Skokihl, or Hidden Creek.

The stream widens as it collects waters from dozens of its own tributaries, among them the Little Schuylkill River and Maiden, Tulpehocken, Manatawny, French, Perkiomen and Wissahickon Creeks. And as it heads downstream, the valley becomes increasingly urbanized and industrialized.

By the standard of well-known rivers, the Schuylkill's long-term average flow near the Delaware confluence is small — 2,780 cubic feet a second. This is only one-fourth the average volume of the Delaware main stem at Trenton, and less than one-twelfth that of the Susquehanna River as it approaches Chesapeake Bay. The flow of the Lehigh River, second largest tributary in the Delaware system, is 2,235 cubic feet a second.

As with any river serving a developed region, the Schuylkill carries a load better served by a stream perhaps several times its size in terms of satisfying water supply demands and evacuating wastes from communities and industries along the route.

The Schuylkill has all the problems normally associated with such a heavily burdened stream — pollution from community and industrial sources, periodic floods and inordinate water supply demands. It even goes most rivers two better with its severe acidity from coal mining operations and large number of oil spills.

All of these problems are getting a good share of attention from various levels of government concerned with such environmental matters. These include the Pennsylvania Department of Environmental Resources, many federal organizations including the Army Corps of Engineers, Environmental Protection Agency, and Department of Interior, and the interstate-federal Delaware River Basin Commission.

Water Supply

The combined withdrawals for communities and industries exceed by several times the river's streamflow during the typically dry summer months. There were times during the drought when there was no flow over the Fairmount dam. This was because the 170-million-gallon daily withdrawals for the Philadelphia water system, or 45 percent of the water used by the city, were greater than the flow.

The future is something else again. Projected increases in Schuylkill demands show clearly that either reservoir storage or imports from another watershed, or both, soon will be a necessity, notwithstanding the heavy reuse pattern, if there is to be enough water to go around.

The Comprehensive Plan of the Basin Commission incorporates several features to accommodate the expanding water supply needs of the Schuylkill watershed.

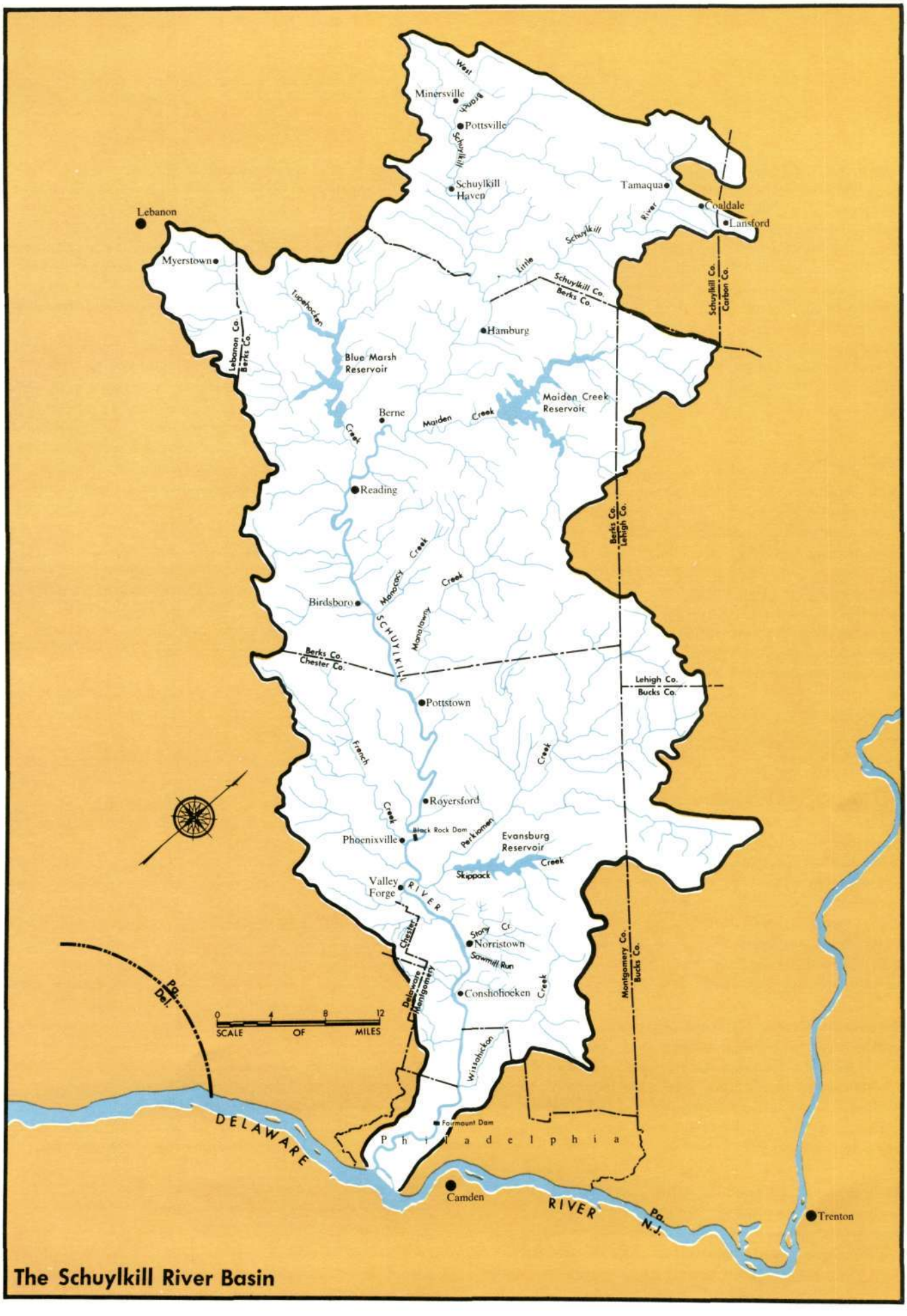
Two major multiple-purpose water impoundments have been authorized by the Congress and the Commission for construction by the Corps of Engineers. They are Blue Marsh reservoir on Tulpehocken Creek and another on Maiden Creek, both in Berks County, which together will yield 130 million gallons daily of water supply for the Reading-Pottstown area as well as Greater Philadelphia. This supply will be equivalent to the needs of a city of 700,000 people. Design of Blue Marsh has been completed, and it is scheduled for early construction and operation after 1975. Maiden Creek will be assigned a target date as its need becomes imminent.

The Commission has legally committed itself to repay the Federal Government the water supply share of the cost of Blue Marsh, as with other reservoirs elsewhere in the Delaware Basin. These funds will come from water sales to such parties as the Western Berks County Water Authority, which already has contracted to buy a large part of the Blue Marsh yield, and from the benefiting states for the portion not yet under contract.

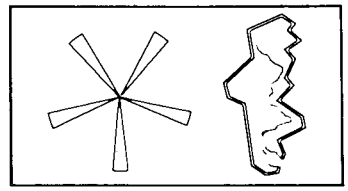
The third Schuylkill water supply reservoir in the Commission's plan is the Commonwealth of Pennsylvania's Evansburg project on Skippack Creek in Montgomery County, where land is being acquired for recreation development and later dam construction.

These reservoirs will bring basic relief from water demand pressures in the Schuylkill Valley's forseeable future. This water will be earmarked essentially to towns and industries for non-consumptive uses (meaning the water is returned to the river for reuse downstream) and will not be expendable for consumptive uses such as industrial cooling (meaning lost from the steam through evaporation).

Because of a large prospective consumptive water requirement on the Schuylkill, the Basin Commission has



The Schuylkill River Basin



authorized a plan to augment future supplies in the valley by an inter-watershed transfer, or diversion, from the Delaware main stem. This would be achieved through pumping from the Delaware at Point Pleasant, in Bucks County, to the nearby East Branch of the Perkiomen Creek, a Schuylkill tributary. Water would flow 30 miles down the Perkiomen, then be piped a few miles to the proposed Limerick nuclear power plant near Pottstown for cooling. The diverted Delaware water may be used also by towns along the Perkiomen. Bucks County is the likely developer of the diversion project, which also would serve domestic water needs in that county.

Flood Control

With completion of Blue Marsh reservoir west of Reading in the mid-1970s, the Schuylkill Valley will get its first major flood control impoundment. Had Blue Marsh and its companion authorized project, Maiden Creek, been in operation in June 1972 during the record flooding from Hurricane Agnes, they would have held back and thus rendered harmless 23 billion gallons of water, cutting seven feet from the devastating crest. Damages would have been reduced by more than 40 percent. (The flooding from Hurricane Agnes is dealt with in more detail on page 6.)

During the 1960s, a number of smaller reservoirs that protect communities from small-stream flash floods, were constructed.

Five of these are in the Little Schuylkill watershed in the northwestern corner of the valley, where the 1955 flood struck fiercely. In September 1971, Norristown was spared even greater damage than it suffered from uncontrolled Stony Creek because of an effective new impoundment upstream on Sawmill Run, and Hamburg, in Berks County, enjoys similar protection from a pair of Kaercher Creek dams. These facilities, all part of DRBC's Comprehensive Plan, were developed by the U.S. Soil Conservation Service, the Commonwealth and local government.

In the wake of heavy damages suffered along the Schuylkill in flooding from Hurricane Agnes, the Corps of Engineers is investigating the need for additional flood protection for Norristown along Stony Creek, for Pottstown, for Birdsboro in Berks County, and for Schuylkill Haven at the upstream end of the river's main stem. The findings are due early in 1973.

Reservoirs are designed to protect against floods up to a certain elevation but do not eliminate the threat to higher land on the flood plain in event of an even worse disaster. Also, they tend to promote unrealistic belief that the low lands are no longer unsafe for homes and other "improvements."

The important companion approach to structural controls is the regulation of flood plains in high-risk areas to ban incompatible use, particularly if maximum benefits are to be derived from reservoirs. Flood history maps are essential to show local governing bodies precisely the lands that have been inundated and how often in order that they can impose flood plain regulations. The maps also reveal the extent of protection to be enjoyed from planned structures.

Many flood plain mapping programs have been completed in the Schuylkill Valley by the U.S. Geological Survey, Corps of Engineers, the Commonwealth, private and public local agencies and DRBC. Four have been completed on the Philadelphia-to-Conshohocken and Conshohocken-to-Norristown reaches on the main Schuylkill and on Perkiomen and Wissahickon Creeks. Nearly finished are others on the Schuylkill from Norristown to Pottstown and on the Wissahickon's East Branch.

Although officials of Pennsylvania and New Jersey are pursuing a greater role in flood plain regulation, only local governments can zone under existing laws for land uses. Meanwhile, DRBC formally initiated action this year to assume power granted under its Compact to impose standards for developments on flood plains, an adjunct to zoning authority.

Pollution Control

The liquid wastes that cause quality problems generally emanate from three sections of the valley — the Schuylkill County coal mining center in the headwaters, the Reading area in the upper-central part of the watershed, and the lower river in and near Philadelphia.

The mining region at the very upstream end of the river delivers a dual pollution problem with its heavy drainage of mine acids and discharges of raw or only primary-treated sewage from a concentration of small towns. The river down to Hamburg, as well as its West Branch and Little Schuylkill tributaries, is spoiled by mine acid for most recreation and fish use, but recovery occurs over the 10 miles from Hamburg downstream.

From the Reading area down, nearly all major industrial and municipal dischargers are giving wastes secondary treatment. Those throughout the valley not at secondary levels are either progressing on abatement programs or are the subject of legal action by the Commonwealth.

Limits in available grant funds and staff are hampering the Commonwealth's Schuylkill cleanup program. Nonetheless, 13 major sewerage installations have gone into operation since the state's Schuylkill pollution control standards were adopted in 1968 and six are being built, while nine with state grants are construction-ready.

The Schuylkill winds 135 miles through coal mining, mountain, farm, industrial, suburban and city areas. Pictured is a view of the river as it passes by Center City Philadelphia a short distance from its confluence with the Delaware.

Twenty-six other plants could go into construction but state funds needed to aid them are insufficient pending adoption of proposed remedial legislation. The 41 incomplete projects will serve more than a million persons, or nearly 75 percent of the Schuylkill Valley's population. The pollution cleanup drive has been impeded further by extensive damage to sewerage facilities caused by flooding from Hurricane Agnes.

In all, the number of industrial, municipal and mine acid pollution sources along the Schuylkill total 506, with nearly 100 in compliance with standards and nearly another 100 making acceptable progress.

As the year ended, Pennsylvania was preparing to impose new advanced waste treatment requirements on the two heaviest developed reaches of the Schuylkill's main stem — 28 miles of the lower river from Fairmount dam to Black Rock dam and 24 miles in the Reading area between Hay Creek and Maiden Creek.

The Schuylkill would appear to be victim of more than its share of spills to the stream of petroleum products and other undesired substances from waste storage lagoons, pipeline breaks and shipping accidents. Under DRBC contracts, the Cities of Philadelphia and Trenton provide emergency cleanup equipment and labor, as with the oil and oil-soaked debris that were mopped up after one of the Schuylkill's worst spills two years ago.

In an unusual water quality situation, the Commonwealth, federal agencies and DRBC are working with a chemical company that inherited the problem to eliminate old concentrations of arsenic from groundwaters and adjacent soils near Myerstown. Studies are in progress to determine whether to resume a program of gradual pumping in harmless volumes to a tributary of the Schuylkill on which Blue Marsh reservoir is to be built or apply some other solution.

Energy

Four large fossil-fueled electric generating stations operate along the main Schuylkill — near Norristown, Phoenixville and two at Reading. These plants return heated water to the river after using it for cooling. Two of the four are under approved state thermal pollution abatement plans, with the others under study.

The Limerick plant near Pottstown on which the Atomic Energy Commission and DRBC are processing applications is one of two that power companies want to operate on the Schuylkill. The other would go into operation in 1985 near Berne, about 10 miles above Reading, with cooling water losses compensated from an off-river utility reservoir. No applications have been filed on the Berne plant, and even though the AEC and DRBC have not cleared the Limerick plant, the sponsor is proceeding with construction at its own risk.

Through a wide variety of cooperative programs, contracts, administrative agreements and memorandums of understanding with other governmental units, the Basin Commission is a partner in the many efforts to protect the Schuylkill Valley. One of DRBC's influential activities is reviewing plans by public or private sponsors of projects that might impair the water resources or interfere with the Comprehensive Plan. DRBC's basic role encompassing any operating, regulatory or management activity is to work with others to assure that programs, projects and policies on a more localized scale blend with and enhance those to improve the resource future of the large region.

Other regional agencies also are engaged in programs or studies for the Schuylkill. For example, the Corps of Engineers recently has begun an up-to-date comprehensive study of the valley, incorporating flooding, water supply, power and quality factors, at the direction of Congress. And the Environmental Protection Agency has embarked on a computerized river model study to predict water quality levels under alternative wastewater management programs.

Progress on Programs

More water supply is committed and flood plain work advances

The year produced many developments on DRBC programs and other events significant to the protection, enhancement and management of the resources of the river system and its environment. Those not dealt with elsewhere in the Annual Report are summarized in this section.

Water Supply

As Blue Marsh reservoir on a Schuylkill River tributary in Berks County neared construction, the Western Berks Water Authority contracted with the Basin Commission to purchase water to help meet public demands in the expanding Reading area. Pending completion of the multi-purpose reservoir in the mid-1970s, the Authority will draw the water directly from Tulpehocken Creek.

The Commission also was engaged in negotiations with the Lehigh County Authority for the sale of water for local communities from the planned Trexler reservoir in the Lehigh Valley.

Trexler and Blue Marsh are among a series of federal projects for which the Basin Commission has assumed responsibility for controlling and financing the water supply functions.

An inventory of users of surface waters in the four-state valley was completed and disclosed that withdrawals are made by 81 municipalities, 175 industries in addition to the thousands supplied by large water systems, and seven institutions. The inventory also disclosed that nearly a half-billion gallons daily of groundwater is used in the basin, not including farm withdrawals.

The inventory purpose was two-fold. First, it gave DRBC a more accurate picture of actual current water supply demands and data for projection purposes. Second, it provided information needed to assess charges for future withdrawals in excess of amounts being used in 1971.

Some communities and industries along the Delaware in Lower Bucks County raised objections during the year to the requirement that they will have to pay for additional water withdrawals. Under the basinwide policy, adopted by Secretary of Interior Morton and the Governors, charges are to be made for any new or additional surface water uses after the first DRBC-sponsored water supply project goes into operation at Beltzville in the Lehigh Valley. The objections, principally from opponents to construction of the Tocks Island reservoir on the upper Delaware, had not been raised at the 1971 public hearing held several weeks prior to the policy's adoption.

Bucks County indicated readiness to proceed with developing a pumping station at Point Pleasant on the Delaware River to increase water supplies in the growing northern Philadelphia suburbs of Bucks and Montgomery Counties. Feasibility of the project, to divert Delaware water to the Neshaminy and Perkiomen watersheds, was established two years ago by the Basin Commission, which later authorized its development. DRBC project review clearance also will be required. Besides communities in both counties, a proposed nuclear electric generating station on the Schuylkill River below Pottstown is a prospective user of the water for cooling.

The Commission entered a one-year agreement to pay $7,600 to the U. S. Geological Survey toward the cost of operating stream gauging stations and conducting flood control studies and snow surveys in the New York State portion of the Delaware Basin.

Energy Regulation

The power companies operating in the four-state Delaware Valley dropped a collective bombshell during the year when they disclosed their desire to expand 10 of their 27 existing power stations and construct 16 new plants by 1986. Provided the companies could get the required approval from the Atomic Energy Commission, Federal Power Commission, Delaware River Basin Commission and the respective state utility commissions, this would put 43 plants in operation 15 years hence, 11 of them nuclear. Six of the atomic plants would be in Pennsylvania, four in New Jersey and one in Delaware. Sponsors of three of the A-plants — Artificial Island and Newbold Island on the Delaware and at Limerick on the Schuylkill — risked starting construction prior to getting government approval.

These disclosures were contained in a master siting study that DRBC mandated the utilities to prepare to put water needs for power in perspective with competing uses. The Commission declared at that time that it would dispose of no new power station applications without first evaluating the effect any plant would have in combination with all others on the environment.

This was the first time a regulatory agency had required such comprehensive advance information, which also included projections as to water-for-cooling requirements and additions to the existing transmission systems.

The Basin Commission is to follow up the utility studies by making its own evaluation of the environmental consequences of the generating requirements, and is now seeking funds to finance the investigation. DRBC has taken no formal position on the utility studies, but members of its policy-making board have said they doubt that the Delaware River system could support all the proposed consumptive water use required by the utility plan.

An electric power plant siting advisory committee was named to assist the Commission in the difficult decisions ahead in this area. It comprises environmental and power experts from the four states and Federal Government.

At year-end, the AEC had not concluded hearings on the Newbold Island and Limerick applications. Action on the two plants was still pending also before DRBC, which took the position that it could not act on them without first being able to assure adequate water supplies for all uses.

Flood Plain Management

Delineation studies that give the flooding history of specified areas in terms of precise lines of land inundation, frequency, water depth and other factors have been completed or started for nearly 1,000 miles of shoreline on some 30 flood-prone stream reaches in the four-state valley. But these studies, by varied organizations, differ significantly in approach.

DRBC moved this year in cooperation with Pennsylvania and New Jersey to establish criteria and procedures for flood delineation work so they will be standardized throughout the basin and also conform to new guidelines of the federal Water Resources Council and the needs of the national flood insurance program. The work, being performed by a national consulting engineering firm, is to be completed in 1973.

The project will produce a detailed hydrologic analysis of the basin to allow selection of base streamflows and also a pilot flood plain delineation of the 82-mile stretch of the Delaware from the Water Gap to Trenton using the new criteria and procedures.

Another phase of the job is establishment of standards for flood plain use that will safeguard public health, safety and property. This phase involves researching existing and proposed laws in each state so that standards and a model flood plain zoning ordinance can be applied basinwide by appropriate state, interstate and local agencies. It also will recommend standards for interim use to control development of hazard areas pending detailed delineation.

Project Reviews

The Project Review Branch continues to process an average of about 200 applications annually as a safeguard against resource impairment and Comprehensive Plan incompatibility by the wide variety of proposed developments investigated. These include impoundments, interwatershed diversions, industrial and public water use and waste treatment, electric generating and transmission facilities, pipelines, stream encroachments and well withdrawals.

To defray the sometimes high cost of conducting the reviews, the Commission this year imposed a schedule of fees, based on project costs, to be collected from applicants, excluding government agencies. Fees range from $25 to $25,000, a seemingly high figure but one which might not actually cover costs where consultants must be engaged and costly investigations performed.

Mopping up after oil spill near Pottstown.

Pipelines and Spills

DRBC has been concerned over dangers of spills from pipelines since the early days when it interrupted construction of a transcontinental liquid petroleum transmission project pending assurance of installation of safeguards.

In final preparation is a set of maps showing the location and routes of all known liquid pipelines in the 13,000-square mile valley. Covering some 1,100 miles of underground pipes, the maps will be made available as a public safety service. Such information is valuable to utility design engineers, contractors, government agencies and others to avoid accidental ruptures which could contaminate surface and groundwaters, be a safety hazard and cause other problems. Knowledge of the pipe routes will make it easier to detect and repair leaks and facilitate spill warnings to downstream water users.

The number of reported spills from pipelines, shipping accidents and other sources continued to increase — from 75 in 1971 to 115 this year excluding those caused by Hurricane Agnes — but this is attributed more to improved industry-agency communications and greater public awareness than to an actual increase in the accidents. The Coast Guard, the Environmental Protection Agency, state agencies and DRBC have coordinated report-and-warning procedures. The Commission's revolving $10,000 fund for emergency mopup operations was not used this year.

Marshland biological factors are a big part of a new Bay-Estuary research project. This is one of many picturesque winding wetland streams that empty into the Bay from Cumberland County (N. J.)

Bay and Estuary

A unique and ambitious new research project has begun to analyze environmental impacts and socio-economic effects on Delaware Bay and the adjacent upstream tidal estuary and thus pave the way for more knowledgeable management decisions affecting the region in the coming decade.

Principal participants in the program are the University of Delaware, Rutgers University and Academy of Natural Sciences of Philadelphia, with involvement also of the University of Pennsylvania and Princeton University. The project, coordinated with DRBC, is funded by the National Science Foundation and involves some 40 scientists.

The 18-month first phase of the project will produce reports on marshland biological values, impacts from the proposed deep water oil tanker terminal, thermal wastes' ecological effects, pollution effects on fin and shell fish, problems of evaluating environmental quality, and nitrification's effects on estuary nutrients. The work will employ both physical and mathematical models.

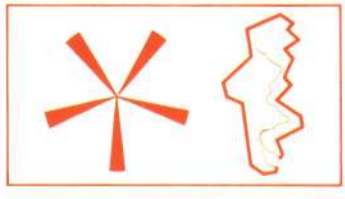
In anticipation of the long-range need to develop an environmental management program for the bay area, DRBC engaged the College of Marine Studies of the University of Delaware to conduct an inventory and evaluation of physical and social information relating to the region. The contract was completed and the report is to be published soon.

Sludge Inventory

Disposal of sludge, the troublesome leftover solids from liquid waste treatment, has developed into a major environmental concern that is the subject of policy studies and debating among legislative, regulatory, academic, industrial and municipal people. To increase the knowledge of the problem at the Delaware Basin level, the Water Quality Branch completed an extensive inventory of sludge volumes and composition, types of treatment, locations and sizes of disposal sites and resulting environmental problems. Ocean dumping is widespread if unpopular, yet satisfactory alternatives are elusive. Following are some of the findings:

The total monthly sludge volume produced is 3.2 million cubic feet, of which 55 percent is municipal and 45 percent industrial; 1.4 million, or 43 percent of the total, is dumped in the ocean by four municipalities, and 1.2 million of that by the City of Philadelphia; sludge from 42 municipal sewerage plants that produce 14 percent of the total goes to landfills, farms, lagoons or incinerators, as does most of that from 32 industries whose total flood yield is 1.45 million cubic feet. These figures do not include 72,000 tons of industrial caustics and acids dumped in the ocean monthly, 63,000 tons of it from E. I. duPont Company's Edgemoor plant.

Annual Meeting 1972



Scenes are at events associated with DRBC's 10th Annual Meeting held May 10 at Washington, D.C.

Staff Activities

Daily routine touches on an endless variety of resource work

The daily grind of the 55-member staff of the Delaware River Basin Commission is of seemingly endless variety.

Some quiet water planning and management chores go on continually. Others are one-shot and even unpredictable — or at least unpredicted. The routine is often the unroutine. It embraces intense controversies and matters where no one could care less (save the obligated professional). Yesterday's crisis may be obscure today. The unnoticed decision may be crucial, while the insignificant one has everyone shouting.

On the visible side, there is participation by various professional and technical staff people at dozens of public or quasi-public events. These include duties at the formal monthly meetings of DRBC, testimony before Congressional or other official bodies, and activity at conferences. There are appearances as speakers before a long list of organizations, on radio and television shows to discuss resource issues, and as spokesmen for the agency at working meetings with government officials, usually in the involved local area. But the visible activity is only the iceberg's tip.

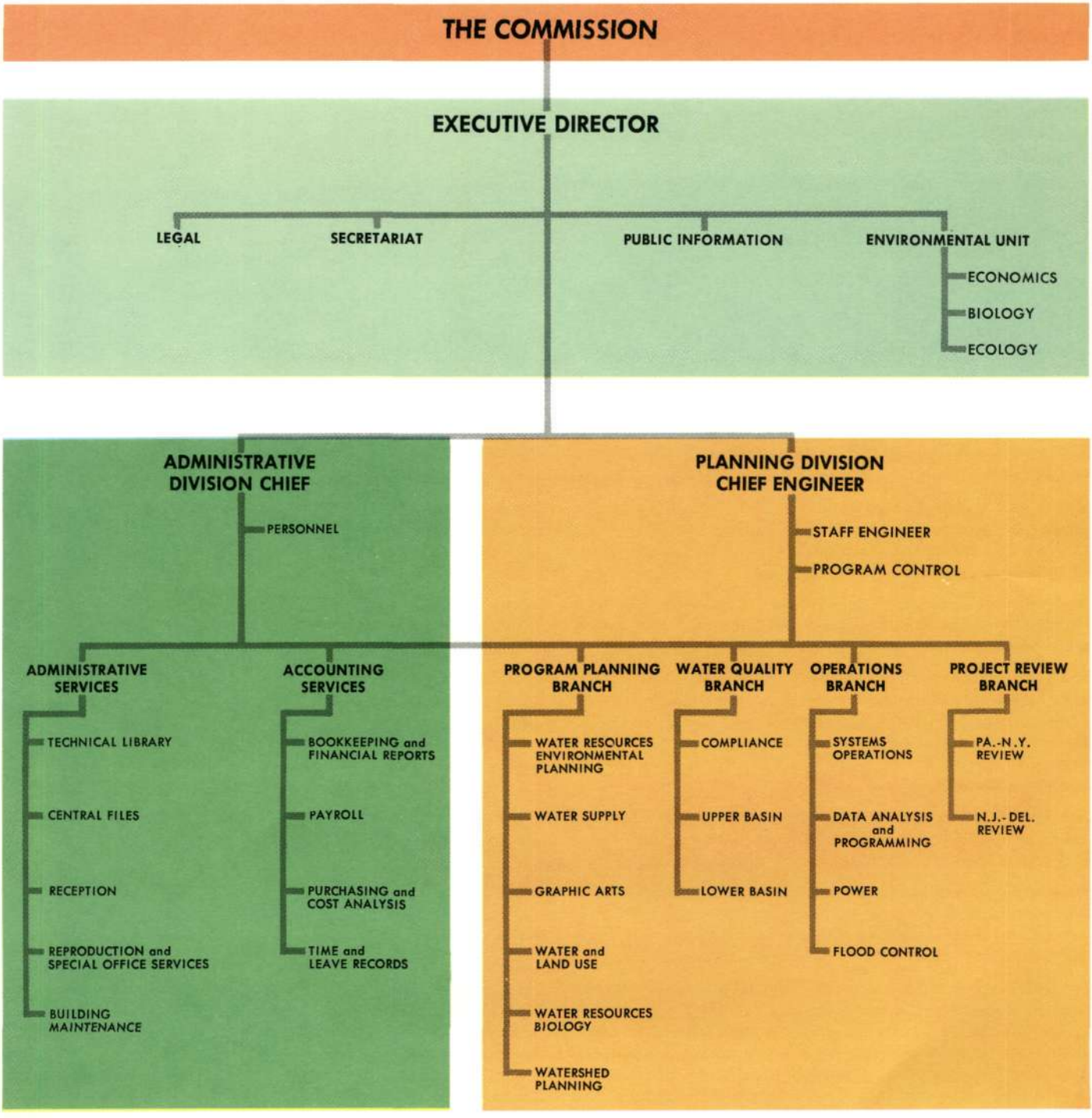
This might be a typical day with the eight-member Program Planning Branch, one of four in the Planning Division. The watershed planner would be providing assistance to one of dozens of local conservation groups with whom he is DRBC's link, as with the Mid-Atlantic Council of Watershed Associations. And the water-land use planner would be making a population analysis or be off discussing a sewerage construction grant problem with the Delaware Valley Regional Planning Commission or Wilmington Metropolitan Area Planning Council. The geologist might be in Carbon County in the Poconos checking a groundwater contamination complaint. The problems of fish passing through a generating turbine may be under analysis by the biologist, between work on an agenda for the Commission's Fish and Wildlife Technical Assistance Committee, of which he is secretary. Or he might be out collecting limnological data from a dozen tributaries to determine their effects on the upper Delaware.

The same branch also is responsible for annual publication of the Commission's Water Resources Program, which is a six-year slice of the longer-range Comprehensive Plan and also a compendium of supply-demand data. It holds regular planning consultations with local, state and federal agencies. It is completing an important map publication project to pinpoint 1,100 miles of oil pipelines, each a potential stream contaminator, and it produces a steady flow of drafting and graphic works for technical publications, reports, hearings, meetings and briefings. In addition, the branch head, as an outgrowth of experience on a noted pipeline case, is a member of the petroleum pipeline standards committee of the American National Standards Institute. This branch also has been active in the work on pollution control for the Tocks Island and Delaware County (Pa.) regions, and participates in the activities of the new task force for developing a basinwide pollution control and abatement plan.

In the busy Water Quality Branch, a dozen persons work on a regular basis on negotiating and preparing pollution abatement schedules, on watching the need for and preparing new or amended standards and rules, and on compiling and reviewing surveillance information that goes on computer cards for storage in a federal data bank. Much of the data comes from boat runs made regularly in the estuary. Other data received from states under DRBC contract, encompasses tributary streams and waste discharge sources. Special studies, surveys, investigations and inventories are initiated and concluded regularly on a myriad of constantly arising pollution problems — toxicity, sludge, acids, nutrients, groundwater, oxygen and more. The branch monitors all pollution spills and participates with other agencies in systematic alerts and warnings to downstream water users, and also supervises emergency standby contracts under which crews from two cities provide spill cleanup services. Two members of the staff took an Environmental Protection Agency course on spill prevention and control.

Constant consultation with pollution control agencies of the four states and Federal Government is the job of the Water Quality Branch, as is steady contact with municipalities and industries whose waste discharges are the source of the pollution problems. It has an expert on industrial processing and wastes who is vital to these contacts. It coordinates and provides services for the Commission's standing Water Quality Advisory Committee. This branch also has conducted two technical seminars, one recently for industry experts on closed cycle waste operations to help familiarize them with legal requirements and current techniques.

The Organization



Probably the branch's most significant activity is development of abatement schedules, for formal Commission adoption, derived jointly with the discharger and states.

The smallest branch, Project Review, has investigated some 2,000 applications for pre-construction clearance of dams, water use and waste water operations, electric generators and transmission lines, pipelines, wells, marinas, docks and so on, in the past decade, divided about 50-50 between public and private jobs. The four-member staff's work entails frequent field inspections and daily contact with applicants and state and federal agencies which likewise are concerned over the projects' effects on the river. Many sponsors must be notified that plans should be altered to qualify for approval, and many requests arrive with insufficient information that must be obtained. Sewerage applications must be approved also by regional planning agencies as a condition to securing federal grants, necessitating a regular exchange of information with those officials. Also, periodic changes in DRBC rules require notification of hundreds of affected towns, industries, consulting engineers, and others.

The five-member Operations Branch is on the firing line at all times dealing with such sensitive subjects as the controversial Tocks Island reservoir and other physical projects, water supply and pricing, electric power plant siting and analysis, and, alternately, droughts and floods and any measures to cushion their impact.

Arrangements for DRBC-sponsored studies of high risk flood plain areas are handled by the Operations Branch along with negotiating and supervising consulting contracts on establishing standards of flood plain development. This group works on projects involving physical handling or transmission of water supply, including a planned diversion of Delaware water for the Philadelphia suburbs. It also keeps check on volumes of water used by each municipality and industry and negotiates contracts for the sale of water supply to public authorities and others.

Computerized analyses concerning effects of changing wasteloads, fresh-salt water relationships and many other DRBC investigations are supervised by the systems operations specialist in this branch. It also compiles and publishes each month a voluminous summary on the conditions of the river system, including facts and historical comparisons on precipitation, streamflows, reservoir storage, water supply imports to and exports from the Delaware Basin, water supply withdrawals by Philadelphia, stream temperatures, oxygen content and salinity, and groundwater tables.

Meanwhile, the environmental unit makes preliminary ecological assessments of proposed developments. This is done to determine if the sponsors are to be directed to prepare and submit reports containing specified information on which DRBC can base its own environmental impact statements in accordance with federal requirements.

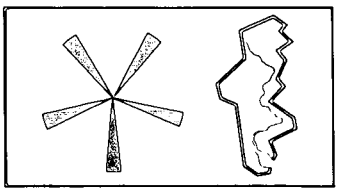
Aside from their regular executive and managerial duties, the director and his staff maintain relations with legislators and other officials, and monitor legislation, research and other developments and trends in the water resource and environmental fields.

The entire staff of the Commission shares the burden of preparing scores of matters each year for public hearing, including projects, pollution abatement schedules, policy and other amendments to the Comprehensive Plan, procedural changes in rules, environmental statements and water supply contracts. The full organization also helps arrange the annual Delaware Basin conference sponsored jointly by the Water Resources Association and DRBC.

The Staff Engineer and others have devoted literally hundreds of days to the massive job of revising DRBC's outdated Comprehensive Plan into a far more all-encompassing and convenient document that is still in preparation.

Staff members participate in and give technical papers at national and international professional and technical conferences and also serve as officers and committee members in professional societies. Administrators, journalists, scholars, students, technicians and citizens flow into DRBC's offices for interviews or materials.

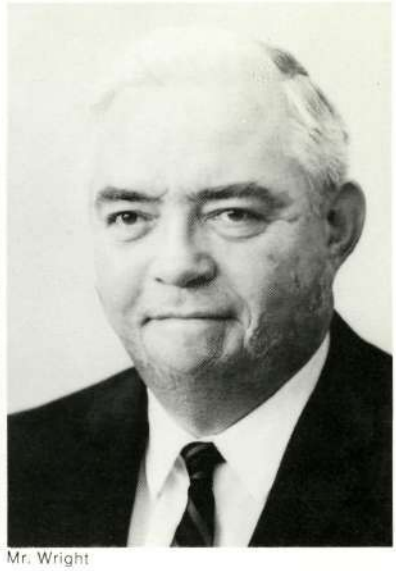
The DRBC technical library, while intended primarily for the staff's use, is used by outside citizens, students and organizations. It is part of the Administrative Division, whose budget preparation duties are unique — and laborious — in view of the large number of clearances required in four state capitals and Washington. The Division's 11 people also handle the accounting, payroll, purchasing, grant administration, financial report, central files, document reproduction and other housekeeping functions.



The Staff

Mr. Thompson, Mr. Peeck, Mr. Whitall

Dr. Miller



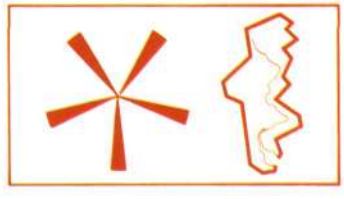
Mr. Wright

James F. Wright	*Executive Director*
William Miller	*General Counsel*
W. Brinton Whitall	*Secretary*
Dawes Thompson	*Public Information Officer*
Arthur E. Peeck	*Chief Administrative Officer*

Environmental Unit

Mr. Thursby, Mr. Mann, Mr. Craighead

Robert L. Mann	*Head*
J. W. Thursby	*Economist*
William M. Craighead	*Biologist*



Mr. Macauley, Dr. Hull, Mr. Howlett

Herbert A. Howlett	*Chief Engineer*
C. H. J. Hull	*Staff Engineer*
Clinton Macauley	*Program Control Officer*

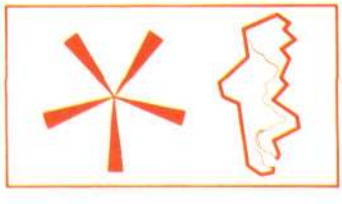
Planning Division

Mr. Porges, Mr. Selzer, Mr. Briganti, Mr. Goodell

Branch Heads

Ralph Porges	*Water Quality*
Robert L. Goodell	*Operations*
Theodore Briganti	*Project Review*
Seymour D. Selzer	*Program Planning*

Aerial view shows hairpin-like Wallpack Bend, about 10 miles upstream of Water Gap on the Delaware.



Financial Summary

Budgetary

1972 REVENUES

	Budgeted	Received
Delaware	84,500	84,500
New Jersey	359,500[1]	359,500[1]
New York	308,500	308,500
Pennsylvania	354,500[5]	355,000[5]
U. S.	179,000	179,000
EPA Grant	234,000	200,250[2]
Miscellaneous	2,000	6,302
TOTAL	1,522,000	1,493,052
		28,948[3]
	1,522,000	1,522,000

(1) Includes $10,000 flood control program support and $1,000 capital appropriation

(2) $33,750 of grant amount not received

(3) Net revenue loss

(4) Includes $55 unexpended funds and $33,750 in budgeted revenue not received.

(5) Includes $1,000 capital appropriation.

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

1972 EXPENDITURES

	Appropriations	Expended
By Organization		
Directorate	188,767	200,860
Administrative Division	157,949	192.668
Planning Division	1,175,284	1,094,667
TOTAL	1,522,000	1,488,195
By Program		
Water Supply	56,000	30,755
Water Demand	37,000	8,439
Recreation	72,000	117,226
Power	30,000	48,316
Project Review	156,000	134,360
Water Quality	713,000	687,604
Comprehensive Plan	207,000	281,268
Flood Loss	77,000	22,995
Basin Operation	134,000	114,792
Small Watersheds	38,000	12,324
Environmental Analysis	0	28,116
TOTAL	1,520,000	1,486,195
Capital Program	2,000	2,000
Excess or deficit in appropriations or receipts over expenditures		33,805[4]
GRAND TOTAL	1,522,000	1,522,000

Non-Budgetary

	Funds Available	Expenditures	Unexpended Dedicated Allotment
Tocks Island Region Environmental Study	8,687	0	8,687
Tocks Island Fish Research	23,959	3,642	20,317
Deepwater Regional Study	141,597	90,390	51,207
Delaware Bay Study	15,000	15,000	0
TOTAL	189,243	109,032	80,211

New Environmental Unit

Activity will carry out national policies in Delaware Valley

A new unit of the Delaware River Basin Commission to deal exclusively with matters of environmental quality was established and staffed in April 1972.

Creation of the unit under the direct supervision of the Executive Director was among several actions taken during the year to implement recommendations contained in a 1971 critique of the Commission's operations prepared for DRBC by the University of Pennsylvania's Environmental Studies Institute.

Appointed as head of the Environmental Unit was Robert L. Mann, a landscape architect and former assistant director of Cornell University's Office of Regional Resources and Development.

The environmental staff represents — or will represent — technical disciplines including landscape architecture, economics, biology, regional planning, limnology, ecology and natural resources conservation.

The group is to maintain a continuous review of DRBC programs and policies to assure protection of environmental quality; represent the Commission in all matters relating to compliance with the three-year-old National Environmental Policy Act, including preparation of environmental impact statements and review of impact documents prepared by other agencies and organizations; monitor and suggest DRBC response to state and federal environmental legislation; and oversee research required to improve understanding of the basin's environment.

Also, the unit is to set criteria for protecting wetlands; cooperate with outside private and public environmental resources organizations; and review Commission policy, regulations and procedures relating to requirements for environmental and ecological evaluation of plans, projects and programs, including setting standards to protect and restore ground cover disturbed by project developments.

The environmental group immediately became engrossed in the preparation of mandated DRBC impact statements as well as review of those by other federal agencies on projects affecting the Delaware Basin.

Under national environmental guidelines, some federal agency must prepare the impact statement on each project either developed or regulated by an agency of the United States Government. DRBC must either prepare or review the impact statement on any covered water-related project in the Delaware Valley, including inter-watershed diversions, reservoirs, electric generating facilities, transmission lines, stream channelization projects, or the filling in of marshes or wetlands.

In addition to working on impact statements, the new unit already has initiated a number of studies. They include:

> *Identification of environmental facts to be encompassed in applications seeking DRBC's consent for jobs to proceed under its 10-year-old project review operation; establishment of standards of protection and restoration of ground cover disturbed by projects; development of definitions of compatible uses of wetlands and parallel formulation of a system to determine worth of wetlands by means other than pure market value; and development of standards for control of sedimentation and soil erosion due to storm drainage from project sites.*

Several of these studies relate to matters on which the Basin Commission was urged by the University of Pennsylvania's report to take action or adopt policies.

An agreement is being formalized under which DRBC will rely on U. S. Environmental Protection Agency personnel for air quality responsibilities with respect to basin projects.

Formation of the unit was one of a series of actions relating to policy and organizational structure taken by DRBC that accommodate to the new federal environmental law and help shape the agency's future in ecological matters. These actions also included arranging for the review by the University of Pennsylvania and revision of Commission rules to require preparation of environmental impact statements on specified project categories.

Scene is of Delaware Valley looking upstream from Poxono Island, foreground, about eight miles above the Water Gap.

RIVER

I am born in the sky
The silent snow is my seed
In the season of the sun
My crystal blood runs
Over the earth
Gathering unto itself
Godspeed

Whispering in the beginning
I uncover brown and gold
Yellow, red and green
From under the whiteness of my mother
Until I have voice enough
To carry leaves
And roll little stones

Warmed by my father's touch
I gather the strength
By which I am to live
And hasten further away
To where I am abundant

In pools where garlands of grass and leaves have fallen
I have fishes and tiny miracles
Some drink of me
And I sustain them
Reflecting their image in my lifeblood
Like a swift mirror

I bear the colors of the sky for my banner
And make a path for the wind
And fog for the night
And mist for the morning's meadows
And rainbows when I soar in cataracts

I have ferns and rushes on my edges
Hardrock and towns
I eat away my earth-sides
And color myself in it
I rush and roll and roar
In white plumed manes
Like a fierce stallion
And sing and glide
In greens and blues
And run the deep silence
To meet my brothers and sisters

We blend our bloods and soils
And fishes and voices
To carry boats and big logs
Our strength is harnessed
And we are painted and photographed
Marvelled at and swam in
And given a name

We flow over dams and under bridges
You pour honey and oil and sewage
Steel and dust and paper into us

Spent and sullied
Slowly we go on down
To be lost in the sea

...Mason Williams