US Army Corps
of Engineers

Water Resources Development in Pennsylvania 1995

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Water Resources Development in

PENNSYLVANIA

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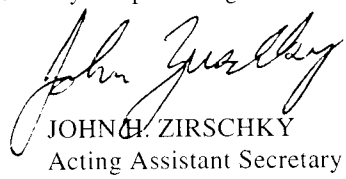
To Our Readers:

The U.S. Army Corps of Engineers has a long and proud history of applying its expertise in engineering and related disciplines to meet the Nation's needs. Over the years, its activities have evolved; however, since 1824, the central focus of its civil mission has been the development of the Nation's water resources. With an annual program of over $3 billion for civil projects, the Corps is the Federal Government's largest water resources development agency. The Corps develops projects that have proven to be wise investments. These projects have reduced flood damages; provided safe, low cost waterborne transportation; generated hydroelectric power; provided water for the public, industry and agriculture; offered opportunities for recreation; and helped the environment. They return to the public, benefits that far outweigh their costs.

Corps civil works activities reflect partnership. All Corps projects begin when non-federal interests see a water-related problem and petition Congress for a solution. Under provisions of the Water Resources Development Act of 1986, once the Corps conducts a reconnaissance study to determine whether a feasible project is likely, these sponsors provide a share of the funding for the feasibility study upon which a project will be based. They also provide a share of the cost of the project's design and construction once Congress has authorized the project and provided construction funds. During the period 1986-1994, non-federal sponsors signed 286 cooperative agreements with the Department of the Army for cost sharing of project construction.

The Corps engineering expertise and responsiveness has stood the Nation in good stead during times of natural disaster. During 1994, the Corps continued to rehabilitate levees damaged by the Midwest Flood of 1993 and responded to the Northridge, California Earthquake and the floods that ravaged the Southeast.

Whatever challenges arise in the decades ahead, I have no doubt that the Army Corps of Engineers will be equal to the task.



JOHN H. ZIRSCHKY
Acting Assistant Secretary of the Army
(Civil Works)

US Army Corps
of Engineers

To Our Readers:

The U.S. Army Corps of Engineers was founded some 220 years ago to be responsive to the needs of a young nation. While the nature of our work has changed with time, our basic purpose remains to be responsive to America's needs.

Clearly, the nation's concern for the environment has permeated the Corps. Under the National Environmental Policy Act, environmental considerations are part of the planning of every Corps project; and under the Water Resources Development Act of 1990, environmental stewardship was made a primary Corps mission along with navigation and flood control.

Response to natural disasters offers opportunities for some of the most direct Corps assistance to local communities. From flood fighting, recovery and levee rehabilitation in response to the Midwest Flood of 1993, to emergency water, electrical power, construction and building inspections after the Northridge Earthquake, Corps people have shown courage, commitment and tenacity.

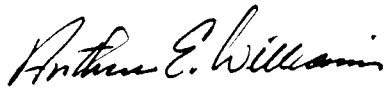
We have continued to enhance our responsiveness to customer needs. For example, the Corps achieved a major cultural shift by instituting a project management system, which assigns one manager to stay with a project from planning through design and construction and to serve as the single point of contact for that project. It has achieved greater accountability to our non-federal partners and, ultimately, projects which better reflect the needs of the community.

Partnering represents another positive shift in Corps business practices, particularly in civil works construction. A local sponsorship kit walks customers through the complexities of Corps projects. A technique related to partnering, alternative dispute resolution, creates an atmosphere in which the clash of differing viewpoints can transform into creative solutions and prevent costly legal disputes. Pioneered by the Corps, alternative dispute resolution is gaining acceptance throughout the federal government.

We are active participants in two major interagency efforts. The Interagency Flood Plain Management Review Committee is looking at ways the federal government can most effectively reduce the risk of flood damage and provide economic benefits and environmental enhancement in flood plains. The Interagency Working Group on the Dredging Process, meanwhile, is establishing better ways to handle the nearly 300 million cubic yards of soil the Corps moves each year from its navigation projects.

And, of course, we still respond to the needs of American families. As one of the nation's largest providers of outdoor recreation, the Corps welcomes citizens to its 461 lakes and other water resource projects. At 82 shore protection projects, the Corps has provided 226 miles of stable beaches. Recreation and natural resource management are responsibilities we take seriously, and we use the opportunity of a visit to a Corps project to help others appreciate our nation's valuable and delicate natural resources.

This booklet is one in a series detailing Corps of Engineers water resources programs and projects in the 50 states and U.S. territories. I hope you will find it interesting and feel some pride in ownership of the projects.



ARTHUR E. WILLIAMS
Lieutenant General, USA
Commanding

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Foreword

This booklet contains descriptive information on water resources development by the United States Army Corps of Engineers in the District of Columbia. The introduction explains the Corps' role in planning and building federal water projects. Information is given on project status, explaining whether the work is completed, is under way, or has not yet been started.

The civil works activities of the Corps of Engineers are organized by river basins, not state boundaries. Therefore, water resource projects of the Corps of Engineers in the District of Columbia are undertaken by the Baltimore District.

Additional information on projects and the responsibilities of the United States Army Corps of Engineers may be obtained from the offices listed on the title page.

Introduction

Civil Works Overview

Introduction

From 1775 to the present, the U.S. Army Corps of Engineers has served the nation in peace and war. The Corps traces its history to June, 1775, when the Continental Congress appointed Colonel Richard Gridley as Chief of Engineers of the Continental Army, under General George Washington. The original Corps was the Army's engineering and construction arm until it mustered out of service at the close of the Revolutionary War in 1783.

In 1802, Congress re-established the U.S. Military Academy at West Point, the country's first—and for 20 years its only—engineering school. With the Army having the nation's most readily available engineering talent, successive congresses and administrations established a role for the Corps as an organization to carry out both military construction and works "of a civil nature."

Throughout the nineteenth century, the Corps supervised the construction of coastal fortifications, lighthouses, several early railroads, and many of the public buildings in Washington, D.C. and elsewhere. Meanwhile, the Corps of Topographical Engineers, which enjoyed a separate existence for 25 years (1838-1863), mapped much of the American West. Army Engineers served with distinction in war, with many engineer officers rising to prominence during the Civil War.

In its civil role, the Corps of Engineers became increasingly involved with river and harbor improvements, carrying out its first harbor and jetty work in the first quarter of the nineteenth century. The Corps' ongoing responsibility for federal river and harbor improvements dates from 1824, when Congress passed two acts authorizing the Corps to survey roads and canals and to remove obstacles on the Ohio and Mississippi rivers. Over the years since, the expertise gained by the Corps in navigation projects led succeeding administrations and congresses to assign new water-related missions to the Corps in such areas as flood control, shore and hurricane protection, hydropower, recreation, water supply and quality, and wetland protection.

Today's Corps of Engineers carries out missions in three broad areas: military construction and engineering support to military installations; reimbursable support to other federal agencies (such as the Environmental Protection Agency's "Superfund" program to clean up hazardous and toxic waste sites); and the Civil Works mission, centered around navigation, flood control and—under the Water Resources Development Acts of 1986, 1988, 1990 and 1992—a growing role in environmental restoration.

Authorization and Planning of Water Resources Projects

Corps of Engineers water resources activities are normally initiated by non-federal sources, constructed by the Corps under the Civil Works Program, and operated and maintained either by the Corps or by a non-federal sponsoring agency.

The Water Resources Development Act of 1986 made numerous changes in the way potential new water resources projects are studied, evaluated and funded. The major change is that the law now specifies greater non-federal cost sharing for most Corps water resources projects.

When local interests feel that a need exists for improved navigation, flood protection or other water resources development, they may petition their representatives in Congress. A congressional committee resolution or an act of Congress may then authorize the Corps of Engineers to investigate the problem and submit a report. Water resources studies, except studies of the inland waterway navigation system, are conducted in partnership with a non-federal sponsor, with the Corps and the sponsor jointly funding and managing the study.

For inland navigation and waterway projects, which are by their nature not "local," Congress, in the Water Resources Development Act of 1986, established an Inland Waterway Users Board, comprised of waterway transportation companies and shippers of major commodities. This board advises the Secretary of the Army and makes recommendations on priorities for new navigation projects such as locks and dams. Such projects are funded in part from the Inland Waterway Trust Fund, which in turn is funded by waterway fuel taxes.

Normally, the planning process for a water resource problem starts with a brief reconnaissance study to determine whether a project falls within the Corps' statutory authority and meets national priorities. Should that be the case, the Corps district where the project is located will carry out a full feasibility study to develop alternatives and select the best possible solution. This process normally includes public meetings to determine the views of local interests on the extent and type of improvements desired. The federal, state, and other agencies with interests in a project are partners in the planning process.

In making recommendations to Congress for project authorization, the Corps determines that the proposed project's benefits will exceed costs, its engineering design is sound, the project best serves the needs of the people concerned, and that it makes the wisest possible use of the natural resources involved and adequately protects the environment.

Once the Corps of Engineers district completes its feasibility study, it submits a report, along with a final environmental impact statement, to a higher authority for review and recommendations. After review and coordination with all interested federal agencies and the governors of affected states, the Chief of Engineers forwards the report and environmental statement to the Secretary of the Army, who obtains the views of the Office of Management and Budget before transmitting these documents to Congress.

If Congress includes the project in an authorization bill, enactment of the bill constitutes authorization of the project. Before construction can get under way, however, both the federal government and the project sponsor must provide funds. A federal budget recommendation for a project is based on evidence of support by the state and the ability and willingness of a non-federal sponsor to provide its share of the project cost.

Appropriation of money to build a particular project is usually included in the annual Energy and Water Development Appropriation Act, which must be passed by both Houses of the Congress and signed by the President.

Navigation

Corps of Engineers involvement in navigation projects dates to the early days of the United States, when rivers and coastal harbors were the primary paths of commerce in the new country. Without its great rivers, the vast, thickly-forested, region west of the Appalachians would have remained impenetrable to all but the most resourceful early pioneers. Consequently, western politicians such as Henry Clay agitated for federal assistance to improve rivers. At the same time, the War of 1812 showed the importance of a reliable inland navigation system to national defense.

There was, however, a question as to whether transportation was, under the Constitution, a legitimate federal activity. This question was resolved when the Supreme Court ruled that the Commerce Clause of the Constitution granted the federal government the authority, not only to regulate navigation and commerce, but also to make necessary navigation improvements.

The system of harbors and inland waterways maintained by the Corps of Engineers remains one of the most important parts of the nation's transportation system. The Corps maintains the nation's waterways as a safe, reliable and economically efficient navigation system. The 12,000 miles of inland waterways maintained by the Corps carry one-sixth of the nation's inter-city cargo. The importance of the Corps mission in maintaining depths at more than 500 harbors, meanwhile, is underscored by an estimated one job in five in the United States being dependent, to some extent, on the commerce handled by these ports.

Flood Control and Flood Plain Management

Federal interest in flood control began in the alluvial valley of the Mississippi River in the mid-19th century. As the relationship of flood control and navigation became apparent, Congress called on the Corps of Engineers to use its navigational expertise to devise solutions to flooding problems along the river.

After a series of disastrous floods affecting wide areas in the 1920s and 30s, Congress determined, in the Flood Control Act of 1936, that the federal government would participate in the solution of flooding problems affecting the public interest that were too large or complex to be handled by states or localities. Corps authority for flood control work was thus extended to embrace the entire country. The Corps turns most of the flood control projects it builds over to non-federal authorities for operation and maintenance once construction is completed.

The purpose of flood control work is to prevent damage through regulation of the flow of water and other means. Prevention of flood-related damages can be accomplished with structural measures, such as reservoirs, levees, channels and flood walls that modify the characteristics of floods; or non-structural measures, such as flood plain evacuation, floodproofing and floodway acquisition, that alter the way people use these areas and reduce the susceptibility of human activities to flood risk.

Corps flood control reservoirs are often designed and built for multiple-purpose uses, such as municipal and industrial water supply, navigation, irrigation, hydroelectric power, conservation of fish and wildlife, and recreation.

The Corps fights the nation's flood problems not only by constructing and maintaining structures, but also by providing detailed technical information on flood hazards. Under the Flood Plain Management Services Program, the Corps provides, on request, flood hazard information, technical assistance and planning guidance to other federal agencies, states, local governments and private citizens. Once community officials know the flood-prone areas in their communities and how often floods would be likely to occur, they can take necessary action to prevent or minimize damages to existing and to new buildings and facilities, such as adopting and enforcing zoning ordinances, building codes, and subdivision regulations. The Flood Plain Management Services Program provides assistance to other federal and state agencies in the same manner.

Planning Assistance to States

Every year the Corps of Engineers provides planning assistance to individual states under the authority of the Water Resources Development Act of 1974. The act provides authority for the Corps to assist states in preparing comprehensive plans for development, use and conservation of water and related land resources.

Each state gives the Corps its request for studies under the program and the Corps accommodates as many studies as possible. Study ideas are often prompted by individual requests made through state personnel based on local identification of problems. These problems may foster studies on water supply, water quality, water conservation, hydropower development, flood control, erosion and navigation.

Typical studies are conducted at reconnaissance level of detail. They involve the analysis of existing data for planning purposes using standard engineering techniques. Most studies become the basis for state and local planning decisions.

Individual studies which may be more than one per year per state generally cost upwards of $25,000 to $100,000. In the past, the studies were performed totally at federal expense. Since fiscal year 1991, states have been requested to contribute a local share of the study costs.

Shore and Hurricane Protection

Corps work in shore protection began in 1930, when

Congress directed the Corps to study ways to reduce erosion along U.S. seacoasts and the Great Lakes. Hurricane protection work was added to the erosion control mission in 1955, when Congress directed the Corps to conduct investigations along the Atlantic and Gulf Coasts to identify problem areas and determine the feasibility of protection.

While each situation the Corps studies involves different considerations, Corps engineers always consider engineering feasibility and economic efficiency along with the environmental and social impacts. Federal participation in a shore protection project varies, depending on shore ownership, use and type and frequency of benefits. (If there is no public use or benefit, the Corps will not recommend federal participation.) Once the project is complete, non-federal interests assume responsibility for its operation and maintenance.

One shore protection method popular in seaside communities is beach nourishment—the periodic replenishment of sand along the shoreline to replace that lost to storms and erosion. Authorized nourishment projects usually have a nourishment period of 50 years. In addition, Section 145 of the Water Resources Development Act of 1976 authorizes placement of beach quality sand from Corps dredging projects on nearby beaches. Under Section 933 of the Water Resources Development Act of 1986, local sponsors pay the federal government 50 percent of the additional costs of this placement of sand.

Hydropower

The Corps has played a significant role in meeting the nation's electric power generation needs by building and operating hydropower plants in connection with its large multiple-purpose dams. The Corps' involvement in hydropower generation began with the River and Harbors acts of 1890 and 1899, which required the Secretary of War and the Corps of Engineers to approve the sites and plans for all dams and to issue permits for their construction. The Rivers and Harbors Act of 1909 directed the Corps to consider various water uses, including water power, when submitting preliminary reports on potential projects.

The Corps continues to consider the potential for hydroelectric power development during the planning process for all water resources projects involving dams and reservoirs. In most instances today, it is non-federal interests who develop hydropower facilities at Corps projects without federal assistance. The Corps, however, can plan, build and operate hydropower projects when it is impractical for non-federal interests to do so. Today, the more than 20,000 megawatts of capacity at Corps-operated power plants provide approximately 30 percent of the nation's hydroelectric power, or three percent of its total electric energy supply.

Water Supply

Corps involvement in water supply dates back to 1853, when it began building the Washington Aqueduct, which provides water to the nation's capital city and some of its suburbs to this day.

Elsewhere in the nation, the Water Supply Act of 1958 authorized the Corps to provide additional storage in its reservoirs for municipal and industrial water supply at the request of local interests, who must agree to pay the cost. The Corps also supplies water for irrigation, under terms of the Flood Control Act of 1944. This act provided that the Secretary of War, upon the recommendation of the Secretary of the Interior, could allow use of Corps reservoirs for irrigation, provided that users agree to repay the government for the water.

Recreation

The Flood Control Act of 1944, the Federal Water Project Recreation Act of 1965, and language in specific project authorization acts authorize the Corps to construct, maintain, and operate public park and recreational facilities at its projects, and to permit others to build, maintain, and operate such facilities. The water areas of Corps projects are open to public use for boating, fishing, and other recreational purposes.

The Corps of Engineers today is one of the federal government's largest providers of outdoor recreational opportunities, operating more than 2,000 sites at its lakes and other water resource projects. More than 600 million visits per year are recorded at these sites. State and local park authorities and private interests operate nearly 2,000 other areas at Corps projects.

Environmental Quality

The Corps carries out the Civil Works Programs in consistency with many environmental laws, executive orders and regulations. Perhaps primary among these is the National Environmental Policy Act (NEPA) of 1969. This law requires federal agencies to study and consider the environmental impacts of their proposed actions. Consideration of the environmental impact of a Corps project begins in the early stages, and continues through design, construction and operation of the project. The Corps must also comply with these environmental laws and regulations in conducting its regulatory programs.

NEPA procedures ensure that public officials and private citizens may obtain and provide environmental information before federal agencies make decisions concerning the environment. In selecting alternative project designs, the Corps strives to choose options with minimum environmental impact.

The Water Resources Development Act of 1986 authorizes the Corps to propose modifications of its existing projects—many of them built before current environmental requirements were in effect—for environmental improvement. Proposals the Corps has made under this authority range from use of dredged material to create nesting sites for waterfowl to modification of water control structures to improve downstream water quality for fish.

In recent years the Corps of Engineers has planned and recommended environmental restoration actions at federal projects to restore environmental conditions.

Regulatory Programs

The Corps of Engineers regulates construction and other work in navigable waterways under Section 10 of the Rivers and Harbors Act of 1899, and has authority over the discharge of dredged or fill material into the "waters of the United States"—a term which includes wetlands and all other aquatic areas—under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500, the "Clean Water Act"). Under these laws, those who seek to carry out such work must first receive a permit from the Corps.

The "Section 404" program is the principal way by which the federal government protects wetlands and other aquatic environments. The program's goal is to ensure protection of the aquatic environment while allowing for sustainable economic development.

The individual permit evaluation process includes a public notice and a public comment period. Applications for complex projects may also require a public hearing before the Corps makes a permit decision. In its evaluation of applications, the Corps is required by law to consider all factors involving public interest. These may include economics, environmental concerns, historical values, fish and wildlife, aesthetics, flood damage prevention, land use classifications, navigation, recreation, water supply, water quality, energy needs, food production and the general welfare of the public.

The Corps of Engineers has issued a number of nationwide general permits, mostly for minor activities which have little or no environmental impact. Individual Corps districts have also issued regional general permits for certain types of minor work in specific areas. Individuals who propose work that falls under one of these general permits need not go through the individual permit process. The Baltimore District has also issued a State Program General Permit. This permit allows applicants to do work for which they have received a permit under the state program. General permits reduce delays and paperwork for applicants and allow the Corps to devote its resources to the most significant cases while maintaining the environmental safeguards of the Clean Water Act.

Emergency Response and Recovery

The Corps provides emergency response to natural disasters under Public Law 84-99, which covers flood control and coastal emergencies. It also provides emergency support to other agencies, particularly the Federal Emergency Management Agency (FEMA), under Public Law 92-288 (the Stafford Act) as amended.

Under PL 84-99, the Chief of Engineers, acting for the Secretary of the Army, is authorized to carry out disaster preparedness work; advance measures; emergency operations such as flood fighting, rescue and emergency relief activities; rehabilitation of flood control works threatened or destroyed by flood; and protection or repair of federally authorized shore protection works threatened or damaged by coastal storms. This act also authorizes the Corps to provide emergency supplies of clean water in cases of drought or contaminated water supply. After the immediate flooding has passed, the Corps may provide temporary construction and repairs to essential public utilities and facilities and emergency access for a 10-day period, at the request of the governor.

Under the Stafford Act and the Federal Response Plan, the Corps of Engineers has a standing mission assignment to provide public works and engineering support in response to a major disaster or catastrophic earthquake. Under this plan, the Corps will work directly with state authorities in providing temporary repair and construction of roads, bridges, and utilities, temporary shelter, debris removal and demolition, water supply, etc. The Corps also provides support to other government agencies in accomplishing their missions under the Federal Response Plan. The Corps is one of the federal agencies tasked by FEMA to provide engineering, design, construction and contract management in support of recovery operations.

Chapter 1

Ohio River Basin

The Ohio River Basin has a drainage area of 204,000 square miles extending over parts of 14 states in the mid-eastern United States and includes the Allegheny and Monongahela river sub-basins. The topography varies from rugged mountains to flat plains. The rugged terrain of the Appalachian Mountains dominates the eastern portion of the basin. West of the Appalachian Mountains and south of the Ohio River, considerable local relief gradually modifies to rolling plains through central and western Kentucky and Tennessee. There are broad valleys with minor relief in central and southwestern Ohio, central and southern Indiana and southeastern Illinois, north of the Ohio River.

The basin's climate is temperate. Summers are warm and humid, and winters range from moderately cold in the southwest to severe in the extreme northeast. Precipitation averages about 45 inches annually and is usually greatest in June and July and least in October. Runoff varies over the year, but flood flows may occur during any season. Major basinwide flood flows have generally occurred between January and March, but maximum runoff from small drainage areas has often resulted from intense thunderstorms during the spring and summer. Often during late summer and early fall, streamflow from precipitation runoff is negligible .

The system of reservoirs and local protection projects throughout the basin significantly reduces average annual flood damages. During extreme low flow periods, the reservoirs have the capability of augmenting the flow in the Ohio River by as much as 50 percent and even higher in the upper portion of the river. Storage is also available in some projects for water supply. The Corps has 914,000 kilowatts of hydroelectric generating capacity in operation, with private power companies producing additional kilowatts at several projects by license agreements administered by the Federal Energy Regulatory Commission. Commercial navigation on canalized basin streams amounts to about one quarter of the inland waterway freight tonnage in the United States. Water surfaces and adjacent developed project lands attract millions of recreation visitors each year.

The upper 40 miles of the Ohio River in Pennsylvania afford direct access for shipment and receipt of commodities over the extensive inland navigation system, as well as connection with the Great Lakes system and the Gulf Intercoastal Waterway. The Ohio River is also an important part of the Mississippi River navigation system.

Waterborne traffic on the Ohio River has grown from 22 million tons in 1930 to 202 million tons in 1989. The annual ton-mile figure totalled 56.5 billion in 1989. Two-thirds of the freight traffic are bulk forms of energy: coal, crude oil and petroleum products. Other major commodities transported are sand and gravel, iron and steel, chemicals and grain. The average annual traffic on the Ohio River for the five year period ending in 1989 (the latest available data) was 193 million tons.

The Ohio River is also a 981 mile-long series of recreational pools. These stable bodies of water above the dams have substantial private shorefront recreational development. The Corps' projects provide ample recreational opportunities for the public. Over 100 million visitor-days were logged at the 124 lakes and navigation pools operated and maintained by the Corps during 1989.

Most of western Pennsylvania is in the Ohio River Basin. In this part of Pennsylvania there are multi-purpose projects which have been completed and others are authorized but not started; local protection projects completed and under way; and navigation structures completed and under construction. Most benefits generated by the completed projects are in Pennsylvania. The multi-purpose projects, however, have beneficial effects on areas downstream along the Ohio River in other states. There are also completed projects in other parts of the basin which provide benefits to areas within Pennsylvania.

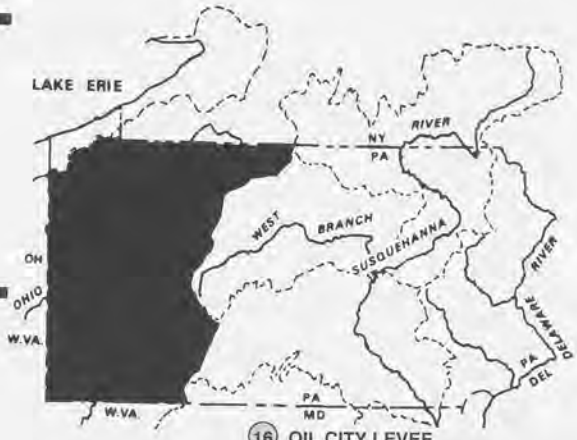
The Ohio River flows 981 miles from the junction of the Allegheny and Monongahela rivers at Pittsburgh, PA to the Mississippi River near Cairo, IL. The entire river has been improved by the construction of locks and dams to provide a channel depth of 9 feet and by open-channel work to remove obstructions and assure adequate channel widths.

The Ohio River navigation project began in 1825 with channel improvements, followed in 1830 by a canal with a set of three locks to pass the "Falls of the Ohio" at Louisville, KY. Until 1885, when a dam with a lock was built near Pittsburgh, river improvements consisted of clearing wrecks and snags, channel dredging and building training dikes and jetties.

Because the Ohio River was usually too shallow for navigation during the summer and fall, Congress authorized the construction of a series of locks and dams. Twelve were built before 1910, and canalization of the river was completed in 1929. By then, 50 lock and dam structures had been built to assure year-round depths of 9 feet from the Mississippi River to Pittsburgh. The dams were made with wooden wickets that were raised to hold back water during periods of low flow and dropped to the river bottom during high water, permitting open-river navigation without locking. With a few exceptions, the dams were of the movable type, with a navigable pass varying from 600 to 1,248 feet and having one or more regulating weirs. At each dam, a lock with usable dimensions of 110 by 600 feet was provided. By 1937, the Montgomery and Gallipolis projects were in operation, reducing the system to 46 locks and dams that were used for years.

To gain efficiency, meet new needs and permit additional growth, a replacement and modernization program was initiated in the early 1950's. As now planned, the Ohio River project will eventually have non-navigable gated dams, each with dual-lock chambers and at least one 1,200-foot long and 110-foot wide lock. The dams are generally higher so that two or three of the older structures can be eliminated with a larger lock serving the same reach enabling tows to travel longer distances between lockages. To provide for powerful, modern tow boats, a 300-foot wide minimum-width channel is now maintained on the Ohio. Since the modernization program began in 1955, the number of dams in operation has been

The Ohio River Basin



1 UNION CITY RESERVOIR
2 KINZUA DAM & ALLEGHENY RESERVOIR
3 WOODCOCK CREEK LAKE
4 EAST BRANCH CLARION RIVER LAKE
5 TIONESTA LAKE
6 SHENANGO RIVER LAKE
7 MAHONING CREEK LAKE
8 CROOKED CREEK LAKE
9 CONEMAUGH RIVER LAKE
10 LOYALHANNA LAKE
11 YOUGHIOGHENY RIVER LAKE

(1) BRADFORD CHANNEL
(2) JOHNSONBURG LEVEE & CHANNEL
(3) RIDGWAY CHANNEL
(4) BROOKVILLE CHANNEL
(5) REYNOLDSVILLE CHANNEL
(6) BIG RUN CHANNEL
(7) PUNXSUTAWNEY CHANNEL & LEVEE
(8) BUTLER CHANNEL
(9) KITTANNING FLOODWALL
(10) TURTLE CREEK CHANNEL
(11) LATROBE CHANNEL
(12) JOHNSTOWN CHANNEL
(13) WASHINGTON CHANNEL
(14) DUBOIS CHANNEL
(15) ETNA CHANNEL
(16) OIL CITY LEVEE
(17) SYKESVILLE CHANNEL
(18) TARENTUM CHANNEL
(19) WILMORE CHANNEL & LEVEE
(20) BURGETTSTOWN CHANNEL
(21) SLOVAN CHANNEL
(22) GRANVILLE CHANNEL
(23) MARIANNA CHANNEL
(24) OIL CITY ICE CONTROL PROJECT

△1 BRADFORD
△2 ELDRED
△3 COCHRANTON
△7 ETNA
△12 FAIRBANK
△12 PORTAGE

OHIO RIVER NAVIGATION PROJECTS
T_1 EMSWORTH L/D
T_2 DASHIELDS L/D
T_3 MONTGOMERY L/D

ALLEGHENY RIVER NAVIGATION PROJECTS
T_4 L/D 2
T_5 L/D 3
T_6 L/D 4
T_7 L/D 5
T_8 L/D 6
T_9 L/D 7
T_{10} L/D 8
T_{11} L/D 9

MONONGAHELA RIVER NAVIGATION PROJECTS
T_{12} L/D 2
T_{13} L/D 3
T_{14} L/D 4
T_{15} MAXWELL L/D
T_{16} L/D 7
T_{17} POINT MARION L/D
T_{18} GRAYS LANDING L/D

(1) GIRTYS RUN, MILLVALE, PA
(2) JAMES G. FULTON FLOOD PROTECTION PROJECT
(3) CANONSBURG-HOUSTON CHANNEL
(4) TURTLE CREEK LOCAL PROTECTION PROJECT REPAIR AND RESTORATION
(5) SAW MILL RUN
[1] GRAYS LANDING L/D
[2] POINT MARION LOCK

LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	[1]	[1]	[1]	[1]
LOCAL PROTECTION	(1)	(1)	(1)	(1)
OTHER IMPROVEMENTS	△1	△1	△1	△1

reduced from 46 to 21. The Pittsburgh District now has six modern locks and dams on the Ohio River. The last of the 14 wicket dams in the district was removed from the river in 1975 upon the completion of the Hanibal Locks and Dam in Ohio.

The cost for the Ohio River navigation project was $1.394 billion.

Descriptions of all Corps projects in the Ohio River Basin in Pennsylvania follow.

Projects Completed

NAVIGATION

Ohio River, Pennsylvania

Lock and Dam 1, commonly called Davis Island Lock and Dam, at mile 4.7, was built 1877-1885. It was the first lock and dam built on the Ohio River and the first movable dam in the United States. It, together with Lock and Dam 2, built 1898-1906, mile 9.0, was replaced by Emsworth Locks and Dams in 1921. Lock and Dam 3, built 1899-1907, at mile 10.9, was replaced by Dashields Locks and Dam in 1929. Locks and Dams 4, 5, and 6, built 1892-1908, at miles 18.6, 24.1, and 29.3, respectively, were replaced by Montgomery Locks and Dam in 1936. The Emsworth Dams were reconstructed 1935-1938, raising Emsworth Pool by 7 feet. Locks and Dams 7, 8 and 9, built 1904-1914, at miles 36.5, 46.1, and 56.1, respectively, were replaced by New Cumberland Locks and Dam in 1959. Major rehabilitation of the Emsworth Locks and Dams was completed in 1984. The rehabilitation of Montgomery Locks and Dam was initiated in 1983 and the primary contract completed in February 1989; total cost through January 1990 was $24.2 million. The rehabilitation of Dashields Locks and Dam began in 1987 and completed in December 1990 at a total cost of $27.3 million.

Locks and Dams	River Mile	Upper Pool Elevation	Crest of Dam	Built	Placed in Operation
Emsworth, PA	6.2	710.0	Gated	1919-1922	Sep. 1921
Dashields, PA	13.3	692.0	Fixed	1927-1929	Aug. 1929
Montgomery, PA	31.7	682.0	Gated	1932-1936	Jun. 1936
New Cumberland, OH	54.4	664.5	Gated	1955-1963	Nov. 1959
Pike Island, W. VA	84.3	644.0	Gated	1959-1965	Nov. 1963
*Hannibal, OH	126.4	623.0	Gated	1966-1975	Jul. 1975

*Non-federal add-on hydropower

Allegheny River, Pennsylvania

The projects for the Allegheny River provide for improvement of the river by means of navigation locks and dams for a distance of 72 miles from its mouth at Pittsburgh to East Brady, PA. Federal interest in the river began in 1879 with the authorization of open channel improvements by the removal of boulders and snags and the construction of low-diversion dams and dikes to facilitate rafting. When the last unit of the authorized projects was completed in 1938, the Allegheny River was improved by eight locks and dams. The locks have single chambers, 56 feet wide and 360 feet long; the controlling navigable depth is 9 feet. The dams are the fixed-crest type with lifts between pools varying from 10.5 to 22 feet. Waterborne traffic consists of coal, coke, sand and gravel, iron and steel, petroleum products and miscellaneous commodities. The cost was $18,157,860. Average annual traffic from 1989 to 1993 was 3.3 million tons. The reported traffic for 1993 was 3.1 million tons.

The annual ton-mile figure for 1993 was 47,313,875. Non-federal hydropower projects were completed at L/D's 5 and 6 in 1988 and L/D's 8 and 9 in 1990. The installed generating capacities at L/D's 5, 6, 8 and 9 are 9.5 MW, 7.5 MW, 13.6 MW and 18.0 MW, respectively.

Locks and Dams	River Mile	Upper Pool Elevation	Crest of Dam	Built	Placed in Operation
2**	6.7	721.0	Fixed	1932-1934	Oct. 1934
3	14.5	734.8	Fixed	1932-1934	Oct. 1934
4	24.2	745.4	Fixed	1920-1927	Sep. 1927
5*	30.4	757.0	Fixed	1920-1927	Oct. 1927
6*	36.3	769.4	Fixed	1927-1928	Oct. 1928
7	45.7	782.4	Fixed	1928-1931	Nov. 1930
8***	52.6	800.2	Fixed	1929-1931	May 1931
9***	62.2	822.2	Fixed	1935-1938	Oct. 1938

*Non-federal add-on hydropower completed in 1988.
**L/D1 was removed when the Emsworth Dams at the head of the Ohio River were reconstructed and the pool raised in 1935-1938.
***Non-federal add-on hydropower completed in 1990.

Lock and Dam 5, Allegheny River.

The new lock project under construction at Point Marion Lock and Dam, Monongahela River.

Lock and Dam 6, Allegheny River. In the foreground is the hydropower facility.

Maxwell Locks and Dam, Monongahela River.

Monongahela River, Pennsylvania and West Virginia

The project for the Monongahela River provides for navigation throughout its entire 129-mile length, from Pittsburgh, PA to Fairmont, W. Va., through a system of locks and dams, which provide a minimum navigable depth of 9 feet. Federal interest began in 1872 with the construction of two locks and dams on the upper river and was renewed in 1896 with authorization for the acquisition of the original seven locks and dams constructed on the lower river by the Monongahela Navigation Company. The Monongahela system now consists of locks and dams as shown in the table below.

Locks and Dams 2 through Point Marion Lock and Dam are in Pennsylvania, with the remainder in West Virginia. Reconstruction of Locks 2 was completed in 1953. Morgantown Lock and Dam was completed in 1950, Hildebrand Lock and Dam in 1960, Maxwell Locks and Dam in 1965 and Opekiska Lock and Dam in 1967. Lock and Dam 8 was renamed the Point Marion Lock and Dam.

Two new navigation projects—Grays Landing Lock and Dam and Point Marion Lock, 82 miles and 90.8 miles above Pittsburgh, respectively—are being constructed on the Monongahela River. Grays Landing, which will replace Lock and Dam 7, will be completed in March 1995 at an estimated cost of $171.8 million. Point Marion lock was completed and opened to navigation in December 1993.

Lock chambers, with lifts from 8.2 to 22.0 feet, are designed to accommodate multiples of the standard Monongahela River-type coal barge, which is 175 feet by 26 feet. Waterborne traffic generally consists of coal, coke, sand and gravel, iron, steel, and petroleum products, with minor amounts of other commodities. Average annual traffic for the 5-year period ending in 1993 was 36.1 million tons. The reported traffic for 1993 was 33,072,236 tons and 1.33 billion ton-miles. Further discussion of the replacement program appears elsewhere in this pamphlet (See "Navigation Projects Under Way.")

Locks and Dams	River Mile	Upper Pool Elevation	Crest of Dam	Built	Placed in Operation
2***	11.2	718.7	Fixed	1904-1905	Aug. 1905
3****	23.8	726.9	Fixed	1905-1907	May 1907
4***	41.5	743.5	Gated	1931-1932	Aug. 1932
Maxwell, PA	61.2	763.0	Gated	1960-1965	May 1964
Grays Landing, PA*	82.0				
7	85.0	778.0	Fixed	1923-1926	Nov. 1925
Point Marion, PA**	90.8	797.0	Gated	1923-1926	Oct. 1925
Morgantown, W. VA	102.0	814.0	Gated	1948-1950	Jul. 1950
Hildebrand, W. VA	108.0	835.0	Gated	1956-1960	Jun. 1959
Opekiska, W. VA	115.4	857.0	Gated	1961-1967	Aug. 1964

*Now under construction. It will replace Lock and Dam 7 when completed in 1995.
**New Point Marion Lock opened in December 1993.
***To be replaced
****To be removed.

Kinzua Dam and Allegheny Reservoir.

FLOOD CONTROL

Kinzua Dam and Allegheny Reservoir, New York and Pennsylvania

Kinzua Dam and Allegheny Reservoir are located on the Allegheny River in Warren and McKean counties, PA and Cattaraugus County, NY. The dam is an earth and concrete gravity structure with a gated spillway 179 feet high above the streambed. It has a drainage area of 2,180 square miles and provides 1,180,000 acre-feet of gross storage. The reservoir is a multi-purpose project for flood control and low-flow augmentation with secondary benefits accruing from recreation and privately developed and operated hydroelectric power. The operational objectives of the project are control and improvement of water quantity and quality for downstream communities. This is a complex problem requiring a coordinated effort with other flood control dams and constant monitoring with analysis of hydrologic conditions within the Allegheny and Upper Ohio River basins.

Under a license granted by the Federal Energy Regulatory Commission, private power companies have constructed a pumped storage project to utilize water behind the dam for the generation of electric power.

This project involves pumping water from the Allegheny Reservoir to a secondary reservoir atop the hill on the left bank during periods of low-power demand. Later, the stored water is used to generate power at peak demand periods. The total generating capacity is 422,100 kilowatts.

Construction of a fish hatchery complex just downstream of the dam on the right bank was started in August 1972 by the Department of the Interior, Fish and Wildlife Service. The facility was placed in operation in the spring of 1978 and completed in fiscal year 1979.

Construction of the Kinzua Dam and Allegheny Reservoir Project was started in February 1960 and it was placed in operation in 1966. Recreational visitation for 1993 was 330,400. Flood damages prevented are estimated at $351,040,000 through fiscal year 1994.

Bradford

The city of Bradford is located in McKean County on Tunungwant Creek and its East and West Branches. The project includes 5.8 miles of channel improvement, a downstream transition reach and improvements of the lower reaches of main stream tributaries. The plan of improvement provides increased channel capacity by deepening, widening and lining, and construction of cutoffs in the existing channels. The extent of the plan involves improvements for Tunungwant Creek, East Branch, West Branch and adjustments of the mouths and lower reaches of Foster Brook, Bolivar Run and Kendall Creek. The community is protected against discharges substantially greater than those which occurred in the flood of April 1947, the maximum flood of record. The lowermost 1.8 miles of the improvement was completed in 1952 by the joint action of the Commonwealth of Pennsylvania and the

Bradford District Flood Control Authority. The channel improvement by the Corps of Engineers extends upstream from this reach on the Tunungwant Creek and its two branches for a distance of approximately 36,200 feet. The project was completed in 1961. The federal and estimated non-federal costs of the project are $7,602,000 and $1,895,000, respectively. Flood damages prevented are estimated at $10,260,000 through fiscal year 1994.

Brookville

The borough of Brookville is in Jefferson County on North Fork, Sandy Lick and Redbank creeks. The project consists of channel improvements extending about 1,900 and 7,100 feet above the mouths of North Fork and Sandy Lick Creeks respectively, and about 7,800 feet below the head of Redbank Creek; with a pilot channel extending about 15,000 feet below the major works on Redbank Creek. The plan of improvement provides increased channel capacity by widening and deepening the channels, by affording more uniform channel sections and by straightening channel alignments. The community is protected against discharges equal to the March 18, 1936 flood. The project was completed in 1962 at a federal cost of $964,976 and an estimated non-federal cost of $289,000. Flood damages which have been prevented are estimated at $20,009,000 through fiscal year 1994.

Butler

The city of Butler is located on Connoquenessing Creek in Butler County. The project protects the city from flooding due to inadequate channels clogged with deposits of industrial and miscellaneous debris. The protection facilities consist mainly of major channel improvements, including a cutoff, through and below the city. The improved channel will carry a flood discharge of 6,500 cubic feet per second within banks, and will reduce damages to a nominal amount. The project was completed in 1966 at a federal cost of $1,556,181 and an estimated non-federal cost of $534,000. Flood damages prevented are estimated at $7,337,000 through fiscal year 1994.

Chartiers Creek, Carnegie-Bridgeville

The James G. Fulton Flood Protection Project consists of major channel improvements on Chartiers Creek in the vicinity of Carnegie, Heidelberg and Bridgeville in Allegheny County. The project provides flood protection by widening, deepening and realigning the old channel and includes a major cutoff channel and other appurtenant work. Protection against the maximum flood of record (1912) extends for 13.4 miles along Chartiers Creek. Constructed in five separate units, or phases, the first unit was started in July 1968 and the last unit was completed in July 1981. The estimated federal and non-federal costs are $32,750,000 and $9,100,000 respectively. Total flood damages prevented in these communities through September 1989 are estimated at $16,519,000.

Conemaugh River Lake.

Conemaugh River Lake

Conemaugh River Lake is located on the Conemaugh River, a major tributary in the Allegheny River Basin, in Westmoreland and Indiana counties. The dam site is 7.5 miles above the junction of the Conemaugh River and Loyalhanna Creek at Saltsburg. It is a concrete gravity structure, 137 feet above the streambed, with a gate-controlled center spillway flanked by abutment sections at the valley sides and supplemented on the right abutment by an earth dike closure. A non-federal hydropower plant, with a total generating capacity of 15,000 kilowatts, was completed in 1989. The reservoir controls a drainage area of 1,351 square miles and provides 270,000 acre-feet of usable storage, all of which is utilized for flood control. This project is operated and maintained as part of the coordinated reservoir system for flood control in the Allegheny and Ohio River Valleys as well as the lower Conemaugh and Kiskiminetas River Valleys. The reservoir system was designed to substantially reduce flood stages on the upper Ohio River and to contribute to the reduction of flood stages on the lower Ohio River and below. The dam has been in operation since the latter part of 1953. The cost was $46,012,411. Flood damages prevented are estimated at $582,158,000 through fiscal year 1994. In 1993, the recreational facilities were used by 129,800 visitors.

Crooked Creek Lake

Crooked Creek Lake is in Armstrong County near the mouth of Crooked Creek, a tributary of the Allegheny River. The dam is an earthfill structure, 143 feet high, with an ungated saddle spillway. It controls a drainage area of 277 square miles and provides 89,400 acre-feet of flood control storage. A recreation lake of 350 acres is provided during the summer months. This project is operated and maintained as a unit of the

coordinated reservoir system for flood control in the Allegheny and the Ohio River valleys. The dam has been in operation since 1940. The cost was $4,431,523. Recreation facilities were developed by the commonwealth of Pennsylvania, but in 1981 all commonwealth-leased areas were returned to the Corps of Engineers for operation and maintenance. Flood damages prevented are estimated at $130,181,000 through fiscal year 1994. Recreational visitation for 1993 was 423,600.

DuBois Channel, DuBois

A major channel improvement on Sandy Lick Creek at DuBois in Clearfield County was authorized by the Flood Control Act of 1960. The project authorized was in accordance with the plan recommended in House Document 185, 89th Congress. Construction of a McCracken Run diversion channel is provided for flood protection in the Beaver Meadow area along Beaver Run. Improvement of Sandy Lick Creek is provided by channel enlargement, realignment and appurtenant facilities. The Sandy Lick Creek improvement extends from the Larkeytown Bridge upstream for about 3.9 miles through DuBois to about 350 feet upstream of the Shaffer-Oklahoma Road Bridge. A pilot channel is provided for about 0.8 mile below the Larkeytown Bridge and the mouths of intercepting tributaries adjusted to the new channel invert. Recreation facilities (walkways and foot bridge) were provided adjacent to the channel and are being used by many DuBois residents. The project protects the community against floods with a discharge equivalent to the March 1936 flood. The estimated federal and non-federal costs are $4,465,000 and $40,000, respectively. Construction was initiated in May 1972 and was completed in 1977. Flood damages prevented through fiscal 1994 are estimated at $5,586,000.

East Branch Clarion River Lake

East Branch Clarion River Lake is located in Elk County on the East Branch of the Clarion River, a tributary of the Allegheny River. The dam, about 7 miles upstream from Johnsonburg, is an earthfill structure, 184 feet high, with an ungated, side-channel spillway. It controls a drainage area of 72.4 square miles and provides 83,300 acre-feet of usable storage. The project is operated for flood control and for low-flow augmentation with secondary benefits resulting from the recreational use of the project. This reservoir is operated and maintained as part of a coordinated reservoir system for flood control in the Clarion, Allegheny, and upper Ohio River valleys. The dam began operation in 1952, but the project was effective as a detention reservoir during the flood of November 25, 1950. The cost was $9,539,586. Flood damages prevented are estimated at $33,871,000 through fiscal year 1994. Recreational visitation for 1993 was 190,200.

Etna

The borough of Etna is near Pittsburgh in Allegheny County, and is located on Pine Creek, a tributary to the Allegheny River. Within the borough limits, West Little Pine Creek joins Pine Creek about a mile upstream of the river. The project, located on West Little Pine Creek, includes a dike, floodwall and channel improvement along the creek for a distance of 2,620 feet upstream from the mouth to the borough line. At the upstream end, a debris basin was provided to control transported sediment. Constructed under the Section 205 authority, the project is designed to provide protection against floods with a 100-year frequency of occurrence. The federal cost was $2,409,000 while state and local governments contributed about $215,000. The project performed well during several severe storms during the last several years.

Crooked Creek Lake.

Johnsonburg

The borough of Johnsonburg is located at the confluence of the East and West Branches of the Clarion River in Elk County. East Branch Clarion River Lake provides a high degree of flood protection for Johnsonburg along the East Branch of the Clarion River. However the Johnsonburg Local Flood Protection Project provides flood protection for West Johnsonburg on the West Branch. Project features consist of a levee, floodwall, drainage facilities and appurtenant works, with supplementary bank protection and enlargement of the channel of the West Branch. Protection of the Rolfe area of West Johnsonburg consists of improvement and minor realignment of the channel of Silver Creek, a tributary of the West Branch. The improvement protects the community with a 3-foot freeboard, against floods 40 percent greater than the maximum flood of record on the West Branch. The federal cost was $674,664, and the estimated non-federal cost was $130,000. Flood damages prevented are estimated at $2,856,000 through fiscal year 1994.

Johnstown

The city of Johnstown is located in Cambria County at the confluence of the Stonycreek and Little Conemaugh rivers, where they form the Conemaugh River. The project consists of

Mahoning Creek Lake

channel enlargement and sideslope paving for 20,700 feet along Stonycreek River, 6,970 feet along the Little Conemaugh River and 19,270 feet along the Conemaugh River. The improvement protects the community against flood discharges equal to the March 1936 flood. The federal cost was $8,865,388. Flood damages prevented since completion in 1943 are estimated at $423,220,000 through fiscal year 1994. On the night of July 19-20, 1977, heavy rains caused extensive flooding in the Johnstown and surrounding areas, killing 77 and resulting in approximately $300 million in property damages. The federal government has responsibility for operating and maintaining this project.

Kittanning

The borough of Kittanning is in Armstrong County on the east bank of the Allegheny River. The existing project consists of 4,220 feet of concrete floodwall, 500 feet of rock revetment and 1,830 feet of gravel revetment. These works are adjacent to and upstream of the abutment of Lock and Dam 7, Allegheny River. They protect the community above the dam based on the maximum flood of reasonable expectancy, as modified by the authorized reservoir system for the protection of Pittsburgh and the upper Ohio Valley. The project was completed in 1948 at a federal cost of $130,317 and an estimated non-federal cost of $2,000. Flood damages prevented are estimated at $487,000 through fiscal year 1994.

Loyalhanna Creek, Latrobe

This channel improvement consists of two separate projects. The initial project, completed in 1950, consists of a channel enlargement on Loyalhanna Creek for 10,780 feet, including an 810-foot cutoff channel. The federal and non-federal costs were $207,700 and $44,400, respectively. The second project, authorized by the Flood Control Act of 1960, provided for additional improvement of Loyalhanna Creek to provide additional and extended protection. This project provided channel enlargement and realignment with appurtenant works from downstream of the Shaffer Road bridge and upstream through Latrobe for about 4.4 miles to the ConRail bridge above Linden Street. This has improved the overall project and protects the community against floods with a discharge equivalent to the October 1954 flood of record. The federal cost of the second and current project was $2,556,652 and the estimated non-federal cost was $698,000. The second improvement was completed in 1967. Flood damages prevented are estimated at $5,642,000 through fiscal year 1994.

Loyalhanna Lake

Loyalhanna Lake is in Westmoreland County near the mouth of Loyalhanna Creek, which is a tributary in the Allegheny River Basin. The dam consists of a concrete gravity structure flanked by an earthfill abutment on the left bank. The dam is 114 feet high and contains in its concrete section a gate-controlled spillway. The reservoir controls a drainage area of 290 square miles and provides usable storage of 93,300 acre-feet for flood control. This project is operated and maintained as part of the coordinated reservoir system for flood control in the Allegheny, Kiskiminetas and Ohio River valleys. This system is designed to reduce flood stages on the upper Ohio River and to help decrease flood stages on the lower Ohio River and below. Recreation is a secondary benefit of the project. The dam has been in operation since 1942. The cost was $5,727,531. Flood damages prevented are estimated at $171,073,000 through fiscal year 1994. The lake was visited by 226,000 people in 1993.

Mahoning Creek Lake

Mahoning Creek Lake is on Mahoning Creek, a tributary of the Allegheny River, in Armstrong and Jefferson counties. The dam in Armstrong County is a concrete gravity structure, 162 feet above the streambed, with a gate-controlled spillway in its central section. It controls a drainage area of 340 square miles and provides a usable storage of 69,700 acre-feet for flood control. This project is operated and maintained as part of the coordinated reservoir system for flood control in the Allegheny and Ohio River valleys. The cost was $7,138,814. Flood damages prevented since 1941 are estimated at $163,465,000 through fiscal year 1994. In 1993, the lake was used by 30,700 people.

Punxsutawney

The borough of Punxsutawney is in Jefferson County on Mahoning Creek. The project consists primarily of channel enlargement of the creek over a length of 18,853 feet with a system of levees and walls (totaling 12,055 feet and 2,454 feet, respectively) through the former flood-damaged section of the community. Appurtenant facilities provide for discharging sanitary sewage and storm runoff from the protected area. The improvements, completed in 1950, protect the borough against flood discharges 20 percent higher than the peak discharge of the March 1936 flood. The federal cost was $3,586,107, and

the estimated non-federal cost was $180,000. Flood damages prevented are estimated at $29,986,000 through fiscal year 1994. The federal government has responsibility for maintaining the improved channel.

Reynoldsville

The borough of Reynoldsville is in Jefferson County on Sandy Lick Creek, about 10 miles above its junction with Redbank Creek. Construction was completed in November 1957. The improvements consisted of deepening, widening, and streamlining in the channel of Sandy Lick Creek through Reynoldsville. The project will reduce the natural stages of most floods by about 3 feet. The federal cost was $385,494 and the estimated non-federal cost was $26,000. Flood damages prevented are estimated at $5,840,000 through fiscal year 1994.

Ridgway

The borough of Ridgway is in Elk County on the Clarion River and Elk Creek. The channel improvements along Elk Creek furnish protection against discharges equal to the flood of July 1942. The plan provides increased channel capacity by deepening, widening and realigning existing channels; construction of a new railroad bridge over the relocated mouth of Elk Creek; and a pilot channel in the Clarion River below the mouth of Elk Creek. Construction was completed in 1962. The federal cost was $628,888 and the estimated non-federal cost was $72,000. Flood damages prevented are estimated at $8,540,000 through fiscal year 1994.

Shenango River Lake, Pennsylvania and Ohio

Shenango River Lake is on the Shenango River above Sharpsville in Mercer County. It controls the runoff from a drainage area of 589 square miles, of which 431 square miles form the intermediate area between the Pymatuning Dam, owned by the commonwealth of Pennsylvania, and Shenango Dam. The structure is a concrete gravity type, 68 feet high and has an uncontrolled center spillway. The reservoir area is contained in the Shenango River Valley in Pennsylvania and in the Pymatuning Creek Valley in Pennsylvania and Ohio. A minimum pool is maintained, generally at elevation 885 with an area of 1,910 acres all in Pennsylvania. During the spring, about 30,000 acre-feet of inflow is impounded for release during the summer to increase the river discharge as regulated by the Pymatuning Reservoir. The remaining capacity of the reservoir, 151,000 acre-feet in summer and 181,000 acre-feet in winter, is available for temporary storage of flood flows. When full, at elevation 919, the reservoir has a usable capacity of 180,900 acre-feet and an area of 11,090 acres, of which 7,330 acres are in Pennsylvania.

The project is operated as part of the coordinated reservoir system for flood protection in the Shenango, Beaver, and Ohio River valleys. The coordinated system is designed to lower flood stages on the upper Ohio River and to help reduce flood stages on the lower Ohio River and below.

Tionesta Lake.

The project area has been developed at federal cost for recreation, including boating, fishing, camping, hunting, swimming and picnicking, in addition to flood control and downstream flow augmentation. The swimming facilities are leased to Mercer County for operation and maintenance. Fish and wildlife development are managed through the Corps of Engineers and appropriate state agencies. Additional facilities constructed around the lake include a nature study area and an administrative complex.

Flood damages prevented are estimated at $28,877,000 through fiscal year 1994. Recreational visitation in 1993 was 836,600. Placed in operation in 1967, the federal cost was $36,900,000. The total project cost including additional recreational development, is about $40,210,000.

Tionesta Lake

Tionesta Lake is near the mouth of Tionesta Creek, a tributary of the Allegheny River, in Forest County. The dam is an earthfill structure, 154 feet high, with an ungated saddle spillway. It controls a drainage area of 478 square miles and provides flood control storage of 125,600 acre-feet, with a summer recreation lake of 480 acres. This project is operated and maintained as part of a coordinated reservoir system for flood control in the Allegheny and Ohio River valleys. The cost, including additional recreational facilities, is estimated at $7,788,379. Flood damages prevented through fiscal year 1994 are estimated at $179,167,000. In 1993, the recreational facilities were enjoyed by 351,200 visitors.

Turtle Creek Channel Improvements

The Turtle Creek Project is in Allegheny and Westmoreland counties near Pittsburgh along the lower reaches of the stream. Turtle Creek is a tributary to the Monongahela River. The

Woodcock Creek Lake

project facilities consist of channel improvements on lower Turtle Creek and lower Thompson Run, which will protect against discharges greater than the October 1954 flood. Construction was initiated in 1962 and completed in 1967 with federal and non-federal costs estimated at $15,400,000 and $1,840,000, respectively. The project performed well during Hurricane Agnes in 1972. Flood damages prevented through fiscal year 1994 are estimated at $84,334,000. A study is being conducted for project restoration.

Union City Reservoir

The Union City Reservoir is in Erie County, northwestern Pennsylvania, on French Creek. The dam site is 41 miles upstream from Meadville and 24 miles upstream from Cambridge Springs. The dam is an earth embankment, 93 feet high and 1,420 feet long, with uncontrolled outlet works and spillway. The dry-bed detention reservoir has a capacity of 47,640 acre-feet and controls a drainage area about 222 square miles. The federal cost was $14,599,800, with construction initiated in 1966 and completed in 1971. Flood damages prevented are estimated at $21,014,000 through fiscal year 1994. Recreation visitation was 24,100 in 1993.

Washington and Canton Township Channel Improvements

The plan of flood protection along Chartiers Creek in Washington and Canton Township consists of 1.7 miles of channel improvement involving widening and deepening, with some realignment. A deflection-type dike was provided at the upstream end of the improvement to direct major flood-flows into the improved channel. The improved channel was designed to contain a discharge 60 percent greater than the flood of record at construction. Construction was completed in 1962, at a federal cost of $789,093 and an estimated non-federal cost of $323,000. The flood damages prevented are estimated at $1,801,000 through fiscal year 1994.

Woodcock Creek Lake

Woodcock Creek Lake is in Crawford County, northwestern Pennsylvania, on Woodcock Creek, a tributary of French Creek. The rolled earthfill embankment dam is 4.1 miles above the mouth of Woodcock Creek and is 90 feet high and 4,650 feet long, with controlled outlet works and an uncontrolled saddle-type spillway. This multi-purpose project provides flood control, water-quality control through streamflow management and recreation. The lake controls a drainage area of about 46 square miles and has a capacity of 19,250 acre-feet, with 4,000 acre-feet available for water quality. Four recreation areas have been developed and constructed by the Corps of Engineers around a 333-acre summer pool. An overlook and parking area on the north side of the impoundment allows visitors to view the dam and lake, while day-use and fisherman-access areas immediately below the dam provide for more active pursuits. The largest recreation facility is Colonel Crawford Park, operated and maintained by Crawford County. The park is on the south side of the lake and includes accommodations for camping, boat launching, swimming, picnicking, sightseeing and fishing. Additional facilities constructed around the lake include a nature study area and an administration complex. The total cost is estimated at $20,545,065. Construction of the dam was initiated in 1968 and completed in 1973. Flood damages prevented are estimated at $3,292,000 through fiscal year 1994. Recreational visitation at the project in 1993 was 262,300.

Youghiogheny River Lake, Pennsylvania and Maryland

Youghiogheny River Lake is on the Youghiogheny River, a tributary of the Monongahela River, in Fayette and Somerset counties, Pa., and Garrett County, Md. The dam, about 1.2 miles upstream from Confluence, Pa., is an earthfill structure, 184 feet high, with an ungated sidechannel spillway. It controls a drainage area of 434 square miles, and provides 248,800 acre-feet of storage. This reservoir is operated for flood control and for low-flow augmentation. A secondary benefit of the project is recreation to include white water rafting downstream. The storage reserved for these purposes varies according to the seasons. A non-federal hydropower plant, with a total generating capacity of 10,000 kilowatts was completed at the dam in 1989. This project is operated and maintained as part of a coordinated reservoir system for flood control in the Youghiogheny, Monongahela and Ohio River valleys. The system is designed to lower flood stages on the upper Ohio River and to help reduce floods on the lower Ohio River and below. The dam was in limited operation from 1942-1947. Since then the operation has been normal. The cost, including additional recreational development, is estimated at $12,521,168. Flood damages prevented are estimated at $163,370,000 through fiscal year 1994. In 1993, 479,700 visitors used the recreational facilities.

Projects Under Way

NAVIGATION

Monongahela River, Reconstruction of Locks and Dams, Pennsylvania

A general plan for the improvement of navigation facilities on the Monongahela River has been initiated. Improvements have included the rehabilitation of Locks 3, the reconstruction of Locks 2, Dam 4 and Point Marion Dam and the construction of Maxwell Locks and Dam. The replacement of Lock and Dam 7 with a larger capacity facility 3.0 miles downriver at Grays Landing, PA, is under construction. Construction for a larger capacity lock at Point Marion Lock and Dam began in the spring of 1990 and the new lock opened in December 1993. In addition, a study of the lower three navigation facilities (Locks and Dams 2, 3 and 4) was completed in April 1992.

The study of the structural problems and future traffic conditions at Locks and Dams 2, 3 and 4, which range in age from 89 to 62 years, concluded that a major replacement project was justified. On June 1, 1992, the Chief of Engineers transmitted to the Secretary of the Army his report of concurrence in the findings of the district and division engineers and the Board of Engineers for River and Harbors which recommend the NED (National Economic Development) plan for maintaining reliable navigation on the Lower Monongahela River. The project, consisting of a "two for three" replacement strategy, was authorized for construction by the Water Resources Development Act of 1992. The project will replace the fixed-crest dam at Locks and Dam 2 with a gated dam having four 110-foot tainter gates; upgrade the floodway bulkhead structure for the small lock chamber at Lock and Dam 2; raise existing Pool 2 by 5 feet; adjust or possibly reconstruct a major railroad bridge; construct new twin 84-foot by 720-foot locks at Lock and Dam 4; remove Lock and Dam 3; lower existing Pool 3 by 3.2 feet; and perform associated miscellaneous relocations and channel dredging. The Corps would adjust, at project cost, all municipally-owned facilities adversely affected by the proposed pool changes. The total estimated fully funded cost of the project is $715 million. Preconstruction, engineering and design activities initiated in January 1992 will conclude in fiscal year 1994. Construction will commence in fiscal year 1995 beginning with the Locks 2 auxiliary chamber floodway bulkhead upgrade and initial project relocations.

FLOOD CONTROL

Chartiers Creek, Canonsburg-Houston

The Flood Control Act of 1965 authorized major channel improvements on Chartiers Creek near Canonsburg and Houston in Washington County, as recommended in House Document 302, 88th Congress, 2nd session. The project provides for channel widening, deepening, realignment, and construction of a major channel cutoff. These improvements will protect a 4.7 mile stretch of land from floods equal to the 1912 flood of record. The project was completed for units 1 and 2A, and unit 2B is ready for right of entry. Estimated federal cost is $8,800,000. The estimated cumulative flood damages prevented are estimated at $3,482,000 through fiscal year 1994.

Work Under Special Continuing Authorities

SMALL FLOOD CONTROL PROJECTS-COMPLETED (SECTION 205, PUBLIC LAW 84-685)

Big Run

The borough of Big Run is in Jefferson County on Mahoning Creek, a tributary of the Allegheny River. The project consists of widening, deepening and realigning the channel of Mahoning Creek beginning about a mile below the borough and continuing upstream for about 13,500 feet. Big Run Creek is also improved from its mouth into the improved Mahoning Creek channel. The project provides protection against a recurrence of the July 1958 flood. Stage reduction at the Mill Street Bridge would be 4.7 feet. The project was completed in 1964. Federal cost was $364,208, and the estimated non-federal cost was $35,900. Flood damages prevented through fiscal year 1994 are estimated at $1,705,000.

Burgettstown

The borough of Burgettstown is in Washington County on Burgetts Fork, a tributary of Raccoon Creek, which flows into the Ohio River about 6 miles below Monaca. The project consists mainly of widening, deepening and straightening the channel of Burgetts Fork through Burgettstown and vicinity for about 2 miles, filling the bypassed reaches of the old channel, and protecting the banks of the new channel in certain locations. The improvement will reduce flood stages by 4.3 feet, based on the July 1950 flood, highest since 1912, and will provide protection against floods of estimated 5-year frequency. The average annual flood control benefits are estimated at $30,000. The project was completed in 1952 at a federal cost of $83,129 and an estimated non-federal cost of $30,000. Flood damages prevented through fiscal year 1994 are approximately $1,836,000.

Granville

The community of Granville is in Washington County on Pike Run and its tributary, Gorby Run, about 1.5 miles above the confluence of Pike Run with the Monongahela River. The protection facilities consist of about 4,600 feet of new and improved channel with dumped rock bank protection in certain locations, about 210 feet of rock-faced dike and the removal of about 34,500 cubic yards of mine dump waste. The project will confine floods to about one-half the flood of record (June 1941). The project was completed in 1952 at a federal cost of $75,908 and an estimated non-federal cost of $3,000. Flood damages prevented through fiscal year 1994 are approximately $2,102,000.

Marianna and Vicinity

Marianna is in Washington County on Ten Mile Creek, a tributary of the Monongahela River. The project consists of widening, deepening and minor realignment of the Ten Mile Creek channel beginning about 5,000 feet downstream of the Jefferson Avenue Bridge and extending upstream 7,670 feet. The mouth of Daniels Run was widened and deepened to effect a transition of its discharges into Ten Mile Creek. Flows equal to the March 1963 flood will be contained in the improved channel. The project also provides concrete-sealed access ramps to the channel, rock gutters, and the construction of a low-flow channel to retain fish habitat. The project was completed in 1978 at a cost of $1,554,428. Cumulative flood damages prevented through fiscal year 1994 are estimated to be $42,000.

Millvale

The borough of Millvale is in Allegheny County, at the mouth of Girty's Run, a tributary of the Allegheny River near Pittsburgh. The project involves lowering the existing Girty's Run channel bottom within the limits of existing walls for 6,125 feet. The improvement will contain, within channels, a flow equal to the flood of July 1950. Construction was initiated in 1976 and completed in 1980 with total federal and non-federal costs of $2,648,849 and $701,722 respectively. Flood damages prevented through fiscal year 1994 are estimated to be $287,000.

Oil City

Oil City is in Venango County at the confluence of Oil Creek and the Allegheny River. The project is designed to protect against Oil Creek floods that overtop the creek bank at the northern limit of the city and flow overland through the city. The protection includes a dike 800 feet long on the left bank of Oil Creek extending from the ConRail railroad to near the easterly edge of North Seneca Street. It averages about 4.3 feet above the natural ground surface. The project was completed in May 1958 at a federal cost of $43,595 and an estimated non-federal cost of $30,700. Flood damages prevented through fiscal year 1994 are estimated to be $24,000.

Oil City, Ice Control Structure—note the fixed concrete weir on Oil Creek.

Oil City, Ice Control Structure

Oil City is in Venango County at the confluence of Oil Creek and the Allegheny River. The project includes a floating ice control structure on the Allegheny River and a fixed concrete weir on Oil Creek. Both are upstream of the city and are designed to eliminate flood-causing ice jams on the Allegheny River at the mouth of Oil Creek. The floating structure on the Allegheny River was installed in 1982 and modified in 1983 at a federal cost of $1,110,000. It has effectively reduced ice formation on the river. The ice control structure on Oil Creek cost approximately $2.3 million and was completed in December 1989.

Portage

The borough of Portage is in Cambria County on the Little Conemaugh River and Trout Run. The project facilities are improvements along Trout Run by concrete cribwalls and limited channel excavation at wall and bridge locations. The project was completed in 1965 at a federal cost of $150,386 and an estimated non-federal cost of $14,900. Flood damages prevented through fiscal year 1994 are estimated at $295,000.

Slovan

The community of Slovan is in Washington County on Burgetts Fork, a tributary of Raccoon Creek, which flows into the Ohio River about 6 miles below Monaca. The protective facilities include widening, deepening and straightening the channel of Burgetts Fork through Slovan and vicinity for about 1.8 miles, filling the bypassed reaches of the old channel, disposing of excess excavated material and protecting the banks. The improvement will reduce by 2.4 feet a recurrence of the flood stage in July 1950, highest since 1912, and will reduce floods of an estimated 3-year frequency to below first floor levels of the houses in the valley bottom. The project was completed in 1952 at a federal cost of $57,811. Flood damages prevented through fiscal year 1994 are estimated at $753,000.

Sykesville

The borough of Sykesville is in Jefferson County, on Stump Creek, a tributary of Mahoning Creek, which flows into the Allegheny River. The project includes widening, deepening, and straightening the channel of Stump Creek beginning about a mile below the borough and continuing upstream for about 6,000 feet to the junction of Stump Creek and Sugar Camp Run, then up Stump Creek for about 400 feet. The improvement will contain within banks a flood greater than the March 1936 flood by reducing flood stages about 6 feet.

The project was completed in 1961 at a federal cost of $184,246, and an estimated local cost of $9,000. Flood damages prevented through fiscal 1994 are approximately $1,756,000.

Tarentum

The borough of Tarentum is in Allegheny County, on the Allegheny River and Bull Creek, a tributary. The project consisted of widening, deepening and straightening the channel of Bull Creek through Tarentum, starting above the Seventh Avenue Bridge and continuing upstream for about a mile to just above the junction of Bull Creek and Little Bull Creek. Excavated materials were placed adjacent to the improved channels to raise overbank levels and prevent overbank flooding during major creek discharges. The project provides protection against a flood equal to the flood of October 1954 by reducing flood stages by 4.6 feet. The project was completed in 1962 at a federal cost of $136,591. Costs to local interests are estimated at $24,600. Flood damages prevented through fiscal 1994 are estimated at $1,677,000.

Wilmore

The borough of Wilmore is in Cambria County on the Little Conemaugh River and its tributary, North Branch, about 14 miles above the confluence of the Little Conemaugh River with Stoneycreek River. The project facilities consist mainly of 2,700 feet of enlarged channel tor the Little Conemaugh River. Near the midpoint of this reach, the twin culvert type railroad arch bridge over the river was cleaned out and improved. Starting at the railroad embankment, a dike extends upstream along the right river bank for 1,200 feet, where the dike turns nearly a right angle to end in high ground about 750 feet away. Other items included providing drainage facilities and placement of excess excavated material to form a fill on the right bank from the railroad embankment downstream. Floods greater than the March 1936 flood will be confined to the improved channel. The project was completed in 1959 at a federal cost of $96,853 and an estimated non-federal cost of $1,300. Flood damages prevented through fiscal year 1994 are estimated at $510,000.

SNAGGING AND CLEARING PROJECTS

General authority is available to the Chief of Engineers to authorize the removal of accumulated snags and other debris, and the clearing and straightening of channels in navigable streams and tributaries for flood control. Such work has been performed in the Pittsburgh District at the following locations:

STREAM	LOCATION	YEAR	FEDERAL COST
Section 208, Flood Control Act of 1954, as amended			
Barden Brook	Eldred, McKean County	1956	$37,300
Dunlap Creek	Dunlap Creek and Saltlick Run, Fairbank, Fayette County	1949	23,300
French Creek	Cochranton, Crawford County	1948	25,000
Pine Creek	Etna, Allegheny County	1939	2,300
Tunungwant Creek	Tunungwant Creek and West Branch Tunungwant Creek, Bradford, McKean County (Incorporated into the Bradford Local Flood-Protection Project, 1961)	1948	49,000
East Branch Tunungwant Creek	Lewis Run Borough and South Bradford, McKean County (Incorporated into the Bradford Local Flood-Protection Project, 1961)	1949	48,700

Emergency Stream Bank Protection

STREAM	LOCATION	STATUS
Section 14, Flood Control Act of 1946, as amended		
Allegheny River	Freeport, Armstrong County	The project consisted of placing a blanket of stone on filter material along the riverbank to protect the borough's Riverside Drive. The project was completed in November 1978 at a federal cost of $113,000.

STREAM	LOCATION	STATUS
Section 14 (continued)		
Monongahela River	Newell, Fayette County	Stabilization along the affected reach consisted of placing stone atop free draining fill material to support the borough's Water Street. The project was completed in March 1982 at a federal cost of $66,764.
Thompson Run	West Mifflin, Allegheny County	The placing of graded rock atop a blanket of granular bedding material provided stabilization to the left stream bank and protection to the borough's Thompson Run Road. The project was completed in March 1982 at a total federal cost of $59,612.
Allegheny River	Wattersonville, Washington Township, Armystrong County	The project consisted of placing a blanket of quarryrun stone riprap atop previous material to stabilize the river-bank which supports a township road. This road affords access into Pennsylvania State Gamelands. The federal cost, in May 1983 was $73,720.
Allegheny and Ohio River	Pittsburgh, Allegheny County	The project, completed in 1983, provided stabilization of the riverbank at Roberto Clemente Park through the placement of slushed, grouted stone protection placed on granular filter material. The adversely affected reach of riverbank supports a paved esplanade and service road, boat docks, and an observation platform along the river edge of the park. The project was completed in July 1984 for a total federal cost of $153,273.
West Butler Creek	Lyndora, Butler County	The project consists of a gabion wall along the right streambank to protect a fire hall, a post office, parking lots and a park located on property of the Lyndora Volunteer Fire Company. The project was completed in August 1982. The federal and non-federal costs were $63,565 and $200, respectively.
Plum Creek	Penn Hills, Allegheny County	The project consists of a concrete wall along the left bank of the creek to protect a sanitary sewer line from bank erosion. The project was completed in December 1983.
Trout Run	Portage, Cambria	The project provided for construction of a low concrete wall to stabilize an existing retaining wall supporting Caldwell Avenue. This wall had deteriorated from stream related erosion. The project was completed in May 1984.

STREAM	LOCATION	STATUS
Section 14 (continued)		
Allegheny River	Tionesta, Forest County	The project provides for placing filter material and stone along the riverbank to protect State Route 62.
Beaver River	Bridgewater, Beaver County	This project consists of placing graded stone protection on filter fabric along the right riverbank to protect Bridgewater's Riverside Municipal Park.
Chartiers Creek	McKees Rocks Borough and Kennedy Township Allegheny County	This project provides protection from bank erosion which has endangered sections of Creek Road, owned and maintained by the borough and the township.
West Run	Munhall Borough, Allegheny County	The project provides protection for a section of West Run Road which is owned and maintained by Allegheny County.
Nelson Run	Ross Township, Allegheny County	This project provides protection for an endangered segment of Nelson Run Road.
Chubb Run	city of Franklin, Venango County	This project provides protection for an endangered segment of Route 8 in the city of Franklin, PA.
Plum Creek	Borough of Oakmont, Allegheny County	This project provides protection for an endangered segment of Dark Hollow Road that is locally owned.

Flood Plain Management Services

LOCATION	DATE COMPLETED
Section 206, Public Law 86-645	
Allegheny River, Armstrong	Dec. 1973
Allegheny River, Clarion County	Jun. 1974
Allegheny River, Forest County	Dec. 1974
Allegheny River and Lillibridge Creek-Port Allegheny, McKean County	Dec. 1973
Allegheny River, McKean County	Dec. 1976
Allegheny River, Potter County	Dec. 1977
Allegheny River, Warren County	Jun. 1975
Allegheny River, Westmoreland County	Jun. 1973
Allegheny River, Venango County	Dec. 1974

LOCATION	DATE COMPLETED
Section 206 (continued)	
Bush Creek-N. Huntington Twp., Westmoreland County	Oct. 1969
Clarion River and Silver Creek-Johnsonburg, Elk County	Dec. 1971
Conemaugh River and Tributaries-Johnstown and Vicinity, Cambria-Somerset Counties	Dec. 1974
French Creek-Cochranton, Crawford County	Sep. 1971
French and Cussewago Creeks-Meadville, Crawford County	Jun. 1969
Hare and Bear Creeks-Corry, Erie County	Sep. 1967
Monongahela River, Fayette County	Dec. 1973
Monongahela River, Greene County	June 1974
Monongahela River, N. Charleroi to Elco, Washington County	Mar. 1970
Monongahela River-California to W. Brownsville, Washington County	Jun. 1970
Monongahela River Monongahela to Union, Washington County	Nov. 1970
Monongahela River-Centerville and E. Bethlehem, Washington County	Nov. 1970
Monongahela River-Carroll Twp. to Donora, Washington County	Nov. 1970
Monongahela River-Monessen and Rostraver Twp., Westmoreland County	Jun . 1971
Neshannock Creek Basin, Lawrence County	Apr. 1964
Ohio, Allegheny, Monongahela and Youghiogheny Rivers, Allegheny County	Mar. 1973
Ohio and Beaver Rivers, Beaver County	Mar. 1973
Peters Creek-Jefferson Borough, Allegheny County	Jun. 1971
Pigeon Creek-Bentleyville, Fallowfield Twp., Somerset Twp., Washington County	Mar. 196•
Sandy Lick Creek-DuBois, Clearfield County	Jun. 1975
Sewickley Creek and Jacks Run Hempfield Twp., Westmoreland County	Mar. 1967
Shenango and Mahoning Rivers, Lawrence County	Feb. 1965

Basin Development Investigations Under Way

NAME	PURPOSE	STATUS
Basin Development Upper Allegheny River, Pennsylvania and New York	The Pittsburgh District and the Soil Conservation Service undertook a study of the upper Allegheny River Basin. The study area, comprising a drainage area of 3,300 square miles, includes that part of the upper Allegheny River Basin within New York and upstream of Warren, PA.	Ongoing

NAME	PURPOSE	STATUS
Basin Development (continued)		
	Authorization stems from a resolution adopted on October 10, 1974 by the Committee on Public Works of the United States House of Representatives. The primary objective was to identify water and related land resource needs and problems and formulate an overall plan of development that would permit the best use of these resources to meet foreseeable short and long term needs, considering the objectives of national economic development and environmental quality. The overall study has generally indicated that basin problems cannot be corrected through projects implemented under existing Corps of Engineers authorities. Accordingly, the Pittsburgh District efforts and funds were terminated for this study. Since the Upper Allegheny River Basin Study is a joint venture by SCS and the Corps of Engineers, responsiveness to the study resolution could be accomplished independently from this point on, i.e., the SCS would pursue its studies and report preparation according to its established procedures.	
Ohio River Main Stem, PA, Ohio and W. VA	A comprehensive study of the 20 locks and dam projects on the main stem of the Ohio River is expected to be initiated in 1995. The study will determine the physical condition and traffic capacity of each navigation project and problem areas will be identified. The projects will be ranked according to the consequences of each project's problems on the overall performance of the Ohio River Navigation System. Those projects with significant condition and/or capacity problems will be studied further to determine possible solutions to the problems. It is expected that the three uppermost projects on the Ohio River (Emsworth, Dashields, and Montgomery) will be among those projects with significant problems and for which further investigations will be warranted. The expectation is based on known condition and capacity problems at the projects. All three of the uppermost projects are within the commonwealth of Pennsylvania. A plan of study outlining the scope of the study and the areas of investigation is being developed. The plan of study is expected to be approved in 1995, at which time work will begin.	Under Way

Studies Under Way

In reponse to numerous requests, the Pittsburgh District Corps of Engineers is conducting investigations and studies to determine whether proposed improvements are justified. Information on those surveys under way in the Ohio River Basin in Pennsylvania is given below. Many of these reports have indefinite completion dates since progress is contingent on appropriation of funds.

NAME	PURPOSE	STATUS
Flood Control		
Saw Mill Run Basin, Ohio River	This Section 205 study will evaluate the feasibility of implementing a non-structural flood reduction project at Ansonia Place along Saw Mill Run as recommended in the approved reconnaissance report.	The district and the city of Pittsburgh are negotiating a Feasibility Cost Sharing Agreement.
Saw Mill Run Local Flood Protection Project	To provide protection to the existing commercial and residential developments in the West End section of the city of Pittsburgh from overbank flooding.	Under Way

National Hunting And Fishing Day At Corps Projects

Since 1972, the Pittsburgh District, in conjunction with national and state proclamations, has held a Hunting and Fishing Day Festival at reservoirs in Pennsylvania.

1. An open house and self-guided tours of the dam and visitor's center.
2. Fishing contest and recognition for the longest fish caught in several categories.
3. A muzzle-loader shooting contest with trophy awards.
4. Entertainment, demonstrations and displays.

The festivals have been held in cooperation with the Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, U.S. Forest Service and the U.S. Fish and Wildlife Service.

Activities At Youghiogheny River Lake And Shenango River Lake

The first official Corps of Engineers cleanup program was initiated at the Pittsburgh District's Youghiogheny River Lake by Corps personnel in 1967. As a result of the favorable response by the public to this unique effort, the cleanup campaign has become an annual event at this popular lake.

To encourage participation in the campaign by boat clubs, adjoining land owners, local business establishments and individuals, the yearly program begins with a decorated boat parade and contest. Trophies are awarded to the best decorated boats following a review by judges and prominent visitors. After the ceremony, the work begins, but in keeping with the occasion, it's handled as a contest. As the debris is collected, participants deposit it at centrally-located stations for later disposal by the Corps. A scoring system is used to keep track of the biggest collectors. After the tallies are all in, prizes are distributed to the clubs and individuals responsible for collecting the largest amount of debris.

Visitors view the Pittsburgh District's barge display at Pittsburgh's Three Rivers Regatta.

The response of the public to these programs has proved invaluable in maintaining Youghiogheny River Lake as a project that is a credit to both the Corps and the commonwealth.

Since 1973, the Pittsburgh District, with the assistance of the Pennsylvania Fish and Game commissions and many local civic groups, has held a special recreation day for various handicapped groups at both the Youghiogheny River and Shenango River lakes.

The program includes a fishing derby, playground rides, boat rides, wildlife display, fish stocking, a picnic lunch and prizes. This program has become an annual affair at both projects.

Participants enjoy a boat ride at one of the Pittsburgh Districts Special Days for the Disabled.

Eco-Meets At Pittsburgh District Projects

Eco-Meets are environmental competitions conducted by Corps personnel at Pittsburgh District lakes. The first annual eco-meets were conducted at the Shenango River.

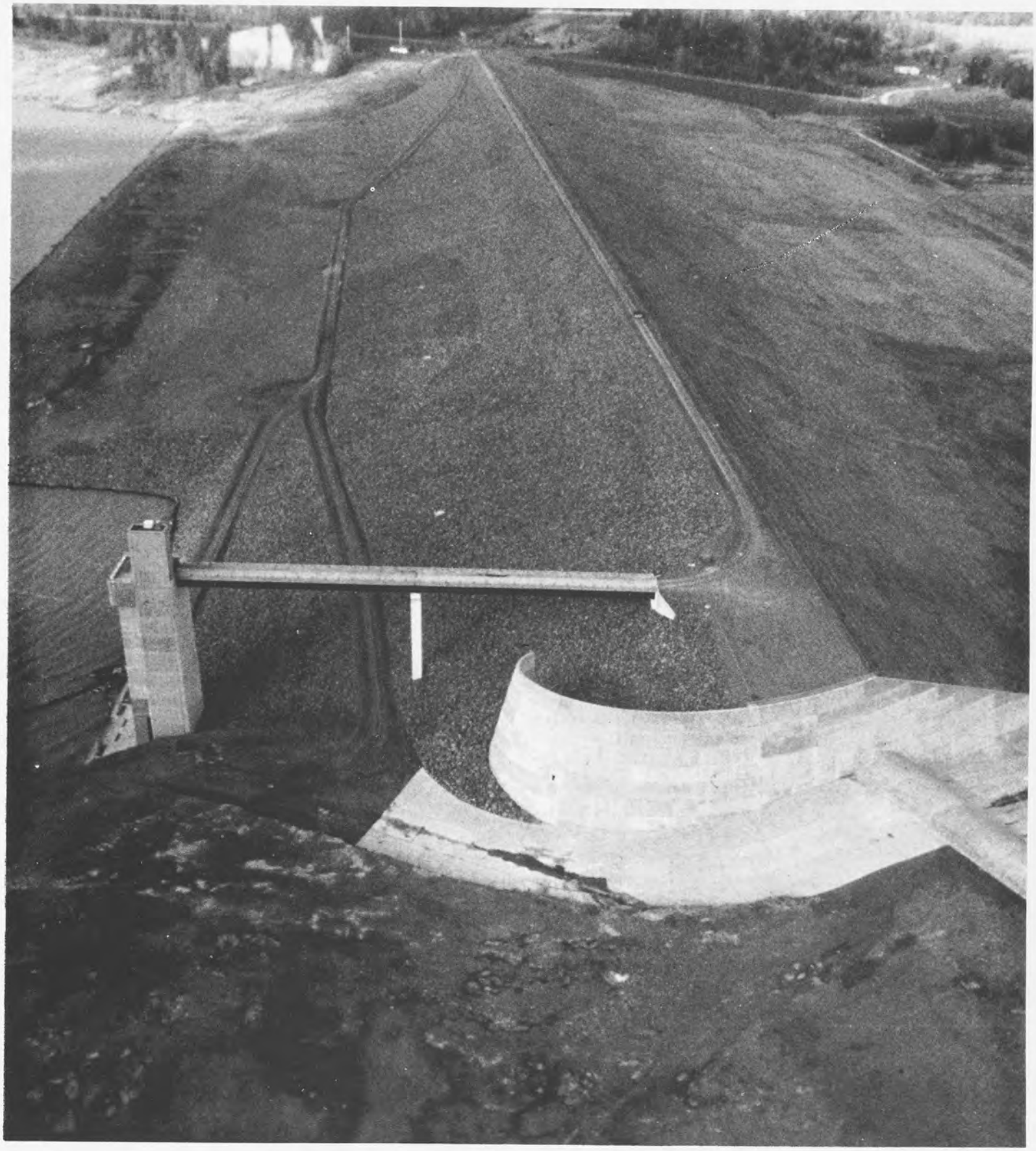
Local school districts are represented by squads which include elementary students, intermediate students and high environmentally-related activities including wildlife identification, a scavenger hunt, tree identification, interpretation, reptile and amphibian identification and track identification.

A number of schools are in each of the local meets. The winning squads from these meets then enter the district final at Crooked Creek Lake.

Certificates are given to all contestants and awards presented to winning squads at the finals. Eco-meets also acquaint area schools with the environmental facilities available at Corps lakes and the broader mission responsibilities of the Corps.

Pittsburgh District rangers and area students participate in the scavenger hunt portion of the Eco-Meet finals at Crooked Creek Lake.

Chapter 2



The Susquehanna River Basin Above Sunbury

The Susquehanna River Basin above Sunbury has a total area of 11,300 square miles, 5,000 in northeastern Pennsylvania and 6,300 in south central New York. The basin comprises the north and northeastern portion of the Susquehanna River Basin and is bounded by the Delaware River Basin on the east, the West Branch on the south, and by the Lake Ontario and Hudson River Basins on the west and north.

The Susquehanna River, the main stream in the basin, rises in Lake Otsego, N.Y. near Cooperstown, and flows generally in a southwesterly direction 335 miles to Sunbury. The main tributaries to the stream above Sunbury are the Shenango, Chemung, and Lackawanna Rivers, the latter stream being the only major tributary in Pennsylvania.

Floods in the basin usually occur between the months of February and April, when snowmelt adds to heavy spring rains to produce increased runoff. Major floods, however, have occurred during the summer and fall due to hurricane activity. The flood of June 1972, caused by tropical storm Agnes, was the greatest flood of record for the basin.

Five multi-purpose dam projects have been authorized in Pennsylvania, four of which are in operation. The existing projects are Stillwater Lake, authorized by the Flood Control Act of August 18, 1941 and located on the Lackawanna River; Aylesworth Creek Lake, authorized by the Flood Control Act of October 23, 1962 and located on Aylesworth Creek, a tributary of the Lackawanna; Tioga-Hammond Lakes, authorized by the Flood Control Act of July 3, 1958, located on Tioga River and Crooked Creek; and Cowanesque Lake Project, authorized by the Flood Control Act of July 3,1958 and located on the Cowanesque River. The remaining project, Fall Brook Lake, authorized by the Flood Control Act of October 23, 1962 and to be located on Fall Brook, was deauthorized May 6, 1981.

Most of the benefits from the completed dam projects are in Pennsylvania, although the Cowanesque and Tioga-Hammond projects will increase flood protection along the Susquehanna in lower New York. By the same token, dam projects in New York augment the flood control defenses of the already-protected communities along the Susquehanna River in Pennsylvania.

Seven local flood-protection projects, authorized by Congress for construction in Pennsylvania, have been completed and are in operation. The Scranton local flood protection project on the Lackawanna River, authorized by the Flood Control Act of October 23, 1962, offers direct protection to a portion of the city of Scranton. Design of a plan to provide protection to another portion of the city is ongoing. Flood protection for the Lackawanna River Basin is supplemented by the Stillwater Lake and Aylesworth Creek Lake Projects. Completed local flood protection projects are also located on the Susquehanna River at Swoyersville-Forty Fort, Wilkes-Barre-Hanover, Kingston-Edwardsville, Plymouth, and Sunbury. The projects offer direct protection to these communities, and are augmented by all the dam projects on upstream tributaries. The Elkland local flood protection project on the Cowanesque River, authorized by the Flood Control Act of July 3, 1958, protects the Elkland area and is upstream from Cowanesque Lake.

Projects Completed

FLOOD CONTROL

Aylesworth Creek Lake

Aylesworth Creek Lake is located on Aylesworth Creek about 1 mile above its confluence with the Lackawanna River in the borough of Archbald. The project controls a drainage area of 6.2 square miles and inundates 87 acres at spillway crest. A permanent lake covers about 7.5 acres. A local park authority was formed by nearby communities to provide recreational facilities around the lake. The project provides flood control storage of 1,700 acre-feet, equivalent to 5.1 inches of runoff from the drainage area.

The dam is an earthfill structure, 90 feet above the streambed, with a top length of 1,270 feet. Adjacent on the south bank is an uncontrolled spillway. The outlet conduit, consisting of a 36-inch diameter concrete pipe 490 feet in length, is also uncontrolled. The federal cost was $2,268,200. Construction was started in November 1967, and the project was operational in August 1970.

This project reduces flood crests at Archbald, Olyphant, Scranton, Old Forge, Duryea and other communities along the Lackawanna River. Since the outlet works are uncontrolled, there is no permanent dam operator assigned. Flood damages prevented are estimated at $4,720,000 through fiscal year 1993.

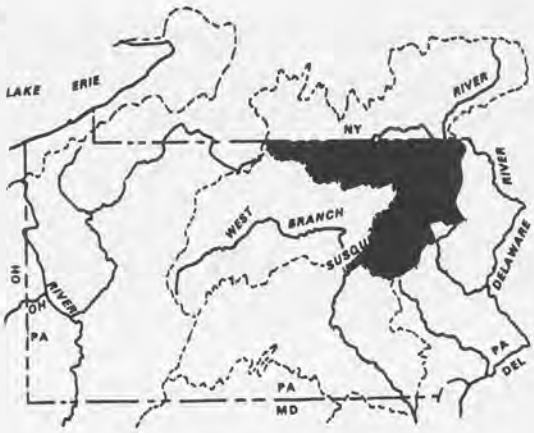
There were 11,900 visitor hours in 1991.

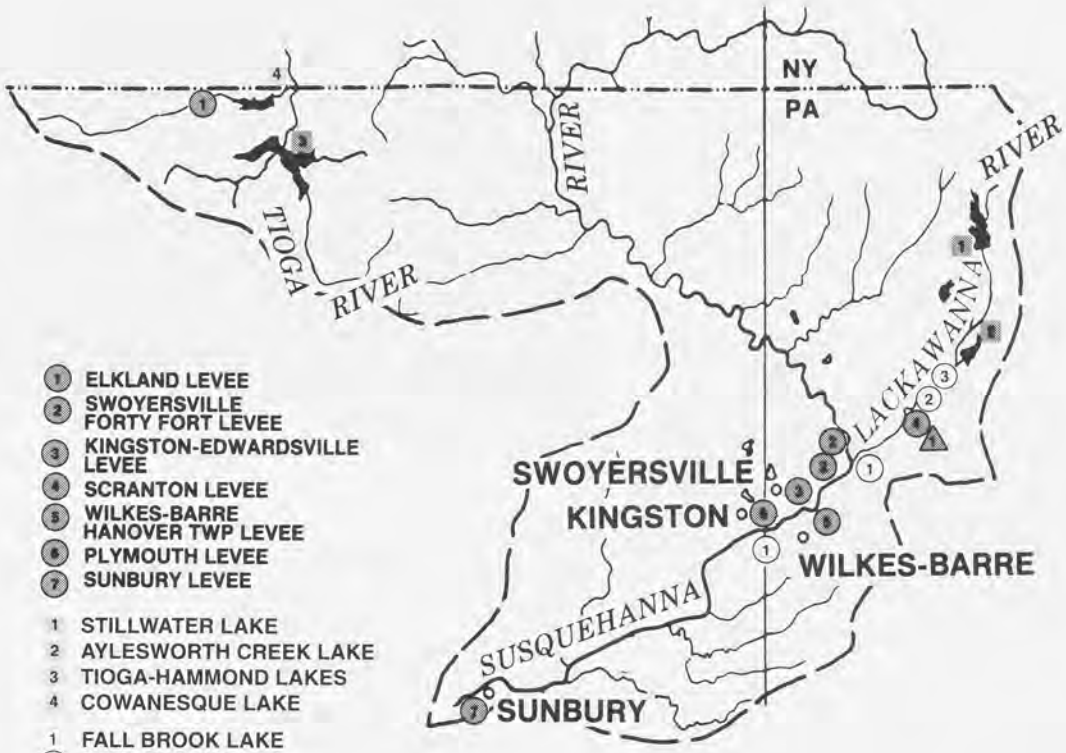
Cowanesque Lake

This project is on Cowanesque River, 2 miles above its confluence with the Tioga River at Lawrenceville and controls a drainage area of 298 square miles. The dam is a rolled earth and rockfill structure rising 151 feet above streambed with a top length of 3,100 feet. The uncontrolled concrete spillway and gated outlet works are on the right bank. At spillway crest, the lake extends for 8 miles.

Relocation of the town of Nelson was a part of this project and was authorized by Section 121 of the Water Resource

The Susquehanna River Basin Above Sunbury





- (1) ELKLAND LEVEE
- (2) SWOYERSVILLE FORTY FORT LEVEE
- (3) KINGSTON-EDWARDSVILLE LEVEE
- (4) SCRANTON LEVEE
- (5) WILKES-BARRE HANOVER TWP LEVEE
- (6) PLYMOUTH LEVEE
- (7) SUNBURY LEVEE

- 1 STILLWATER LAKE
- 2 AYLESWORTH CREEK LAKE
- 3 TIOGA-HAMMOND LAKES
- 4 COWANESQUE LAKE

- 1 FALL BROOK LAKE
- (1) WYOMING VALLEY
- (2) SCRANTON, PA (LEVEE)
- (3) OLYPHANT, PA (LEVEE)

△1 SCRANTON

40 0 40

LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	1	1	1	1
LOCAL PROTECTION	(1)	(1)	(1)	(1)
OTHER IMPROVEMENTS	△1	△1	△1	△1

Scranton local flood protection project, floodwall and outlet flume for Roaring Brook.

Development Act of 1976. Construction was completed in 1980 for $106,031,000.

This project was modified for water supply storage by authority of the Chief of Engineers in March 1983 in accordance with the Flood Control Act of 1944, as amended. The modification provides for reallocating 25,600 acre-feet of present flood control storage for water supply storage by raising the permanent pool from elevation 1045 to 1080 mean sea level. This includes modifying the existing lake tower, the dam's filter blanket and access ramps; stabilizing the reservoir slope near the new town site of Nelson; replacing and expanding existing recreation facilities and mitigating for loss of wildlife habitat. The estimated cost of this modification is $14,900,000 of which $1,110,000 is federal and $13,790,000 non-federal. The non-federal sponsor is the Susquehanna River Basin Commission, who has purchased the water supply storage for downstream consumptive use make-up releases during low flow years. In addition, local interests will reimburse the federal government for the cost of existing flood control storage reallocated to water supply storage, presently estimated at $39,414,000. The Corps operates and maintains recreation facilities, which include boat launches, picnic areas, a beach, a campground, overlooks, and trails. Recreation attendance for 1991 was 846,200 visitor hours. Flood damages prevented are estimated at $142,462,000 through fiscal year 1993.

Elkland

The borough of Elkland is in Tioga County on the left bank of the Cowanesque River about 12 miles above its confluence with the Tioga River. Protection is afforded by approximately 15,200 feet of earth levee, including two bridge approaches that cross through the levee. Six drainage structures are provided for the discharge of runoff from the levied area. The project protects against floods greater than the flood of May 1946, the greatest flood of record when the project was built. Construction was initiated in March 1965, and the project was completed in January 1967. The federal and non-federal costs were $1,297,850 and $228,000, respectively. Flood damage prevented amounted to $2,956,000 through fiscal year 1993.

Scranton

Scranton lies on both banks of the Lackawanna River about 9 miles above its confluence with the Susquehanna River. Roaring Brook and Stafford Meadow Brook flow through the city and join the Lackawanna within the city limits.

A plan of protection developed cooperatively by the Corps of Engineers and the Commonwealth of Pennsylvania, Department of Forests and Waters, provided that the Commonwealth would construct protection facilities on the sidestreams and the Corps would construct protective works on the Lackawanna River.

Stillwater Lake. Embankment with side-channel spillway to right. Highway at left shown is Pennsylvania Route 171.

The Commonwealth subsequently constructed channel lining, debris basins, and stilling basins on Roaring Brook and Stafford Meadow Brook and dredged the Lackawanna River. The Corps constructed earth levees, a concrete floodwall, and appurtenant drainage structures on the east bank of the Lackawanna River from near Stafford Meadow Brook upstream for 3,600 feet to high ground near Hickory Street. A pumping station was constructed near the levee on the east bank of the river to discharge local runoff during high river stages.

The project is designed to protect the reach between Hickory Street and Roaring Brook against a discharge of 24,500 cubic feet per second, and the reach downstream from Roaring Brook against a discharge of 35,000 cubic feet per second. Construction started in the fall of 1966, and was completed in June 1969. The federal cost was $2,006,800 and the non-federal cost was $4,090.000. A plan of protection for another area of Scranton, on the right bank, upstream from the completed project, is now in design.

Stillwater Lake

Stillwater Lake, part of the comprehensive plan for flood control in the Susquehanna River Basin, is on the Lackawanna

Sunbury, PA during the flood of June 1972.

Wilkes-Barre, Pennsylvania. Flooding in the area of Market Street and the public square caused by tropical storm Agnes in June 1972.

River in Susquehanna County 4 miles north and upstream from Forest City and 30 miles upstream from Scranton. The Lackawanna River Basin has suffered extensively from flood damages because it is exposed to intense summer thunderstorms of short duration, coastal hurricane storms, and long duration runoff resulting from generally heavy snowfall on the higher parts of the basin. Stillwater Lake reduces flood stages in the Lackawanna River downstream from the dam and in the Susquehanna River downstream from its confluence with the Lackawanna River. Carbondale, Olyphant, and Scranton are the principal damage centers that benefit from the project.

The dam is an earthfill structure, 77 feet high, 1,700 feet long at the crest, with a side-channel spillway and a gate-controlled outlet conduit in the left abutment. It controls a drainage area of 36.8 square miles and provides storage for 11,600 acre-feet of flood water and 200 acre-feet of water for domestic use. The dam was operational in September 1960. About $79,684,000 in flood damages have been prevented by Stillwater Lake for fiscal year 1993, including $7,115,000 during the flood of September 1975 caused by tropical storm Eloise. Federal cost was $5,725,700.

Sunbury

The city of Sunbury is located in Northumberland County on the left bank of the Susquehanna River immediately downstream from its confluence with the west branch. The project, consisting principally of 14,000 feet of earth levee and 12,100 feet of concrete floodwall, in conjunction with the upstream reservoirs, protects the community against flood discharges equal to the greatest flood of record, which occurred in June 1972. Five pumping stations are provided to discharge sanitary sewage and storm runoff from the protected area into the river during flood periods. The authorized lakes upstream will, upon completion, substantially increase the degree of protection afforded the community. Ten of these lakes have been completed, and they retained enough flood water to save Sunbury from serious damage during the flood of June 1972. The total federal cost of the project, which was operational in 1948, was $6,063,000; the non-federal cost was $373,304. Flood damages estimated at $301,542,000 have been prevented to date for fiscal year 1993, $50,400,000 of which was prevented during the June 1972 flood.

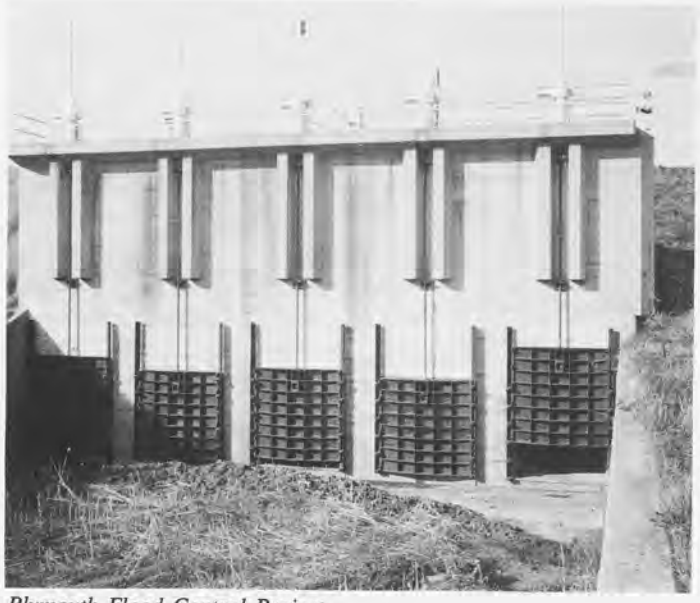
Wyoming Valley

The valley area along the Susquehanna River from the mouth of the Lackawanna River downstream to Nanticoke is generally referred to as Wyoming Valley. This area, all of which is in Luzerne County, includes one of the most important anthracite fields in the United States. This, together with extensive manufacturing and the usual commercial development, made the area a center of great economic activity. As a consequence, the flood of March 1936, the greatest of record then, caused severe and widespread destruction. Soon after the flood, construction was begun on an extensive system of local flood-protection projects throughout the valley. These projects now provide protection to the city of Wilkes-Barre and a number of other incorporated boroughs in the valley against flood discharges equal to those in 1936. The flood of June 1972 caused by tropical storm Agnes exceeded the March 1936 flood and became the greatest flood of record. In so doing, high water caused by the flood topped the design height of the protection and inundated almost the entire valley causing tremendous damage to most of the communities along the river. A system of 14 flood control lakes in the Susquehanna River Basin upstream from Wyoming Valley was originally authorized to provide substantially greater protection. Eight of these lakes were completed, but 6 have since been deauthorized.

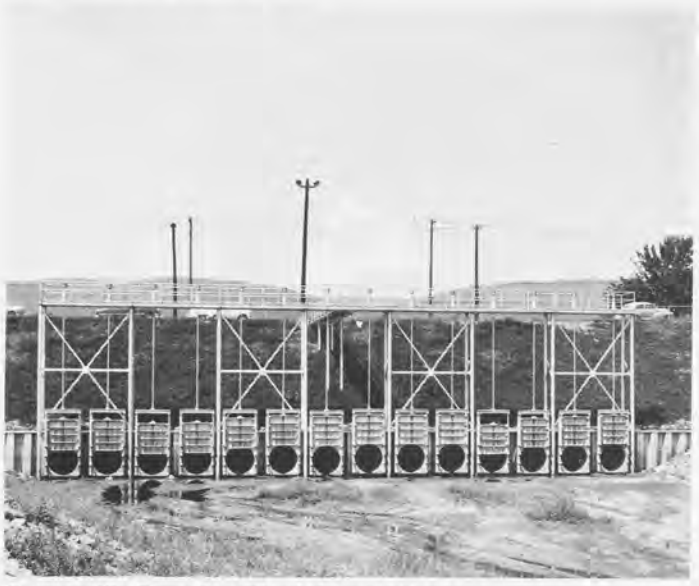
The individual projects that provide local flood control at communities in Wyoming Valley are described in the following paragraphs.

Wilkes-Barre-Hanover Township

The city of Wilkes-Barre, which is the county seat of Luzerne County, and adjoining Hanover township are on the



Plymouth Flood Control Project.



Swoyersville-Forty Fort Flood Control Project.

Tioga Lake.

east bank of the Susquehanna River. As a barrier between the built-up areas and the river, 24,660 feet of earth levee and 160 feet of concrete wall were constructed. For the discharge of storm runoff and sanitary sewage during flood periods, eight pumping stations and an impounding basin for Solomon Creek, which in itself required 3,200 additional feet of earth levee, were provided. The project was completed in 1943 although, because of World War II, equipment for the Solomon Creek pumping station was not installed until 1948, and other incidental work not completed until 1952. The total federal cost was $3,853,457. The non-federal cost was $216,000. The project has prevented flood damages estimated at $1,715,352,000 for fiscal year 1993.

As a result of mining beneath the levees prior to their construction, about 1,600 feet of levee subsided as much as three feet. The city of Wilkes-Barre, as an emergency expedient, restored the levees to grade through the construction of mud boxes. Permanent restoration of levees was undertaken by the federal government in 1959 under the special authorization for emergency repairs.

Kingston-Edwardsville

The adjoining boroughs of Kingston and Edwardsville are located on the west bank of the Susquehanna River opposite the city of Wilkes-Barre. To protect the built-up areas from floods, a protective barrier of 18,429 feet of earth levee was constructed. In addition, a concrete pressure conduit, 16.5 feet in diameter and 6,659 feet in length, was constructed to carry the flow of Toby Creek from an impounding basin to the river. Three pumping stations and 3,080 feet of concrete intercepting sewer were provided to carry storm runoff and sanitary sewage to the river during flood periods. The federal cost was $4,431,394, and the non-federal cost was $378,900. The project was operational in 1943, and thus far has prevented flood damages estimated at $1,097,377,000 for fiscal year 1993. This project has also required emergency repairs due to mine subsidence.

Plymouth

The borough of Plymouth is on the west bank of the Susquehanna River just downstream from Kingston and Edwardsville and opposite Hanover township. The borough is protected by 8,680 feet of earth levee. Brown Creek, Wadham Creek and Coal Creek flow easterly through the borough to join the Susquehanna. Pumping stations are provided at Brown and Wadham Creeks to pump the flow into the river during flood stages. During normal periods the streams flow conduits through the levee. The third stream, Coal Creek, is diverted outside the protected area of a diversion channel leading to the river. The federal cost was $1,911,689 and the estimated non-federal cost was $116,750. The project was operational in May 1948, and flood damages prevented to date are estimated at $130,009,000 for fiscal year 1993.

Swoyersville-Forty Fort

The boroughs of Swoyersville and Forty Fort are on the west bank of the Susquehanna River, immediately upstream from Kingston. The protection is provided by 16,970 feet of earth

levee and 2,490 feet of steel sheet pile wall, which form a barrier against flood flows in the Susquehanna River. To protect against flooding from Abrahams Creek, this stream was diverted outside the leveed area through 3,900 feet of channel leading to the Susquehanna River. Also included in the project is an earth levee and drainage structure at the mouth of Hicks Creek. This levee prevents the Susquehanna River from flowing up the creek during flood periods and inundating large areas as during the flood of 1936. Construction began in June 1953 and was completed in June 1957. The total federal cost was $2,728,113 including $36,000 for a levee extension at Swetland Lane constructed in 1968. The non-federal cost was $282.000. Flood damages prevented to date are estimated at $420,280,000 for fiscal year 1993.

Tioga-Hammond Lakes

This project, involving two separate dams, has a common uncontrolled spillway. The spillway serves a combined reservoir because of a connecting channel through the saddle in the ridge separating the Tioga River and Crooked Creek Basins. The combined drainage area controlled is 402 square miles, of which 280 square miles are in the Tioga River Basin and 122 square miles are in the Crooked Creek Basin. At spillway crest. Tioga Lake extends for about 9.9 miles along the Tioga River, where it inundates 1,600 acres of Hammond Dam and extends 7.8 miles along the Crooked Creek, inundating 1,770 acres. Flood control storage available is 125,000 acre-feet, equal to 6 inches of runoff from the combined drainage area. The estimated cost is $193,120,000, which includes $7,500,000 for construction of recreation facilities at Mill Creek yet to be built.

Tioga Dam is located on the Tioga River, 1.7 miles above the mouth of Crooked Creek. The dam is of earth and rockfill construction and is 140 feet high and 2,710 feet long. A gated outlet conduit is provided in the left abutment for control of flood flows from both the Tioga and the Hammond Dams. The spillway is in the adjoining Hammond Lake, a connecting channel approximately 1,000 feet upstream from Tioga Dam joins the two lakes. A summer lake of 500 acres is provided. Construction required the relocation of about 10 miles of highway.

Hammond Dam is on Crooked Creek, and adjacent to Tioga Dam. The dam is of earth and rockfill construction and is 122 feet high and 6,450 feet long. An uncontrolled concrete spillway is in the western embankment section. A summer lake of 665 acres is provided. Construction required the relocation of about 9 miles of railroad and 7 miles of highway. Construction of the Tioga-Hammond Lakes project was started in 1971 and completed in late 1978.

Flood damages prevented are estimated at $275,455,000 for fiscal year 1993.

The community of Mansfield, Pa. is at the head of Tioga Lake and requires levee protection as an integral part of the Tioga-Hammond Lakes project. Local protection plans at Mansfield included about 11,740 feet of earthfill levee, 2,200 feet of rectangular conduit, drainage structures, three pumping stations and associated highway relocations. The Corps operates and maintains the Ives Run and Lambs Creek Recreation Areas as well as several overlooks. Recreation facilities include boat launches, picnic areas, hiking trails, beach and a campground. Recreation attendance for 1991 was 1,011,000 visitor hours.

Projects Not Started

FLOOD CONTROL

Olyphant, PA

The recommended plan is for flood damage reduction on the Lackawanna River at Olyphant, Pennsylvania. The proposed project consists of approximately 3,800 feet of earth levee. 1,400 feet of floodwall, and appurtenant project features such as access ramps, a closure structure, erosion protection, relocations, and associated environmental restoration

The project will provide a 100-year level of flood protection to the Borough of Olyphant, equivalent to a flood discharge of about 10,000 cubic feet per second. Structures currently susceptible to flooding in the area include 450 residential and 95 commercial/industrial properties. Under existing conditions, a recurrence of the 1985 Hurricane Gloria event would cause $11.1 million in damages in Olyphant (1990 prices). The total estimated cost of the proposed project is $15.4 million, of which $10.9 million is federal and $4.5 million is non-federal.

The project was authorized for construction in the Water Resources Development Act of 1992, and is currently in the engineering and design phase.

Scranton, PA

The recommended plan is for flood damage reduction on the Lackawanna River at Scranton, PA, on the right bank, Albright Avenue Bridge area, locally known as Park Place. The proposed project would consist of approximately 5,700 feet of earth levee, 1,700 feet of floodwall, and appurtenant project features such as access ramps, closure structures, erosion protection, relocations, improved flood warning system, and associated environmental restoration and cultural mitigation measures.

The project will provide a 100-year level of flood protection to the Park Place area, equivalent to a flood discharge of about 12,500 cubic feet per second. The number of structures susceptible to flooding in the area includes 340 residential and 50 commercial/industrial structures. Under existing conditions, a recurrence of the 1985 Hurricane Gloria event would cause damage of $10.8 million in the Park Place area (1990 prices). The total estimated cost of the proposed project is $20.5 million, of which $15.4 million is federal and $5.1 million is non-federal .

The project was authorized for construction in the Water Resources Development Act of 1992, and is currently in the engineering and design phase.

Wyoming Valley

The recommended plan which was authorized by Section 401 of the Water Resources Act of 1986 will raise the existing levee system in the Wyoming Valley by 3 to 5 feet, and provide new closure and drainage structures, a new pumping station, and new levees and floodwalls to maintain the system's integrity at five communities in the Wyoming Valley. The five communities are: (1) Wilkes-Barre/Hanover township, (2) Swoyersville/Forty-Fort, (3) Exeter/West Pittston, (4) Kingston/Edwardsville, and (5) Plymouth.

The authorized plan also contains substantial mitigation measures which more than offset the small increment of increased flooding caused by the project.

An extensive analysis was performed to determine the amount of increased flooding caused by the levee raising project. The levee raising project does have an impact on communities along the Susquehanna River from Duryea to Sunbury, however, the increase in flood damages is limited.

The authorized mitigation plan includes raising existing levees and floodwalls in five communities (Sunbury, Danville, Brookside, Miners Mills, and Duryea), constructing a new levee/floodwall and associated interior drainage facilities in one community (Wyoming/Exeter/West Pittston), undertaking non-structural measures in two communities (Plainsville and Port Blanchard), and removing an abandoned railroad bridge in one community (Bloomsburg). The current recommended plan would provide for construction of the currently authorized structural features at Sunbury and Bloomsburg, accompanied by a long-term non-structural and mitigation plan, and an inflatable dam on the Susquehanna River in the vicinity of Wilkes-Barre. The long-term plan consists of a flood damage reduction, flood insurance voucher, flood warning and response and a flood management program. With the exception of the flood warning program, these program elements would be implemented by a controlling agency, with funds provided to the agency in a two-time cash payment. The total cost of the recommended plan would be limited to $37 million.

The existing project provides protection against a design discharge of 232,000 cubic feet per second, a 50-year event. The design discharge for the proposed improvements is 318,500 cubic feet per second, a 370-year event, which takes into account the effects of the Cowanesque and Tioga-Hammond Lakes projects. Tropical storm Agnes in June 1972, the greatest flood of record, caused about $730 million in damages. A recurrence of storm Agnes would result in damages of approximately $2 billion. The total estimated cost is $134,000,000 of which $100,000,000 is federal and $34,000,000 is non-federal. The final Phase II General Design Memorandum is scheduled to be approved by Corps higher authority in June 1995 and project construction is to be initiated in March 1996.

Deauthorized Projects

Fall Brook (May 6, 1981)

Susquehanna River at Sunbury (Permanent Closure Structure) November 17, 1991.

Work Under Special Continuing Authorities

General authority is available to the Chief of Engineers to authorize the removal and accumulated snags and other debris, and the clearing and straightening of channels in navigable streams and tributaries for flood control. Such work has been performed above Sunbury in the Susquehanna River at the following location:

STREAM	LOCATION	YEAR	FEDERAL COST
Snagging and Clearing Projects			
Lackawanna River	Scranton, Lackawanna County	1942	$7,900

Emergency Bank Protection

Wilkes-Barre

After the 1948 flood, emergency riverbank stabilization was undertaken on the project at Wilkes-Barre and Hanover township. This work was completed in 1949 with federal and non-federal cost of $146,000 and $44,300, respectively.

Kingston-Edwardsville

Emergency work has been completed on the project at Kingston-Edwardsville, consisting of repairs to Toby Creek impounding basin, levee raising and seepage control. Initial work was completed in 1950 at a federal cost of $346,500. The subsided levee was raised again in 1964 for a federal cost of $32,000.

Sunbury

Emergency work has been completed on an existing levee (Mile Post Levee) north of Sunbury which was destroyed by the 1946 flood. The levee was restored to afford temporary protection to Sunbury during construction of the floodprotection project previously described in this pamphlet. The repairs were completed in 1947 for $3,800.

Wilkes-Barre and Hanover Township

Emergency work has been completed near Ross Street Pumping Station, Wilkes-Barre, consisting of about 2,230 feet of steel sheetpile wall driven into the levee crown. The wall restored the levee to project height where settlement had occurred from coal mining. The cost of emergency repairs, completed in 1959, was $335,400.

Additional levee restoration was accomplished in 1961 near the D&H Railroad Pumping Station, the Horton Street Pumping Station, and the Willow Street Relief Culvert. The work consisted of levee raising by impervious fill at a federal cost of $33,200.

In 1964 subsided levee sections scattered along the length of the project were raised at a federal cost of $45,500.

Swoyersville-Forty Fort

Emergency work has been completed on an existing Swoyersville-Forty Fort levee near the Forty Fort Cemetery. A 2,800 foot section of levees was severely eroded by flooding during March and April 1993, resulting in the removal of sediments and the collapse of trees. The levee was restored to afford interim remedial protection. Restoration of the levee to pre-event conditions will be incorporated as part of the Wyoming Valley Levee Raising Project. The interim repairs were completed in 1994 at a cost of $300,000.

Streambank Erosion Protection

(Section 14 of the 1946 Flood Control Act, as amended)

Solomon Creek, Ashley
Luzerne County

Construction of the streambank protection project was authorized on October 12, 1990, and consists of 30 feet of gabion retaining wall approximately 11 feet high. The project was completed in 1993, at a cost of $140,000.

Spring Brook Creek
Luzerne County

On January 26, 1989, the Chief of Engineers authorized construction of streambank protection consisting of excavation and backfilling of the existing streambank and placement of approximately 870 feet of stone riprap. Additional riprap is being placed as a betterment as proposed by the sponsor. The The project cost is $406,000. The sponsor contributed $115,000 and $40,000 for the betterment. The project was completed in 1990.

Tunkhannock Creek
Wyoming County

On September 22, 1988, the Chief of Engineers authorized the construction of streambank protection consisting of removal of a shoal in the creek and placement of fill material capped with stone riprap along, approximately 250 feet of the streambank. The project was completed in 1990 at a cost of $160,000.

Flood Plain Management Services

Section 206, Public Law 86-645

Section 206 of the Flood Control Act of 1960, as amended, provides authority for the Corps of Engineers to use its technical expertise in flood plain management matters to help both public and private interests. Upon request, the Corps will develop the flood plain information and technical

assistance needed in planning the prudent use of lands subject to flooding from streams, lakes, and oceans.

The objective of the Flood Plain Management Services (FPMS) Program is to support comprehensive flood plain management planning with technical services and planning guidance at all appropriate governmental levels; and thereby, to encourage and to guide them toward prudent use of the Nation's flood plains for the benefit of the national economy and welfare. People live and work on flood plains to take advantage of natural resources and convenient location, but these benefits must be weighed against the hazards caused by flooding. Land use adjustments based on proper planning and the employment of techniques for controlling and reducing flood damage provide a rational way to balance the advantages and disadvantages of human settlement on flood plains.

Upon request, the FPMS Program provides a full range of technical services and planning guidance on floods and flood plain issues within the broad umbrella of flood plain management. With the exception of requests from federal agencies and private persons, services are funded by the federal government. Involvement by project sponsors, who may furnish field survey data, maps, and historical flood information is encouraged.

a. General Technical Services. The Corps of Engineers obtains or develops and interprets data about the flood plain, including topics such as the timing and area inundated by various flood stages, water velocities, the width of the floodway and the natural values of flood plains. We also assess loss potential before and after employment of management measures and prepare flood stage inundation maps for communities served by existing flood warning and forecast systems. These maps show approximate areas of inundation limits for several different flood levels referenced to stages at a nearby stream gage. This information is used by emergency planners, residents and business owners to plan appropriate responsive action.

b. Planning Assistance. The Corps of Engineers provides planning assistance and guidance for development of flood plain regulations, flood warning and preparedness procedures, floodproofing measures, and permanent evacuation and relocation procedures. The Corps can provide a wide range of technical assistance for flood plain management and planning. We can assist a small community to predict the future flood plain and plan remedial modification. We also assess possible impacts of changes in land use of surrounding areas that may affect the flood plain. In cooperation with other federal, state and local agencies, we can assist flood-prone residents to plan for flood emergencies and make flood-damage reduction recommendations.

c. Guides, Pamphlets, and Supporting Studies. The Corps of Engineers conducts studies to improve methods and procedures for flood damage prevention and abatement. Our findings are used to develop guidance for floodproofing, flood plain occupants and regulations. The Corps' studies are also used for evaluating economics of flood plain values and regulations. These guidelines are published in pamphlets designed for federal agencies, state and local governments and private citizens in planning for action to reduce flood damages.

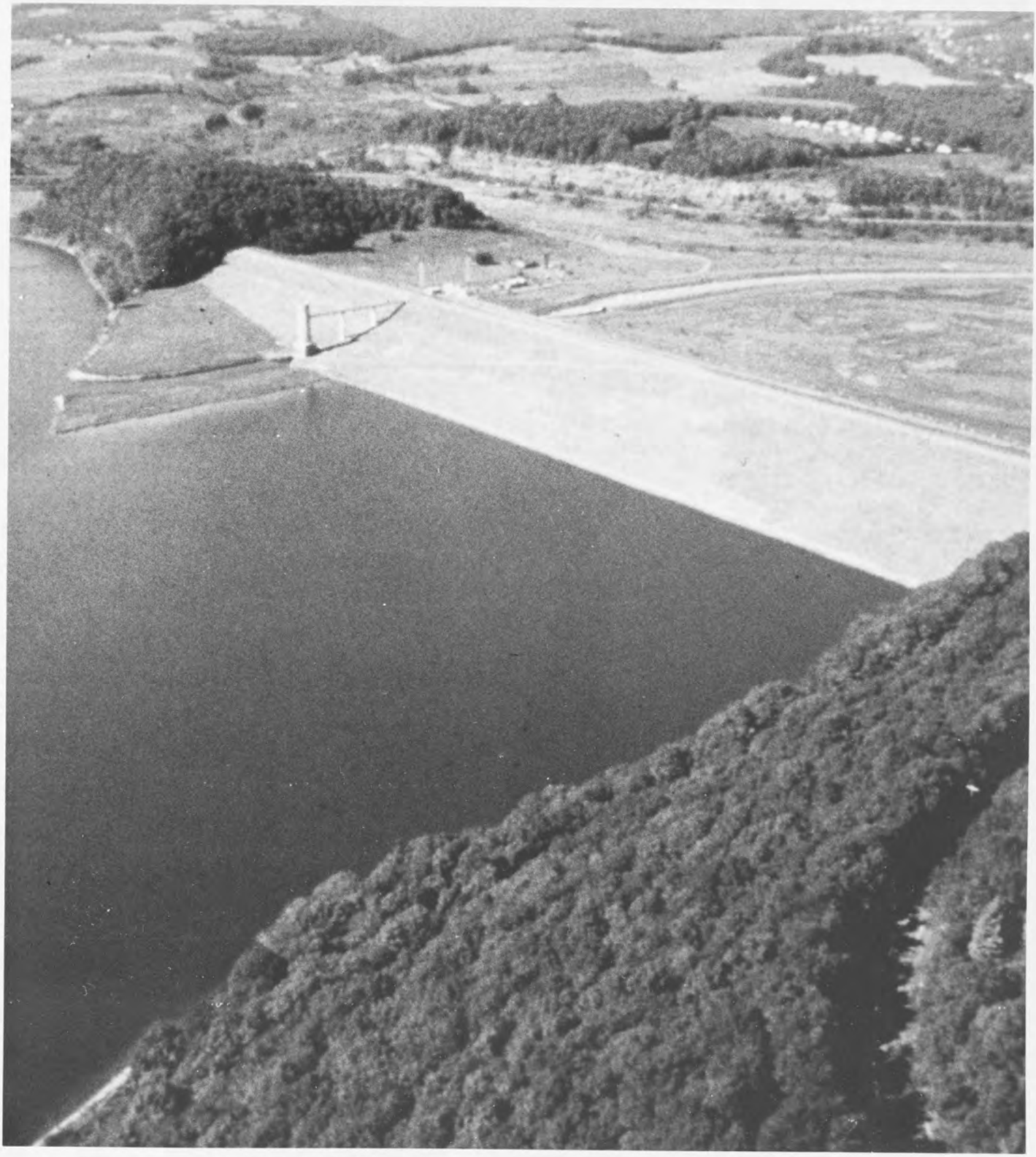
Section 206, Project Location	Date Completed
Shamokin Creek, Northumberland County, PA	1984
Susquehanna River and Lackawanna River, Wilkes-Barre, Luzerne County	1991
Susquehanna River, Shickshinny, Luzerne County	1992
Susquehanna River, Plymouth Township, Luzerne County	1992

Basin Development Investigations Under Way

NAME	PURPOSE	STATUS
Susquehanna River Basin Fish Restoration Study	Recently completed agreements between federal and state agencies and private hydropower developers provide for fish passage on the lower Susquehanna River. The reconnaissance study was undertaken to determine if previously constructed Corps projects in the Susquehanna River Basin would adversely affect the restoration of anadromous fish runs.	A reconnaissance report was completed in June 1993. Negotiations with potential feasibility study sponsors is ongoing.

NAME	PURPOSE	STATUS
	The feasibility study will evaluate methods to modify blockages to migratory fish runs and restore juvenile spawning habitat.	
Lackawanna River Corridor Greenway Reconnaissance Study	Reconnaissance study was done to develop a comprehensive river corridor greenway plan, with emphasis on examination of multiple purpose projects to provide for environmental restoration, river corridor recreation/public access, water quality improvements, flood damage reduction, flow management, and public education.	Reconnaissance report was completed in June 1993. Negotiations with potential non-federal feasibility study sponsors are ongoing.

Chapter 3



The West Branch Susquehanna River Basin

The West Branch Susquehanna River Basin, which is approximately 135 miles long and from 50 to 70 miles wide except in narrower headwater areas, is in north-central Pennsylvania. It constitutes the central and west-central part of the Susquehanna River Basin and is bounded by the basin above Sunbury on the north and east, the Susquehanna River Basin below Sunbury on the south, and the Ohio River Basin on the west. The basin is 6,990 square miles and is in Pennsylvania.

The West Branch Susquehanna River is 240 miles long, and rises on the Appalachian Plateau of the Allegheny front. It flows east toward Williamsport, then south to Sunbury. The principal tributaries to the West Branch are Clearfield, Sinnemahoning, Kettle, Bald Eagle, Pine, Lycoming, Loyalsock, and Muncy Creeks.

Floods in the West Branch usually occur between February and April, when snowmelt adds to heavy spring rains, increasing runoff in the basin. Major floods, however, have occurred during the summer and fall due to hurricane activity, such as the flood of June 1972.

Three multipurpose dam projects authorized by Congress for construction in the West Branch Basin have been completed and are in operation. The completed projects are Foster Joseph Sayers Dam on Bald Eagle Creek, Alvin R. Bush Dam on Kettle Creek, and Curwensville Lake on the West Branch Susquehanna River. All three were authorized by the Flood Control Act of September 3, 1954. In addition, the George B. Stevenson Dam on the First Fork Sinnemahoning Creek, constructed and operated by the Commonwealth of Pennsylvania, forms part of the basin-wide flood control plan. Releases from the reservoir during flood periods are directed by the Corps of Engineers.

There are three completed local flood-protection projects in the basin. They are Williamsport, authorized by the Flood Control Act of June 22, 1936, Loyalsock, authorized by Section 205 of the Flood Control Act of 1948, as amended, and the recently completed Lock Haven project. The flood-protection projects offer protection to Williamsport, South Williamsport and Loyalsock, with additional protection provided by the dams upstream.

A detailed description of projects in the basin, with their status, follows.

Projects Completed

FLOOD CONTROL

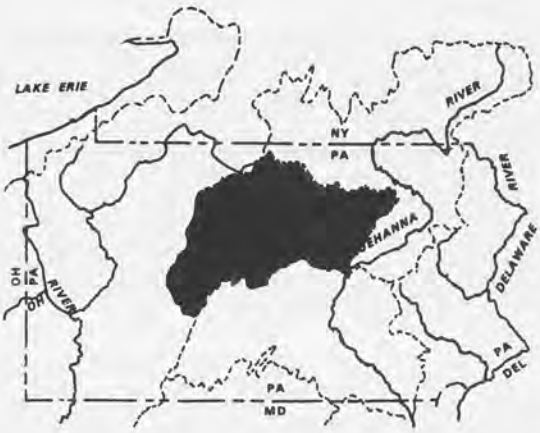
Curwensville Lake

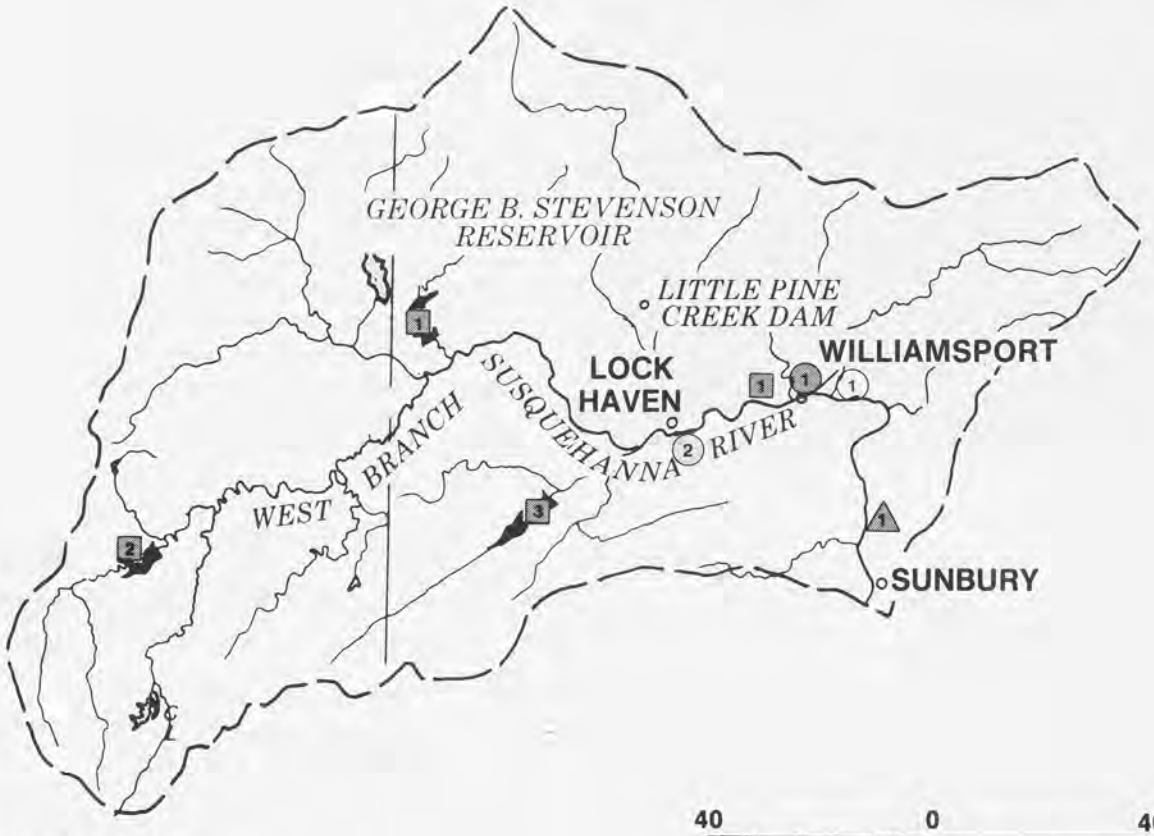
Curwensville Lake.

Unlike the other three dams included in the West Branch Basin plan which are located on tributary streams Curwensville Dam is on the West Branch Susquehanna River. It is located about 0.6 mile upstream from the Route 453 bridge near the southern limits of Curwensville in Clearfield County. The drainage area above the dam is 365 square miles. The reservoir, when filled with flood-waters to spillway crest, will extend upstream approximately 14 miles. A recreation lake of 790 acres is provided in the summer. The recreation area, operated by Clearfield County, provides facilities for boating, swimming, picnicking and camping. Recreation attendance in 1991 was 23,600 visitor hours.

The dam is a rolled earthfill structure, which rises 131 feet above the streambed of the West Branch Susquehanna River and extends 2,850 feet across the valley. The river flow is carried through a gate-controlled outlet tunnel. Operation and maintenance is done by the Corps of Engineers except for the recreation facilities. The dam will produce substantial stage reductions at Curwensville and

The West Branch Susquehanna River Basin





1 ALVIN R. BUSH DAM
2 CURWENSVILLE LAKE
3 FOSTER JOSEPH SAYERS DAM

(1) LOYALSOCK TOWNSHIP LEVEE

(1) WILLIAMSPORT LEVEE
(2) LOCK HAVEN LEVEE & FLOODWALL

1 MILTON

1 WILLIAMSPORT CHANNEL

LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	1	1	1	1
LOCAL PROTECTION	(1)	(1)	(1)	(1)
OTHER IMPROVEMENTS	1	1	1	1

Alvin R. Bush Dam.

Williamsport during 1946 flood.

Clearfield, and, as a part of the basin plan, will benefit all downstream localities. For example, should the 1936 flood recur, the dam would reduce the flood stage at Clearfield by more than 5 feet. The federal cost was $20,396,060 in 1965.

Flood damages prevented through 1993 are estimated at $152,173,000, of which $16,800,000 was prevented during the flood of June 1972 caused by tropical storm Agnes; an additional $16,225,000 was prevented during the September 1975 flood caused by tropical storm Eloise.

Foster Joseph Sayers Dam

Foster Joseph Sayers Dam is on Bald Eagle Creek approximately one mile upstream from Blanchard and 14 miles upstream from Lock Haven, where the stream enters the West Branch Susquehanna River. The drainage area above the dam site is 339 square miles. The lake, in Centre County, is nearly 10 miles long at spillway crest. Part of the borough of Howard is below the maximum lake elevation and is protected by 6,700 feet of earth levee. A conservation lake is provided for recreation. The dam is an earthfill structure 100 feet high with a top length of 6,835 feet; it provides 99,000 acre-feet of storage to spillway crest. There is a conduit through the dam with a gated outlet for control of flood flows. Construction began in April 1965 and was operationally complete in August 1969.

This project substantially reduces flood heights at Lock Haven and Jersey Shore, and contributes to substantial flood control benefits throughout the lower valley. The project is maintained and operated by the Corps of Engineers except for certain recreation and sanitary facilities operated and maintained by the Commonwealth of Pennsylvania and Howard borough. The major recreational facilities were completed in March 1972. Recreation attendance for 1989 at Bald Eagle State Park was 1,430,900 visitor hours. The federal cost was $30,887,063. Non-federal cost is estimated at $1,888,900. Flood damages prevented through 1993 are estimated at $209,110,000, of which $43,500,000 was prevented during the flood of June 1972.

Alvin R. Bush Dam

The Alvin R. Bush Dam in Clinton County is on Kettle Creek about 8.4 miles above its confluence with the West Branch Susquehanna River and 14.4 miles upstream from Renovo. The lake formed by the dam extends 8.8 miles upstream when filled to spillway crest. The dam controls a drainage area of 226 square miles. A recreation area, including a bathing beach with a dressing stockade, boat-launching ramp and dock facility, a picnic area, and a camping area is provided about one mile upstream from the dam. Water quality in Kettle Creek is exceptionally good, making the lake popular for swimming and fishing. Recreation facilities on the 160-acre conservation lake are operated and maintained by the Commonwealth of Pennsylvania. Recreation attendance in 1989 was 564,300 visitor hours.

Alvin R. Bush Dam, an earth and rockfill structure, rises 165 feet above the streambed and measures 1,350 feet along the crest. The dam provides a storage capacity of 75,000 acre-feet, equivalent to 6.22 inches of runoff from the drainage area. An ogee weir spillway is in the right abutment; a gate-controlled outlet tunnel regulates floodflows. Federal cost was $7,103,001.

Renovo, the first urban center downstream from the dam receives major flood control benefits. Alvin R. Bush Dam also materially reduces flood stages at other downstream points. About $359,655,000 in flood damages has been prevented through fiscal year 1993 by this project, including $64,300,000 prevented during the 1972 flood.

Adjacent to Kettle Creek Watershed is the First Fork Sinnemahoning Creek Watershed and George B. Stevenson Dam, constructed by the Commonwealth of Pennsylvania as part of the basin plan for West Branch Susquehanna River. The dam controls a drainage area of 243 square miles. During floods, the Commonwealth of Pennsylvania operates the dam under the direction of the Corps of Engineers. This joint effort is necessary to ensure coordination with other reservoirs to secure maximum flood control benefits.

Loyalsock Township (Bull Run)

Loyalsock township is in Lycoming County on the West Branch Susquehanna River downstream from Williamsport. The project includes alterating the Williamsport Beltway highway embankment by incorporating an impervious core of 4,100 feet. The embankment serves as a levee to provide protection

from flood stages on the West Branch. A pumping station with associated drainage structures is located at the Bull Run culvert and prevents flooding from coincidental interior drainage on Bull Run. An upstream tie-back levee protects against flooding on Millers Run and a downstream tie-back levee extends from the highway embankment to high ground. The project provides protection against a flood equal to the June 1972 flood caused by tropical storm Agnes. The total cost of the project was $2,902,000. The project was completed in fiscal year 1983.

Williamsport

The city of Williamsport, the county seat of Lycoming County, is on the left bank of the West Branch Susquehanna River. A major tributary, Lycoming Creek, flows through the western or upstream section of the city. The project also includes protection for the borough of South Williamsport, which is opposite the city on the south bank of the river. The project provides metropolitan Williamsport protection against flood discharges equal to those of March 1936, the greatest flood of record. It includes 70,520 feet of earth levee and 4,125 feet of concrete wall along the river and on both banks of Lycoming Creek. Ten pumping stations, seven in Williamsport, and three in South Williamsport, discharge storm runoff through the protective barrier during floods. An additional pumping station was provided by Williamsport. A reinforced concrete flume and conduit, 1,860 feet long in South Williamsport, carries the flow from Hagermans Run to the river. Additional protection is provided by the system of dam projects for the West Branch, which have previously been discussed. The total federal and non-federal costs were $12,819,893 and $2,158,500, respectively. In addition, remedial work funds of $113,993 have been expended to December 31, 1977. The project was completed in 1955. Flood damages prevented are estimated at $790,977,000 for fiscal year 1993.

Lock Haven

The city of Lock Haven is on the riverbank of the West Branch Susquehanna River in Clinton County. The project provides protection for Lock Haven and Castanea township. The project provides for approximately 36,600 feet of earth levee along the east, north and south side of the city, and approximately 1,000 feet of floodwall with associated interior drainage facilities. Also part of the project are mitigation features in Woodward township, and recreation components. The maximum flood of record on the West Branch (238,000 cubic feet per second) was in March 1936. The project was completed in November 1994 at a cost of $85 million.

Deauthorized Projects

Marsh Creek Bridge (repair) November 17, 1991

Curwensville Lake (waterline) November 17, 1991

Small Navigation Project

SECTION 107, PUBLIC LAW 86-645 COMPLETED

Susquehanna River at Williamsport

This project is located in Lycoming County, 40 miles above the mouth of the West Branch Susquehanna River. It provides a channel 5 feet deep below extreme low water, varying from 180 feet to 500 feet wide. The project is 11.4 miles long from mile 40.0 to mile 51.4 of the West Branch Susquehanna River. The estimated cost is $100,980, of which $60,980 is federal and $40,000 non-federal. Benefits to be derived from this improvement are primarily prevention of boat damages and increased recreational boating in the area. The project was completed in 1972.

Emergency Flood Control Activities

The Chief of Engineers can authorize removal of accumulated snags and other debris, and the clearing and straightening of channels in navigable streams and tributaries for flood control. This has been done in the West Branch Susquehanna River Basin at the following locations:

STREAM	LOCATION	YEAR	FEDERAL COST
Snagging and Clearing Projects			
West Branch Susquehanna River	Milton, Northumberland County	1951	$35,500

Flood Plain Management Services

Section 206, Public Law 86-645

Section 206 of the Flood Control Act of 1960, as amended, provides authority for the Corps of Engineers to use its technical expertise in flood plain management matters to help both public and private interests. Upon request, the Corps will develop the flood plain information and technical assistance needed in planning the prudent use of lands subject to flooding from streams, lakes, and oceans.

The objective of the Flood Plain Management Services (FPMS) Program is to support comprehensive flood plain management planning with technical services and planning guidance at all appropriate governmental levels; and thereby, to encourage and to guide them toward prudent use of the Nation's flood plains for the benefit of the national economy and welfare. People live and work on flood plains to take advantage of natural resources and convenient location, but these benefits must be weighed against the hazards caused by flooding. Land use adjustments based on proper planning and the employment of techniques for controlling and reducing flood damage provide a rational way to balance the advantages and disadvantages of human settlement on flood plains.

Upon request, the FPMS Program provides a full range of technical services and planning guidance on floods and flood plain issues within the broad umbrella flood plain management. With the exception of requests from federal agencies and private persons, services are funded by the federal government. Involvement by project sponsors, who may furnish field survey data, maps, and historical flood information is encouraged.

a. General Technical Services. The Corps of Engineers obtains or develops and interprets data about the flood plain, including topics such as the timing and area inundated by various flood stages, water velocities, the width of the floodway and the natural values of flood plains. We also assess loss potential before and after employment of management measures and prepare flood stage inundation maps for communities served by existing flood warning and forecast systems. These maps show approximate areas of inundation limits for several different flood levels referenced to stages at a nearby stream gage. This information is used by emergency planners, residents and business owners to plan appropriate responsive action.

b. Planning Assistance. The Corps of Engineers provides planning assistance and guidance for development of flood plain regulations, flood warning and preparedness procedures, floodproofing measures, and permanent evacuation and relocation procedures. The Corps can provide a wide range of technical assistance for flood plain management and planning. We can assist a small community to predict the future flood plain and plan remedial modification. We also assess possible impacts of changes in land use of surrounding areas that may affect the flood plain. In cooperation with other federal, state and local agencies, we can assist flood-prone residents to plan for flood emergencies and make flood-damage reduction recommendations.

c. Guides, Pamphlets, and Supporting Studies. The Corps of Engineers conducts studies to improve methods and procedures for flood damage prevention and abatement. Our findings are used to develop guidance for floodproofing, flood plain occupants and regulations. The Corps' studies are also used for evaluating economics of flood plain values and regulations. These guidelines are published in pamphlets designed for federal agencies, state and local governments and private citizens in planning for action to reduce flood damages.

LOCATION	Date Completed
Section 206, Project Location	
Loyalsock Creek, Williamsport, Lycoming County	1984
West Branch Susquehanna River, Muncy, Lycoming County	1988
West Branch Susquehanna River, Williamsport, Lycoming County	1984
West Branch Susquehanna River and Bald Eagle Creek, Lock Haven, Clinton County	1986
West Branch Susquehanna River, Jersey Shore, Lycoming County	1984
West Branch Susquehanna River, Various Locations, Clinton County	1984

Basin Development Investigations Under Way

NAME	PURPOSE	STATUS
Susquehanna River Basin Fish Restoration Study	Recently completed agreements between federal and state agencies and private hydropower developers provide for fish passage on the lower Susquehanna River. The reconnaissance study was undertaken to determine if previously constructed Corps projects in the Susquehanna River Basin would adversely affect the restoration of anadromous fish runs. The feasibility study will evaluate methods to modify blockages to migratory fish runs and restore juvenile spawning habitat.	A reconnaissance report was completed in June 1993. Negotiations with potential feasibility study sponsors is ongoing.
Milton Local Flood Protection Study	Over the past 60 years, the Milton area has experienced 6 major floods. The greatest flood of record occurred in June 1972 (tropical storm Agnes) and caused damages equivalent to $75 million (1994 price level). The reconnaissance study will consider both structural and non-structural measures to reduce the community's flood damages	The reconnaissance study was initiated in April 1994; a reconnaissance report will be completed in March 1995.

Project Not Started

NAME	PURPOSE	STATUS
Curwensville Lake Reallocation Project	The Curwensville Lake Reallocation Project was authorized in November 1992, when the Chief of Engineers approved the Final Feasibility Report/ Environmental Impact Statement. The project will reallocate up to 5,360 acre-feet of conservation storage at Curwensville Lake to meet the need for consumptive use make-up flow for downstream municipal and industrial users during low-flow periods. The reallocation project includes the provision of a year-round normal pool and modifications to the recreation area to minimize adverse effects to recreational use of the lake. The reallocation will cause no measurable loss in the existing flood control protential of Curwensville Lake.	Water supply agreement was executed in September 1994. Plans and specifications were initiated in October 1994. Construction of project modifications is scheduled to begin in Spring 1996.

NAME	PURPOSE	STATUS
Curwensville Lake Reallocation Project (cont'd.)	The cost of the modifications and operation of the reallocated water supply storage will be funded 100% by the non-federal sponsor, the Susquehanna River Basin Commission. In addition, the non-federal sponsor will reimburse the federal government for part of the original reservoir construction, proportional to the amount of water supply storage purchased.	

Chapter 4

The Susquehanna River Basin Below Sunbury

The Susquehanna River Basin below Sunbury is 9,200 square miles in south central Pennsylvania and northeastern Maryland. The basin forms the lower third of the Susquehanna River Basin, and is bounded by the Ohio River Basin on the west, the Delaware River Basin on the east, the Potomac River and Chesapeake Bay Basins on the south, and the West Branch and Upper Susquehanna River Basins on the north.

The Susquehanna River below Sunbury flows southeasterly 123 miles from Sunbury to the Chesapeake Bay. The principal tributary is the Juniata River, which enters the Susquehanna about 38 miles below Sunbury and drains 3,409 square miles in the west part of the basin. Another tributary to the Susquehanna below Sunbury, is Codorus Creek, which flows northeasterly and enters the river from the west about 20 miles below Harrisburg.

Two multipurpose dam projects were authorized for construction by Congress. Both are in operation. The projects are Indian Rock Dam on Codorus Creek, authorized by the Flood Control Act of June 22, 1936 as amended by the Flood Control Act of June 28, 1938 and Raystown Lake on the Raystown Branch of the Juniata River, authorized by the Flood Control Act of 1962. The Raystown Lake project was completed in 1973.

Two local flood protection projects have been authorized. The York local flood protection project, also authorized under the Flood Control Acts of June 1936 and 1938, is in operation; in conjunction with the Indian Rock Dam, it provides direct flood protection for York. A local flood protection project at Tyrone on the Little Juniata River, authorized by the Flood Control Act of 1944, was partly constructed and the balance of the project has been deferred.

Projects Completed

FLOOD CONTROL

Raystown Lake

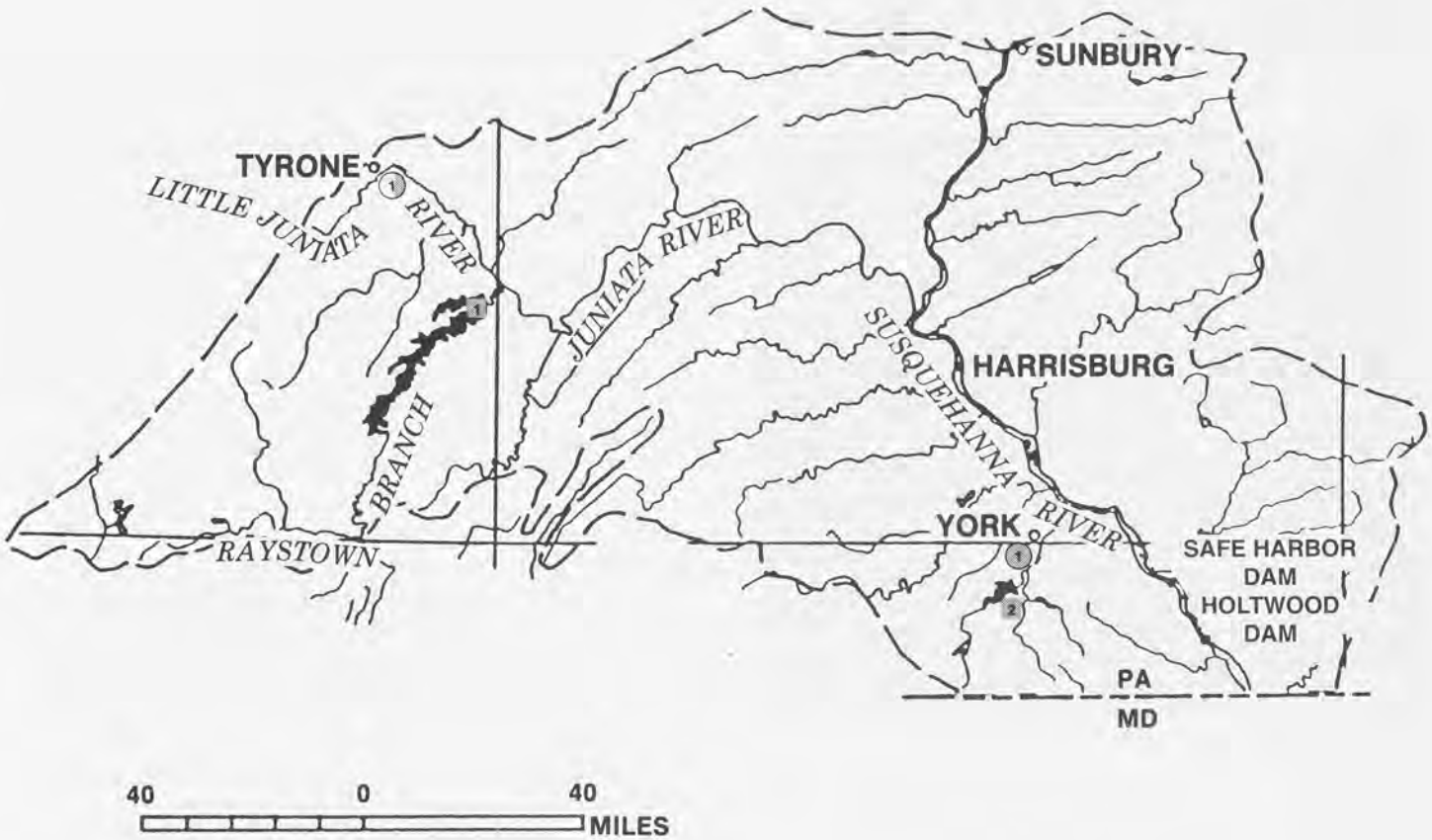
The dam forming Raystown Lake is located on the Raystown Branch about 5.5 miles upstream from its confluence with the Juniata River. The lake provides flood control, recreation, an enhanced fishery, and water quality control. The dam controls a drainage area of 960 square miles. The flood control pool will extend 34 miles near Saxton and will inundate 10,800 acres. The conservation lake was opened to the public early in 1975. At normal level it is 27 miles long and has an area of 8,300 acres. The flood control storage available above the conservation lake is 248,000 acre-feet, equal to 5 inches of runoff from the drainage area.

The dam is of earth and rockfill construction with a maximum height of 225 feet and top length of 1,700 feet. A gate-controlled spillway and an uncontrolled spillway are located in a saddle in the spur of Terrace Mountain on the right abutment 2,300 feet from the dam. Construction was started in 1968 and was completed in 1973.

The flood control storage provided by Raystown Lake reduces flood stages along the Juniata River and the Lower Susquehanna River. The project is expected to reduce flood damages 73 percent along the Juniata and 11 percent along the lower Susquehanna. The project has prevented flood damages estimated at $207,084,000 for fiscal year 1993, of which $60,000,000 were prevented by the partially completed embankment during the flood of June 1972.

Raystown Lake

The Susquehanna River Basin Below Sunbury



1 RAYSTOWN LAKE
2 INDIAN ROCK DAM
1 YORK LEVEE & CHANNEL
1 TYRONE LEVEE

LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	1	1	1	1
LOCAL PROTECTION	1	1	1	1
OTHER IMPROVEMENTS	1	1	1	1

Tyrone. Flooding on South Logan Avenue in vicinity of Moose Hall during tropical storm Agnes in June 1972.

Indian Rock Dam.

Also Allegheny Electric Cooperative Inc. of Harrisburg. Pennsylvania constructed a 20 megawatt conventional hydropower facility which uses scheduled water releases from Raystown Dam to produce an average annual output of 77 million kilowatt hours, or enough to supply approximately 7,700 typical rural homes. The facility became operational in the spring of 1988. One of the better recreational areas in Pennsylvania is near the Raystown Branch. The federal government has developed it for all types of recreational activities including swimming, boating, fishing, camping, hunting, and picnicking. Fish and wildlife development are managed through the cooperative efforts of the Corps of Engineers and appropriate state agencies. Recreational attendance in 1991 was 8,281,300 visitor hours.

The cost of the Raystown project was $77,408,770.

Tyrone

Tyrone, an incorporated borough on the left bank of the little Juniata River, is about 116 miles above the mouth of the Juniata River. Construction began July 1972 and the completed portions were accepted by local interests on October, 1980. The completed portions consist of Schell Run concrete conduit with an intake structure and debris basin at the upstream end, and a stilling basin at the Little Juniata River. The Sink Run Diversion to Schell Run consists of a dike and concrete tunnel about a mile upstream from the borough. The remainder of the project has been deferred.

York Local Flood Protection Project and Indian Rock Dam

The city of York, the county seat of York County, is on Codorus Creek about 10 miles above its confluence with the Susquehanna River. The flood control project consists of Indian Rock Dam and improvement of the Codorus Creek channel in and near the city. The two components afford protection against flood discharges about 30 percent greater than the August 1933 flood. Indian Rock Dam is located about 3 miles upstream from York. The dam is an earth and rockfill structure, 83 feet high, with side-channel spillway. It controls runoff from 94 square miles on the main branch of Codorus Creek, or 41 percent of the total drainage area above York. A storage capacity of 28,000 acre-feet is provided, all of which is reserved for flood control. There is no permanent pool. A 15-foot diameter circular tunnel controlled by three 6 by 13-foot vertical-lift gates is provided to release water to the downstream areas. During floods the gates can be closed to stop all flow in the main branch of the creek at this point. Flow through York is then limited to the discharge from the South Branch and other tributary streams. The channel improvements on Codorus Creek extend 22,969 feet and include widening, deepening, protection of bank slopes, and levee construction. Indian Rock Dam was completed in 1942; the channel improvements were operationally complete in 1947. The total federal cost was $5,061,167. Flood damages estimated at $133,673,000 have been prevented, to date for fiscal year 1993, including $23,000,000 prevented during the flood of June 1972, and $27,000,000 prevented during tropical storm Eloise in September 1975.

Work Under Special Continuing Authorities

Flood Plain Management Services (Section 206, Public Law 86-645)

Section 206 of the Flood Control Act of 1960, as amended, provides authority for the Corps of Engineers to use its technical expertise in flood plain management matters to help both public and private interests. Upon request, the Corps will develop the flood plain information and technical assistance needed in planning the prudent use of lands subject to flooding from streams, lakes, and oceans.

The objective of the Flood Plain Management Services (FPMS) Program is to support comprehensive flood plain management planning with technical services and planning guidance at all appropriate governmental levels; and thereby, to encourage and to guide them toward prudent use of the Nation's flood plains for the benefit of the national economy and welfare. People live and work on flood plains to take advantage of natural resources and convenient location, but these benefits must be weighed against the hazards caused by flooding. Land use adjustments based on proper planning and the employment of techniques for controlling and reducing flood damage provide a rational way to balance the advantages and disadvantages of human settlement on flood plains.

Upon request, the FPMS Program provides a full range of technical services and planning guidance on floods and flood plain issues within the broad umbrella of flood plain management. With the exception of requests from federal agencies and private persons, services are funded by the federal government. Involvement by project sponsors, who may furnish field survey data, maps, and historical flood information is encouraged.

a. General Technical Services. The Corps of Engineers obtains or develops and interprets data about the flood plain, including topics such as the timing and area inundated by flood warning and forecast systems. These maps show approximate areas of inundation limits for several different flood levels referenced to stages at a nearby stream gage. This information is used by emergency planners, residents and business owners to plan appropriate responsive action.

b. Planning Assistance. The Corps of Engineers provides planning assistance and guidance for development of flood plain regulations, flood warning and preparedness procedures, floodproofing measures, and permanent evacuation and relocation procedures. The Corps can provide a wide range of technical assistance for flood plain management and planning. We can assist a small community to predict the future flood plain and plan remedial modification. We also assess possible impacts of changes in land use of surrounding areas that may affect the flood plain. In cooperation with other federal, state and local agencies, we can assist flood-prone residents to plan for flood emergencies and make flood-damage reduction recommendations.

c. Guides, Pamphlets, and Supporting Studies. The Corps of Engineers conducts studies to improve methods and procedures for flood damage prevention and abatement. Our findings are used to develop guidance for floodproofing. flood plain occupants and regulations. The Corps' studies are also used for evaluating economics of flood plain values and regulations. These guidelines are published in pamphlets designed for federal agencies, state and local governments and private citizens in planning for action to reduce flood damages.

LOCATION	DATE COMPLETED
Susquehanna River, Harrisburg, Dauphin County	1987
Juniata River, Huntington County	1986
Paxton Creek, Harrisburg, Dauphin County	1984
Bald Eagle Creek, Tyrone, Blair County	1989

Flood Control (Section 205, Public Law 80-858, as amended)

Paxton Creek, Harrisburg

An investigation into the feasibility of improving the existing flood warning system for Paxton Creek was completed in June 1992. The recommended plan identified for implementation of a new base station, utilization of a flood warning dissemination service, a flood stage forecast model, an additional rain gauge, and solar panels on existing gauges. Construction of the project was completed in June 1994, at a cost of $152,000.

Basin Development Investigations Under Way

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Basin Development		
Susquehanna River Basin Water Management	The study area encompasses the Susquehanna River Basin and its 27,510-square mile drainage area which includes portions of New York, Pennsylvania, and Maryland. This study will develop a comprehensive plan to manage existing reservoir storage in an effort to maintain and enhance aquatic resources as well as minimize flood related damages in the Susquehanna River Basin.	The reconnaissance study was was initiated in April 1995 and was completed in March 1996.
Juniata River Basin Study	The Juniata River Basin study was authorized by House Committee on Public Works and Transportation dated 24 September 1992 which directs the Corps to create a comprehensive plan for the Juniata River Basin. The objective of the reconnaissance study is to develop a comprehensive plan which identifies projects that address: flood damage reduction; restoration of fish and wildlife habitat; water quality improvement; restoration of public access to the river; and the creation of recreation opportunities in the basin.	The reconnaissance study was initiated in April 1994 and was completed in September 1995.
South Central Pennsylvania Environmental Infrastructure Study	**A. Masterplanning.** The South Central Pennsylvania Environmental Infrastructure Study was authorized by Section 313 of the Water Resources Development Act of 1992 which directs the Secretary of the Army to establish a pilot program for providing environmental assistance to non-federal interests in south central Pennsylvania. The study area is defined as a six county area which includes Bedford, Blair, Cambria, Fulton, Huntingdon and Somerset counties. The scope of study includes water-related environmental infrastructure, and resource protection and development projects, including water supply, storage, treatment and distribution facilities; surface water protection and development; and waste-water treatment facilities; surface water protection and development; and waste-water treatment facilities. The projects identified in the report may be provided design and construction assistance by the Corps in subsequent years, if funding is appropriated.	The study was initiated in April 1994 and was completed in March 1995.

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Basin Development (continued)		
South Central Pennsylvania Environmental Infrastructure Study (Cont'd.)	**B. Design and Construction.** The 1994 Energy Water Appropriation Act identified $4.5 million for design and construction assistance for water system improvements for the Altoona City Authority, PA. The Authority's project, the Mill Run Water Treatment Facility, is under final design review by the Corps. The 1995 Energy & Water Appropriation Act identified $1.75 million for design and construction of an adequate sewer management system for Broad Top Township and Coaldale Borough, and $1.75 million for design and construction of public sewerage projects for the Chestnut Ridge Area Joint Municipal Authority. The Corps is coordinating with the potential non-federal sponsors regarding design of these projects.	Mill Run project design completed May 1995, and Project Construction to be completed in 1997. Chestnut Ridge and Broad Top/ Coaldale project schedule remains undetermined.
Broad Top Region of Pennsylvania	**A. Masterplanning.** The Broad Top Region of Pennsylvania study was authorized by Section 304 of the Water Resources Development Act of 1992 which directs the Secretary of the Army to develop and carry out watershed reclamation and protection and a wetlands creation and restoration project along the Juniata River and its tributaries. The planning effort developed a demonstration or pilot project to restore and maintain the physical, chemical, and biological integrity of specific water resources in the Broad Top Region of Bedford, Fulton and Huntingdon counties. The pilot project concept plan focuses on solutions to acid mine drainage, water supply and water quality problems at an abandoned surface mine site approximately 400 acres in size which is part of the East Broad Top Railroad and Coal Company holdings in the Broad Top Region. This site is known locally as the "Bikini Site." Additionally, a watershed restoration plan was developed, including innovative reclamation technologies; the removal of public safety hazards; and the development of recreational, cultural, and economic resource opportunities.	The study was initiated in April 1994 and was completed in March 1995.
	B. Design and Construction. Based on the above masterplanning study, a pilot project was initiated, focusing on reclamation of acid mine lands, water quality problems related to acid mine drainage, municipal water supply, and	Project design scheduled for completion in 1997.

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Basin Development (continued)		
Broad Top Region of Pennsylvania (Cont'd)	environmental restoration of a 200-acre site known as the "Bikini Site." The Corps has initiated coordination with potential non-federal sponsors regarding final design and construction of the "Bikini Site" pilot project. Project design and construction would be cost-shared 75% federal and 25% non-federal.	
Middle Creek (Mussers) Dam, Snyder County	The Water Resources Development Act of 1992 authorized the Corps of Engineers to provide planning, engineering, design, construction, technical, and other assistance to non-federal interests for the repair, reconstruction, replacement or modification to Middle Creek (Mussers) Dam as necessary to bring the dam into compliance with FERC safety requirements. The total project cost is to be cost-shared 75% federal, and 25% non-federal. The 1995 Appropriations Act included $100,000 to initiate engineering and design for the project. With the funds received in fiscal year '95, the Baltimore District is identifying a non-federal sponsor, and will provide them technical assistance by conducting geotechnical and environmental baseline investigations which would be necessary for any further work.	
Raystown Lake Reallocation Study	The Raystown Lake Reallocation Study was authorized as a result of the recommendations of the Chesapeake Bay and Tributaries Reallocation Study. The purpose of the study was to determine the feasibility of reallocating some flood control and/or conservation storage at Raystown Lake to meet the flow needs in the lower Susquehanna River. The study evaluated the beneficial and adverse impacts of storage reallocation, as well as the costs of the necessary project modifications. The Raystown feasibility study was initiated in February 1990. In March 1992, the Corps of Engineers and the non-federal sponsors agreed to suspend the feasibility study due to the lack of justification for downstream flow needs.	Study suspended March 1992.

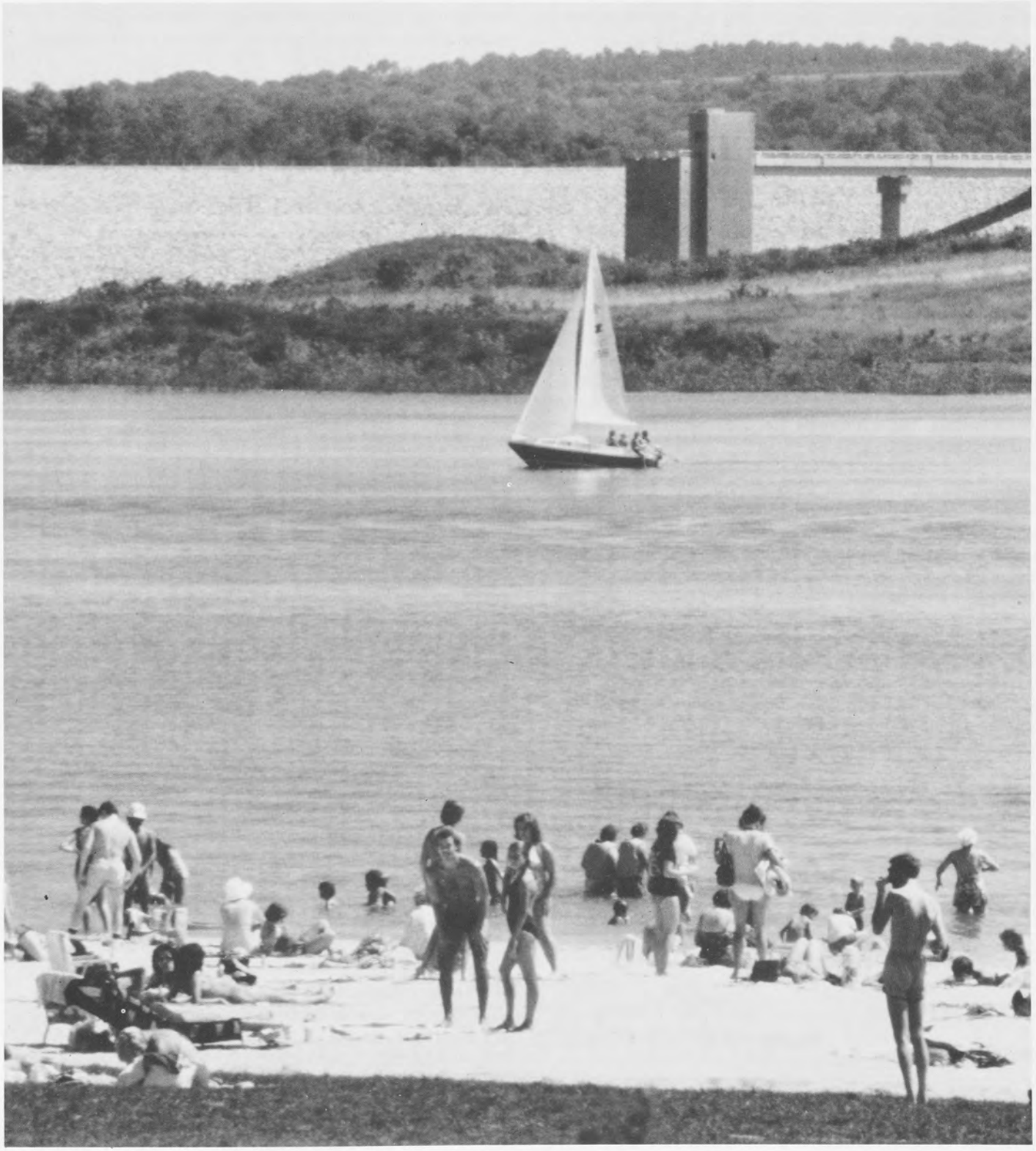
NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Basin Development (continued)		
Juniata River Basin Flood Warning Study	The Juniata River Basin Flood Warning Study was authorized by Section 17 of the Water Resources Development Act of 1988. The purpose of the study was to design and implement a comprehensive flood warning and response system to serve the flood-prone communities along the Juniata River and its tributaries. The Juniata flood warning reconnaisance study was initiated in May 1990, and completed in April 1991. The reconnaissance study evaluated the most cost-effective warning equipment and measures required to supplement the existing system in the Juniata River basin and define the federal interest in potential solution.	Completed in April 1991
Susquehanna River Basin Fish Restoration Study	Recently completed agreements between federal and state agencies and private hydropower developers provide for fish passage on the lower Susquehanna River. The reconnaissance study was undertaken to determine if previously constructed Corps projects in the Susquehanna River Basin would adversely affect the restoration of anadromous fish runs. The feasibility study will evaluate methods to modify blockages to migratory fish runs and restore juvenile spawning habitat.	A reconnaissance report was completed in June 1993. Negotiations with potential feasibility study sponsors is ongoing.

Other Authorized Project

Susquehanna Basin at Harrisburg

Work on the authorized project during the pre-construction engineering and design phase was terminated in 1989 when it was determined that the project was no longer economically justified. Subseqauently, the project was placed in the inactive category in 1991.

Chapter 5



Delaware River Basin

The Delaware River rises on the western slopes of the Catskill Mountains in southeastern New York and flows in a southwestern direction as separate East and West Branches to confluence at Hancock, N.Y. The river then flows southeasternly toward Port Jervis, N.Y., forming the boundary between New York and Pennsylvania. The Lackawaxen, Mongaup and Neversink rivers are the major tributaries in this reach. From Port Jervis to Trenton, N.J., the river flows in an irregular path through mountainous and moderately rolling country to the Delaware Water Gap, meeting the coastal plain and tidal reach at Trenton. The Delaware then enters its tidal estuary and flows southwesterly to Delaware Bay, emptying into the Atlantic Ocean at Cape May, New Jersey and Cape Henlopen, Delaware. The river also serves as the boundary between Pennsylvania and New Jersey, and New Jersey and Delaware.

The length of river from its source to the head of the bay is 367 miles, with an additional 48 miles to the ocean. The two major tributaries, the Lehigh and Schuylkill Rivers, enter the Delaware at Easton, Pa., and Philadephia, Pa., respectively. The drainage area of the entire basin is 12,765 square miles, which does not include the water area of the bay.

The Delaware River Basin is an area of irregular outline, the greatest dimensions of which are approximately 250 miles north-south and somewhat less than 100 miles east-west; situated between the river valleys of the Hudson River to the east and the Susquehanna on the west. The geographical center of the basin, near Allentown, Pa., is about 100 miles due west of New York City. The Delaware's waters rise at upstream elevation up to 4,000 feet above sea level and flow to tidewater at Trenton. The entire drainage basin, except for 8 square miles in the northeast corner of Maryland, lies in Delaware, New Jersey, New York and Pennsylvania.

The water resources of the Delaware River Basin contribute to the economic and social well-being of approximately 22 million people who live within the area that is or can be serviced, wholly or in part, by its water.

The basin's water resources furnish about three billion gallons of water each day for use in homes, offices, farms, factories, irrigated lands and for other uses. In addition, approximately 3.4 billion gallons per day are used for cooling purposes by steam electric-generating plants. The waters of the basin support the transport of over 100 million tons of goods into and out of the ports of the Delaware River and bay annually. Its waters also provide extensive outdoor recreation opportunities from the headwaters to the Atlantic Ocean.

Lack of control over these waters resulted in the loss of more than 90 lives and in $100 million in damages during the floods produced by Hurricanes Connie and Diane in August 1955. Absence of flow regulation has also resulted in serious local water shortages such as those of 1957, 1961-1965, 1980-1981, and 1984-1985.

The population growth rate within the basin has slowed dramatically since 1970. If growth rate continues at the current level, the total population will increase by less than 15 percent over the next 50 years. By the year 2010, the basin's water resources will need to furnish approximately 14 billion gallons per day for uses other than cooling at steam electric-generating plants, which would require 38 billion gallons per day. The requirements for power in the service area have increased and additions to generating capacity will be required to meet future loads. It is estimated that the utility peak demands of the area will increase to a total of 50 million kilowatts by 2000.

To ensure this economic growth and supply of water and power, the Delaware River Basin's water resources must be preserved, further developed and controlled. The recommended plan of development for the Delaware River Basin will meet these needs by providing 11 major water-control projects and eight other projects. The latter would be developed, by local interests, for recreation and later for water supply when needed. (Three of these eight were deauthorized in 1986 by PL 99-662.) Also included in the plan are 39 small control projects that could be developed under prior laws.

Pennsylvania has an important role in the basin's development, as seven of the eight formerly authorized, major federal projects (including the three that were deauthorized) were planned wholly within its boundaries, with the other project located in Pennsylvania, New York and New Jersey. Of the seven major projects totally within Pennsylvania, two were modifications of existing projects; the other five were new projects.

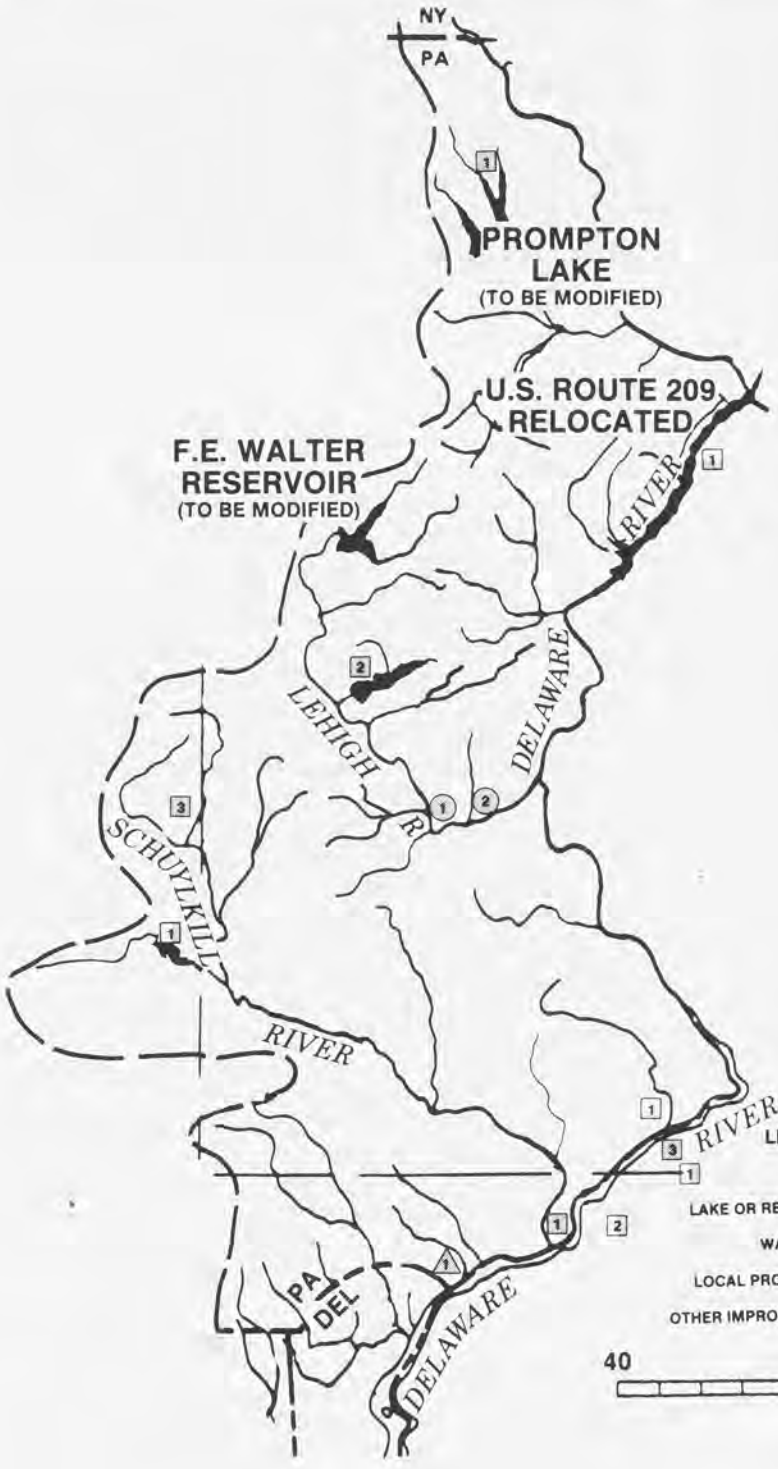
Projects Completed

NAVIGATION

Schuylkill River

The Schuylkill River flows southeasterly for 150 miles from its source in the highlands of Schuylkill County to its mouth on the Delaware River at Philadelphia. From a commercial standpoint, only the last 6 miles downstream are utilized extensively by shipping. This 6-mile length is wholly in the city of Philadelphia and serves a large and important concentration of petroleum industry. It has been developed as a federal navigation project. The existing channel is 33 feet deep and 400 feet wide from the Delaware River channel to a point three-fourths of a mile upstream. Here the width decreases to 300 feet, while the depth remains at 33 feet. These dimensions prevail to the Passyunk Avenue Bridge, 3.5 miles above the mouth. Here the width and depth of the

The Delaware River Basin



1 GENERAL EDGAR JADWIN RESERVOIR
2 BELTZVILLE LAKE

1 SCHUYLKILL RIVER ABOVE FAIRMOUNT DAM
2 SCHUYLKILL RIVER
3 NESHAMINY STATE PARK HARBOR

(1) ALLENTOWN LEVEE & CHANNEL
(2) BETHLEHEM LEVEE & PUMP STATIONS

△1 CHESTER

1 TOCKS ISLAND LAKE

1 DELAWARE RIVER PHILA TO SEA (TIOGA TERMINAL)

1 DELAWARE RIVER PHILA-TRENTON NAVIGATION PROJECT
2 DELAWARE RIVER PHILA TO SEA NAVIGATION PROJECT
1 BLUE MARSH LAKE

LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	1	1	1	1
LOCAL PROTECTION	(1)	(1)	(1)	(1)
OTHER IMPROVEMENTS	△1	△1	△1	△1

40 0 40 MILES

Beltzville Lake.

channel decrease to 200 feet and 26 feet, respectively, and remain this size to Gibson Point, 4.5 miles above the junction with the Delaware River. The final reach of channel, from 4.5 to 6.0 miles above the mouth, is 200 feet wide and 22 feet deep and terminates at the University Avenue Bridge. Widening of the channel has been accomplished at bends in the river to ease the passage of shipping. The project was completed in 1962 with the removal of the rock shoals that existed above the Passyunk Avenue Bridge. The cost of the completed project was $2,809,000. Commodities include petroleum products, iron ore, sand and gravel, chemicals and scrap metals. Annual traffic reported for 1993 was 9.1 million tons.

Schuylkill River, Above Fairmount Dam

The existing project, adopted in 1946 and completed in 1955, covers 9.5 miles of the Schuylkill River. It provides for removal of culm deposits from the pools formed by Plymouth Dam, Flat Rock Dam, and Fairmount Dam. Maintenance is performed by the commonwealth of Pennsylvania.

FLOOD CONTROL

Allentown

Allentown is in Lehigh County along the Lehigh River, 17 miles upstream from its junction with the Delaware River at Easton. The Lehigh Valley had severe flooding because a large part of the upstream river basin consists of steeply sloping terrain, which promotes very rapid runoff of rainfall. The flood of May 1942 caused damages in Allentown estimated at $990,000, and the flood of August 1955 was approximately of the same magnitude. Flood protection on the Lehigh River include local flood protection facilities at Allentown, Beltzville Lake near Lehighton, Francis E. Walter Dam and Reservoir on the Lehigh River a short distance below the mouth of Bear Creek, and local protection facilities at Bethlehem. Improvements at the Francis E. Walter Reservoir and Bethlehem are described elsewhere in this section.

The project at Allentown consisted of straightening and deepening over 1.5 miles of main channel and constructing a levee upstream, a training dike to direct the river flow around a sharp bend at the mouth of Little Lehigh Creek, and a concrete wall and two sections of levee between these two structures. These improvements, combined with the Francis E. Walter Dam and Reservoir, will reduce damages in Allentown by 70 percent should a flood equivalent to the May 1942 flood recur. It is estimated that $917,000 in flood damages were prevented in June 1972 during flooding caused by tropical storm Agnes. Construction at Allentown began in September 1958 and was completed in June 1960. The federal cost of the project was $1,615,582. The estimated local cost for lands, damages, and relocation of utilities is $270,000. The city maintains the protective facilities. Through fiscal year 1994 the project prevented an estimated $14.6 million in flood damages.

Beltzville Lake

Beltzville Lake is on Pohopoco Creek about 5.2 miles upstream from its confluence with Lehigh River and 4 miles east of Lehighton, PA. This is a multiple-purpose development project to provide water supply, water quality, flood control, and recreation. The dam has an impervious core with random fill, 4,200 feet long, and rises 170 feet above the creekbed. It has an ungated spillway around the north end of the dam and gate-controlled outlet works, discharging through a conduit on rock along the right abutment. The project, part of the flood control plan in the Delaware River Basin, has a reservoir capacity of 68,250 acre-feet at spillway crest level. It has 1,390 acre-feet in inactive storage, 39,840 acre-feet for water supply, waterquality control and recreation, and 27,000 acre-feet for flood control. The net drainage area above the dam site is 75 square miles, excluding 22 square miles that contribute to the Wild Creek Reservoir, which supplies water to Bethlehem. Flood control storage at Beltzville reduces to flood stages at the principal damage centers on Lehigh River below its confluence with Pohopoco Creek. These damage centers are at Bowmanstown, Walnutport, Northampton, Hokendauqua, Catasauqua, Allentown, Bethlehem, Freemansburg, and Easton. Operations of the three new flood control projects in the Lehigh River Basin will result in a stage reduction of 2 feet at Bethlehem for a flood similar to that experienced in 1955. Construction started in July 1966 on the highway relocation and was completed in 1969. Construction of the dam and appurtenances started in June 1967 and was completed in 1971. The project is operated and maintained by the Corps of Engineers, except for recreation areas, which are the responsibility of the Pennsylvania Department of Environmental Resources, the designated agency representing the commonwealth. An area has also been set aside to mitigate wildlife losses under control of the same agency. The federal project provided a recreation capacity of 700,000 visitors in 1983. The project prevented an estimated $336,000 in flood damages during the flood of June 1972 and an estimated $7.0 million through fiscal year 1994. Visitation for 1994 was 448,987.

Flood control project at city of Bethlehem (at left) includes levee and pumping stations. View is looking upstream on the Lehigh River.

Bethlehem

The flood control project for Bethlehem is part of the authorized plan for flood control in the Lehigh River basin. Bethlehem is in Northampton and Lehigh Counties on the Lehigh River, 16 miles above the river's mouth at Easton. In May 1942, a major flood caused damages in this city estimated at $6,390,000. More than half of this damage was incurred by the Bethlehem Steel Corporation, a large steel producer. To protect against similar floods, the authorized project provides a system of concrete floodwalls and paved slope earth levee along the Lehigh River, and pumping stations at various points on the river to discharge storm runoff from the protected area. This local flood control system, functioning as part of the basin system, provides complete protection from flood discharges similar to that of May 1942.

It is estimated that the levees prevented $4,480,000 in flood damages from the Lehigh River in June 1972 during tropical storm Agnes; the pumping stations are estimated to have prevented an additional 17 to 18 million dollars in damage to the Bethlehem Steel Plant by pumping runoff from the protected area and preventing major damage and business loss. The project has prevented an estimated $12.6 million in flood damages through fiscal year 1994.

Construction of protective facilities on the right bank was initiated in June 1960 and completed in 1964. The federal and non-federal costs were $4,520,995 and $699,591, respectively. Bethlehem assumed responsibility for maintenance in 1964.

Blue Marsh Lake

This project provides for water supply, flood control, and recreation. The Blue Marsh Dam is on Tulpehocken Creek, 1.5 miles upstream from Plum Creek and about 6 miles northwest of Reading. The dam is 1,775 feet long and 98 feet high. It provides 3,000 acre-feet of inactive storage; a winter pool of 14,620 acre-feet of storage for recreation, water quality and water supply which extends upstream for 8 miles; and 32,390 acre-feet of short term storage for flood control. The latter contributes to flood-stage reductions on the Schuylkill River at Reading, Birdsboro, Pottstown, Norristown, Conshohocken, and Philadelphia. The federal cost is $63,180,300 of which $16,132,000 is reimbursable by non-federal interests for water supply. Construction was completed in 1980. The flood damages prevented are estimated at $22.0 million through fiscal year 1994. Visitation for 1994 totaled 1,455,239.

Francis E. Walter Reservoir

This project is a part of the authorized plan for flood control in the Lehigh River Basin. The dam is on the Lehigh River below the mouth of Bear Creek, in Luzerne County, between White Haven and Stoddartsville. It is approximately 60 miles above Allentown and 77 miles above the junction of the Lehigh River with the Delaware River at Easton.

Francis E. Walter Dam and Reservoir controls a drainage area of about 288 square miles by providing 109,000 acre-feet of storage, of which 107,815 acre-feet are reserved for flood purposes. The remaining 1,785 acre-feet are maintained as a permanent pool for water conservation and for public use. Visitation for 1994 was 251,919.

The reservoir is formed by an earthfill dam measuring 3,000 feet along the crest and 234 feet in height, with a low concrete overflow section and gate-controlled outlet works discharging through a tunnel. The cost of construction, completed in 1961, was $11,087,400.

Downstream floods are controlled by operating Francis E. Walter Dam and Reservoir in conjunction with local projects downstream. It is estimated the combined action of the reservoir and the improvement projects at Allentown and Bethlehem would prevent $23.6 million in damages if a flood such as that associated with Hurricane Diane in 1955 were to recur. The project has prevented an estimated $41.6 million in damages through fiscal year 1994, of which about $1.8 million was prevented in June 1972 during tropical storm Agnes.

In August 1965, at the end of the 1961-1965 drought, the Delaware River Basin Commission (DRBC) requested that the Corps of Engineers increase water storage in Francis E. Walter Reservoir. In November 1965, the DRBC extended the drought emergency to the end of the year, but in late December approval was given by the DRBC to lower the water to normal operating level, elevation 1,300 feet.

In April 1966, in compliance with a DRBC request, the water level was increased to elevation 1,390 feet for continued emergency drought storage. Lowering the water level to normal pool elevation, 1,300 feet was requested by the DRBC on June 20, 1966. During this period, 11 billion gallons of water was stored in the reservoir until the storage availability in the Delaware River Basin was restored and the drought ended. In May 1981, in response to a DRBC request during a drought emergency, the Corps again stored water at Francis E. Walter Dam—to elevation 1,397—for use in repelling the advance of salinity in the Delaware River.

General Edgar Jadwin Dam

The Lackawaxen River drains 597 square miles in northeastern Pennsylvania. Much of the Upper Lackawaxen

Francis E. Walter Dam.

Prompton Lake.

drainage system is characterized by steeply sloping catchment areas and torrential watercourses. The General Edgar Jadwin Project is on Dyberry Creek approximately 3 miles above the confluence of Dyberry Creek and Lackawaxen River in Honesdale. The earth embankment is 1,255 feet long and 109 feet high. It controls a drainage area of 65 square miles and provides 24,500 acre-feet of storage. The project has been in operation since June 1960. Federal cost was $4,073,100. Flood stages on Dyberry Creek particularly affect the northerly part of Honesdale. Damages prevented are estimated to be $2.2 million through fiscal year 1994.

Prompton Lake

The project is on the Lackawaxen River, 5 miles upstream from Honesdale, and approximately 30 miles above the confluence of the Lackawaxen and Delaware Rivers. The dam controls a drainage area of 60 square miles, retains 3,500 acre-feet of inactive long-term storage and can provide 52,000 acre-feet of short-term storage for flood control. The dam is formed by an earth embankment approximately 1,230 feet long at the crest and rising 140 feet above the riverbed. It has a principal outlet conduit of reinforced concrete and an emergency spillway high on the west abutment. The total cost of construction, which was completed in 1960, amounted to $4,557,483. During each major flooding of the River, the Boroughs of Honesdale, Haley, Prompton, Seelyville, and several smaller communities suffer damage. Flood damages prevented by this project are estimated to be $1,100,000 through fiscal year 1994. Visitation for 1994 totaled 49,752.

Projects Under Way

NAVIGATION

Delaware River, Pennsylvania, New Jersey and Delaware, Philadelphia-to-the-Sea

The Delaware River forms the boundary between New Jersey to the east and Pennsylvania and Delaware to the west as it follows its southerly course to the mouth at Delaware Bay. The Delaware River has played an important role in national growth from the founding of Philadelphia. As early as 1735, the number of **vessels** arriving and clearing the port was 427. Today, the Philadelphia Port Area—Delaware River and its tributaries—comprise one of the greatest port groups in the world, and has one of the largest annual import tonnages in the United States. The total crude petroleum imports in this port rank among the highest in the nation.

The earliest improvements were construction of ice harbors and breakwaters to provide safe havens from ice and storms. Work on the Delaware breakwater at Cape Henlopen was begun in 1828 and completed in 1869. In 1885, Congress approved a comprehensive project for the improvement of the Delaware River to accommodate larger ships. This project provided for a channel 26 feet deep and 600 feet wide from Philadelphia to deep water in Delaware Bay. Congress provided for a deeper and wider channel as commerce increased and larger and faster ships were constructed. The Rivers and Harbors Act of 1899 adopted a project providing for a channel 30 feet deep and 600 feet wide from Philadelphia to deep water in Delaware Bay.

In the interval since 1899, many additional improvements were authorized for the river. The authorized dimensions of the channel and anchorages included in the existing project are as follows:

FEATURE	AUTHORIZED DIMENSIONS		
	WIDTH (FEET)	LENGTH	DEPTH (FEET)
Channels:			
Allegheny Avenue to Philadelphia Navy Base			
West side channel	400-500	8.5 mi.	40
East side channel	500-600	8.5 mi	37
Navy Base to the Sea	800-1,200	94.5 mi.	40
Anchorages:			
Port Richmond	750	6,400 ft.	37
Gloucester	400	3,500 ft	30
Mantua Creek	2,300	11,500 ft.	40
Marcus Hook	2,300	13,650 ft.	40
Reedy Point	2,300	8,000 ft.	40
Deepwater Point	2,300	5,200 ft.	40

FEATURE	AUTHORIZED DIMENSIONS		
	WIDTH (FEET)	LENGTH	DEPTH (FEET)
Anchorages:			
Port Richmond	500	6,400 ft.	35
Gloucester	400	3,500 ft	35
Mantua Creek	1,400	11,500 ft.	37
Marcus Hook	2,300	13,650 ft.	40
Reedy Point	2,200	8,000 ft.	35
Deepwater Point	1,750	5,200 ft.	35

The project also provides for the construction of dikes and training works for the regulation and control of tidal flow. The anchorages alongside the channel are for the safety and convenience of navigation, which will benefit from the elimination of hazards to life and property. The anchorages are an integral part of the Delaware River waterways and are necessary to their continued safe use. Deepening of the channel to 40 feet, from the Philadelphia Naval Base to deep water in Delaware Bay, was accomplished between June 1940 and February 1942 by a fleet of hopper and pipeline dredges. These dredges removed 50,000,000 cubic yards of material from the river channel during a 20-month period. The urgent need was to provide a waterway to and from the Naval Base for capital ships, when many modern warships are repaired. The work remaining to be done consists of dredging the east side of the channel in Philadelphia Harbor from 35 to 37 feet, deepening Port Richmond Anchorage to 37 feet, and constructing Mantua Creek, Reedy Point, and Deepwater Point anchorages to project dimensions. Enlargement of these anchorages to authorized dimensions is being deferred until the needs for anchorages have been established.

The estimated cost for new work, at October 1984 prices, is $77.8 million.

Commerce consists of crude oil, coal, iron ore, petroleum products, paper, machinery, wood and wood products, chemicals, miscellaneous food products, a large variety of general merchandise, and passengers.

Traffic for 1993 was 120.5 million tons.

Delaware River Between Philadelphia, Pennsylvania and Trenton, New Jersey

Heavy industrial development along a 30-mile reach of the Delaware River, beginning at Philadelphia and extending northward into the Trenton area, prompted local interests to request that the federal project, which provided generally for a navigation channel 25 feet deep and 250 feet wide from Philadelphia to Trenton be modified to provide for a deeper and wider channel for ore ships and other vessels bringing in supplies for heavy industry and transporting finished products to markets.

The existing project, from Philadelphia, to Trenton, N.J., extends upstream from the northern end of the "Philadelphia-to-the-Sea" project, described previously. These projects together provide a continuous navigation channel, about 130 miles long, from Trenton to the sea and have made the Delaware River one of the most important commercial waterways in the world. Progressive deepening and widening of the river channel makes the harbors along the river more accessible to deep-draft vessels and provides low-cost water transportation to industries in the Delaware Valley.

The project from Philadelphia to Trenton provides for a channel 40 feet deep and 400 feet wide from Allegheny Avenue, Philadelphia, to the upstream end of Newbold Island—a distance of 23.5 miles, relocation of the channel at the Delair Railroad Bridge and reconstruction of the bridge, a channel 35 feet deep and 300 feet wide to the former

Delaware River terminals at Philadelphia.

Trenton Marine Terminal—a distance of 5.5 miles, and a turning basin, 800 feet wide and 1,700 feet long, at the former terminal.

The project is about 90 percent completed. Work remaining to be done consists of dredging, from the upper end of Newbold Island to the site of the former Trenton Marine Terminal, and widening the turning basin at this point which is in deferred category.

Waterborne commerce consists of coal, petroleum products, iron ore, chemicals and miscellaneous food products. Traffic reported for 1993 was 120.8 million tons.

Active Authorized Projects Not Started

NAVIGATION

Schuylkill River Basin, Mouth to Penrose Avenue

This project was authorized by the Water Development Act of 1988. It will provide a 40-foot depth and widths of 400 feet from the Mouth of the Schuylkill to 29th Street and 300 feet from 29th Street to Penrose Avenue. It also calls for a turning basin adjacent to Girard Point. Preconstruction Engineering and Design Studies were suspended in 1981 when closure of one of the project's beneficiary industries resulted in a single-user situation.

FLOOD CONTROL

Tamaqua

The project was authorized by the Water Resources Development Act of 1974. It provides a tunnel 10 feet in diameter starting at Wabash Creek on the West boundary of Tamaqua, through Sharp Mountain and ending at the Little Schuylkill River just south of its confluence with Wabash Creek. During advanced engineering and design, the tunnel diameter was reduced to 9 feet and a dry dam on the North Ward Tributary was added. Plans and specifications were completed in fiscal year 1988. The total estimated cost of the scheduled portion of the project (tunnel) is $11,280,000, of which the federal share is $8,435,000 (October 1990 price level). Award of a construction contract is pending execution of a project cooperation agreement and finalization of a financing plan between the Borough of Tamaqua and the commonwealth of Pennsylvania.

Francis E. Walter Reservoir

This project provides for the modification of Francis E. Walter Dam, which was completed in 1961. The dam is located on the Lehigh River about 5 miles north of White Haven. It rises 234 feet above the riverbed and is 3,000 feet long. At present, the dam acts only for flood control and provides for a small amount of recreation. The proposed modifications will provide long-term storage, water supply and recreational development. The modified dam structure will be 264 feet high and 3,500 feet long. With these modifications, the inactive storage will be 3,000 acre-feet. The normal pool storage for water supply and recreation will be 70,000 acre-feet and will extend upstream for 7 miles. The short-term of flood control storage of 108,000 acre-feet originally provided will remain unchanged. The project will provide recreation for 250,000 visitors annually. The estimated total cost of the modification is $163,500,000 (October 1990 price level), of which $136,900,000 would be reimbursable by non-federal interests for water supply and recreation. Feature design memoranda were completed through January 1988, and plans and specifications for various features through October 1990. Award of a construction contract is pending execution of a project cooperation agreement and finalization of a financing plan by the Delaware River Basin Commission.

Prompton Lake

This project provides for the modification of Prompton Lake, which was completed in November 1960. The dam is on the Lackawaxen River about 31 miles upstream from the confluence of the Lackawaxen and Delaware Rivers, and about 5 miles above of Honesdale. It is 140 feet high and 1,230 feet long. The dam acts only for flood control, with incidental recreation. The proposed modifications will provide water supply and an increased recreational area. The

modified dam will retain the original 20,300 acre-feet of short-term flood control storage and, in addition, will provide a normal pool of 30,900 acre-feet of water supply storage, increased recreation and 800 acre-feet in inactive storage. Prompton Lake, acting with General Edgar Jadwin Reservoir, will substantially reduce flood heights on the Lackawaxen River at such towns as Honesdale and Hawley and will provide relief from frequent and considerable flood damages to several villages and seven townships on the lower reaches of the river. The project will provide recreation for a capacity of 156,000 visitors annually. The total estimated federal cost of the modification is $50,650,000 (at October 1990 prices), of which $47,610,000 is reimbursable by non-federal interests. Preconstruction Engineering and Design work on the modification was resumed in 1985 but has been on hold since 1988, when study funds were removed from the budget.

Work Under Special Continuing Authorities

EMERGENCY STREAMBANK EROSION CONTROL-COMPLETED SECTION 14, PUBLIC LAW 526

Equinunk Creek

This project was approved on September 21, 1983, under the authority of Section 14, Flood Control Act of 1946, as amended. The project provides for protection of 140 linear feet, along the northwest roadway approach embankment of the LR 63042 bridge crossing the Equinunk Creek and continuation structure. The protective measures utilized galvanized and PVC-coated wire gabions. Additional protection, in the form of a gabion mattress, was provided under the bridge to prevent scour of abutments.

Notice to proceed on construction of the project was given on July 20, 1984. Total estimated cost of the project was $1,179,576.

Darby Creek

The project was authorized under Section 14 of the Flood Control Act of 1946, as amended.

The project area is located in Landsdowne borough, Delaware County, within the vicinity of Hilldale Road Bridge, where streambank erosion threatens a heavily utilized borough road. The project provides for the placement of 325 feet of gabions.

Construction was awarded in September 1986 and was completed in March 1987. Total estimated project cost was $124,000.

Perkiomen Creek

The project was authorized under Section 14 of the Flood Control Act of 1946, as amended.

The project area is located within Hereford township, Berks County, where streambank erosion threatens a township bridge. The project proposes placing gabions along the streambank and rip rap along the windwalls.

The project was awarded for construction in September 1986 and completed in April 1987. The project cost was $42,000.

Fort Mifflin

The project was authorized under Section 14 of the Flood Control Act of 1946, as amended. The project area is located along the west bank of the Delaware River in the city of Philadelphia.

The project consisted of placement of geotextile material and riprap protection along approximately 150 feet of the riverbank to prevent erosion which threatened historic Old Fort Mifflin.

Construction contract was awarded in October 1989 and construction completed in March 1990. Estimated project cost was $220,000.

Interstate Highway 80, Stroud Township

This project was authorized under Section 14 of the Flood Control Act of 1946, as amended. It is located on the left bank of Pocono Creek, immediately west of the ramp for Interchange 47 in Stroud Township, Monroe County.

The project provided for restoration of the highway embankment slope to pre-storm configuration with gabion protection for slope revetment in the area where riprap protection failed. It was completed in 1978 at a cost of $190,437, with the entire amount funded by the federal government.

SMALL NAVIGATION PROJECTS SECTION 107, PUBLIC LAW 86-645

Neshaminy State Park Harbor

This project, constructed on the Delaware River adjacent to Neshaminy Creek in the community of Croydon, Bristol township, Bucks County, was approved and adopted by the Chief of Engineers on March 13, 1964.

The project provides for construction of general navigation facilities, consisting of an entrance channel protected by a stone jetty and revetment, an access channel, an anchorage area, and a turning basin. The project depth is 8 feet. Construction started in August 1965. Dredging of the channel and basin, and construction of a stone jetty were completed in August 1966.

The cost of the general navigational facilities was $456,161. The federal cost was $128,204, and the nonfederal portion was $327,957. In addition, the state will provide service and berthing facilities for 400 small recreational craft. As the Neshaminy State Park Harbor will be about 16 miles north of downtown Philadelphia, it will serve the needs of the boating public and will help alleviate the acute shortage of small boat facilities in the Philadelphia area.

Small Flood Control Projects

SECTION 205, PUBLIC LAW 84-858 COMPLETED

Chester

The city of Chester is in Delaware County on the Chester River, a tributary of the Delaware River. The flood control project consists of an earth levee and concrete wall on the right bank of the Chester River, providing protection from all floods of magnitudes experienced prior to 1951 at the Eyre Park residential area and the Chester Hospital. The project was completed in 1954 for $183,270. The city assumed maintenance of the work on June 1, 1954. After the flood of September 1971 overtopped the project, the Eyre Park residential area was demolished and left as open space.

Delaware River, Port Jervis, N.Y. Area/Mashipacong Island, Sussex County, N.J.

This project was authorized under Section 205 of the Flood Control Act of 1948, as amended. It is located along the southeast side of Mashipacong Island in the Delaware River, downstream of Port Jervis, New York. This area has a history of flooding due to ice and water being backed up by ice jams. The project provided an ice diversion channel by selectively clearing trees within a 13,000-foot long, 200-foot wide existing natural overflow channel.

The construction contract was awarded in December 1994, with the project scheduled for completion in the spring of 1996. Under the terms of a Local Cooperation Agreement witht the Delaware River Basin Commission signed in July 1992, 75% of the estimated $1,640,000 total project cost is being funded by the federal government. The remaining 25% is shared among the Commonwealth of Pennsyvania, the State of New York, Matamoras Borough and Westfall Township in Pennsylvania, and the city of Port Jervis. Following completion of construction, the project will be turned over to the commission, with the three municipalities responsible for maintenance.

Pennypack Creek

This project was authorized under Section 205 of the Flood Control Act of 1948, as amended. The project is located in the borough of Hatboro in the vicinity of Old York Bridge over the Pennypack Creek.

The project area was subject to flooding primarily from Pennypack Creek. The project consisted of channel modification upstream and downstream of Old York Bridge .

The construction contract was awarded in June 1988 and the project was completed in December 1988. The estimated cost of the project was $504,000. The Borough of Hatboro assumed maintenance of the project.

Poquessing Creek

This project was authorized under Section 205 of the Flood Control Act of 1948, as amended. The project is located approximately 8 miles upstream from the confluence of Poquessung Creek with the Delaware River and lies just upstream of the boundary with the city of Philadelphia, in Lower Southampton Township.

The project area has a history of frequent minor flooding. The project consisted of adding two 8-foot diameter reinforced concrete pipe culverts along the side of an existing arch railroad bridge and improving an existing drainage ditch, on the upstream side of the railroad embankment.

The construction contract was awarded in April 1987 and the project transferred by the federal government to the project sponsor, lower Southampton township in September 1988. Estimated project cost was $1,027,000.

Flood Plain Management Services

SECTION 206, PUBLIC LAW 86-645

The Corps of Engineers provides a flood plain management services program which makes available to federal, state, and local governmental agencies information, guidance, and advice on flood hazards which will enable them to proceed with such planning, engineering studies, construction, and other action as may be necessary for wise use of flood plains in the interest of reducing flood losses. The program includes flood plain information reports, technical services and guidance, guides, pamphlets, related research, and comprehensive planning on flood damage prevention.

The Philadelphia District has prepared flood plain information reports for locations in the Delaware River Basin area. Completed study reports are available from the Department of Environmental Resources, Commonwealth of Pennsylvania, Harrisburg, or from the local community for which the report was prepared. Local agencies can obtain assistance in preparing applications for flood plain information studies by contacting the Philadelphia District.

LOCATION	DATE COMPLETED
Completed Flood Plain Information Reports	
Antietam Creek and Heisters Creek, Berks County	Jun. 1974
Brandywine Creek, Main Stem, Chester County	Mar. 1972
Brandywine Creek, East Branch (Downingtown to the Junction) Chester County	Dec. 1970
Brandywine Creek, West Branch (Coatesville to the junction of East and West Branches), Chester County	Nov. 1969
Bushkill Creek, vicinity of Easton	Jan. 1972
Chester Creek, Delaware County	Dec. 1966
Crum Creek, Delaware County	Mar. 1974
Delaware River, Bucks County	July. 1967
Lehigh River, Jordan Creek and Trout Creek, city of Allentown	Sep. 1971
Little Bushkill Creek and Shoeneck Creek, Northampton County	Apr. 1973
Little Lehigh Creek, Cedar Creek and Little Cedar Creek, city of Allentown	Oct. 1972
Little Neshaminy Creek, Bucks County	Nov. 1973
Martins Creek (Waltz Creek to North Bangor), Northampton County	Mar. 1970
Mill Creek and Ironworks Creek, Bucks County	May 1974
Mill, Watson, and Lahaska Creeks, Bucks County	May 1975
Neshaminy Creek, Bucks County	Apr. 1965
Pennypack Creek, Meadow Brook, Southampton Creek, Huntington Valley Creek, and Blair Mill Run, Montgomery County	Mar. 1973
Perkiomen Creek, East Branch, Bucks County	Jan. 1971
Perkiomen Creek, East Branch, and Indian Creek, Bucks and Montgomery Counties	Oct. 1974
Ridley Creek, Delaware County	Apr. 1970
Wissahickon Creek, Montgomery County	Mar. 1965
Special Flood Hazard Information Reports	
Allegheny Creek, Berks County	Jun. 1976
Darby Creek, Delaware County	Aug. 1977
Stony Creek, Montgomery County	Jun. 1976
Unami Creek, Bucks and Montgomery Counties	Jun. 1976
Zacharias Creek, Montgomery County	Jun. 1976

Surveys Under Way

In response to the request of Congress, the Philadelphia District is conducting numerous investigations and studies to determine whether proposed improvements are justified.

Information on those surveys under way in the Delaware River Basin is listed below. Some of these reports have indefinite completion dates since progress is contingent on appropriation of funds.

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Delaware River Dredging Spoil Disposal Study	To develop a regional dredging spoil disposal plan for the Delaware River, its tidal tributaries, and Delaware Bay for both public and private sectors.	Combined with Delaware River Comprehensive Navigation Study
Delaware River Comprehensive Navigation Study	To define federal interest in navigation development related to the Delaware River Ports' future needs for waterway improvements.	Intermediate reports have been developed for several waterways including the Delaware River, Philadelphia to Wilmington, Salem River, Maurice River, and the Delaware River Main Stem. The Delaware River at Camden was deepened to 40 feet in 1992, while the Salem River was deepened to 16 feet in 1995. The Delaware River Main Channel Deepening Project was authorized in Section 101(6) of PL102-580. It would deepen the Delaware River from Philadelphia/Camden to the Sea from its current 40-foot navigation depth to 45 feet. Pre-construction Engineering and Design Studies are now underway, with construction scheduled to begin in 1998.
Schuylkill River Basin, Pa., Limited Reconnaissance Study	To evaluate flooding problems within the Schuylkill River Basin and address issues related to water supply, water quality, environmental initiatives and recreation.	Full study to be completed in 1997. Interim reconnaissance studies for Local Flood Protection (LFP) have been completed for these areas: • Pottstown LFP, 1991 • Reading LFP, 1992 • Schuylkill Haven LFP, 1995 Other areas recommended for reconnaissance study are as follows: • Conshohocken LFP • Schuylkill River Basin Regional Flood Control Study • Norristown LFP • Phoenixville LFP • Perkiomen Creek Basin Study • Wissahickon Creek Basin Study • Schuylkill River Basin Environmental Initiatives Study
Flood Control		
Schuylkill River Basin, Schuylkill Haven	To investigate flood control along the Schuylkill River in the Borough of Schuylkill Haven.	Reconnaissance Study submitted in March 1995

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Small Flood Control Activities (Section 205, 1962 Flood Control Act		
Fort Mifflin, Philadelphia	To investigate the advisability of providing improvements for erosion control	FY 1990
Port Jervis Area	To investigate the feasibility of improvement for flood control in the study area.	FY 1992
Mill Creek, Upper Moreland Township	To investigate flood control in Upper Moreland Township, Montgomery County, along the Pennipack and Mill Creeks.	Reconnaissance Study submitted in August 1995.
Darby Creek, Darby Borough	To investigate flood control in Darby Borough, Delaware County, along Darby Breek.	Reconnaissance Study submitted in November 1993. Awaiting sponsorship to continue studies.
Naylors Run, Upper Darby Township	To investigate flood control in Upper Darby Township, Delaware County, along Naylors Run.	Reconnaissance Study submitted in January 1996.

Chapter 6

Lake Erie Basin

Waters drain into Lake Erie from the Commonwealth of Pennsylvania, the states of New York, Ohio, Indiana and Michigan, and the Canadian province of Ontario. Streams wind through the flat clay-rich land carrying heavy silt and waste loads, which help to make the lake the most polluted of the Great Lakes. Lake Erie also has the smallest volume and is the shallowest of the Great Lakes. Buffalo District is responsible for the Lake Erie drainage basin in New York, Pennsylvania, and Ohio.

Pennsylvania's share of Lake Erie's 400 mile United States shoreline is only 48 miles, yet it contains one of the lake's most popular recreation areas, at Presque Isle Peninsula, and a major commercial harbor and industrial center in Erie. Presque Isle is a 3,200-acre park with six miles of beaches. The park offers the following recreational opportunities: picnicking, boating, water skiing, hunting, swimming, fishing, hiking, a nature center, ice skating, and ice fishing. Presque Isle Peninsula offers ecologists a rare opportunity to study plant life successions. Geologically, it is one of the rarest spots in the world where one can study the winds, currents and waves upon glacial sands resulting in a reoccurring sand spit formation. The Lake Erie drainage basin extends only 10 miles inland in Pennsylvania and the land, excluding Erie, is devoted mostly to agricultural development. Vineyards are a common sight in the area.

Entrance to Erie Harbor showing the eastern tip of Presque Isle at the bottom of the photo and the city of Erie in the distance.

Projects Completed

NAVIGATION

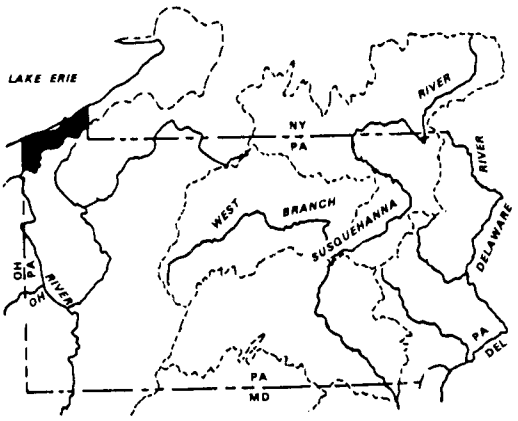
Erie Harbor

Erie Harbor, the first harbor in the United States to receive aid from the Corps of Engineers under the Rivers and Harbors Act in 1824, is on the south shore of Lake Erie on the south side of the bay formed by Presque Isle Peninsula. The existing project provides a pier-protected entrance channel, 29 feet deep, from the lake into the bay. and deepened channels and basins ranging from 18 to 28 feet deep, within the bay. A confined area has been constructed to accept polluted harbor bottom sediments removed during channel maintenance operations.

Federal costs for construction of the Erie Harbor project totaled $6,390,000. The last essential feature, the confined area, was completed in 1979. The confined area was constructed under authority of the 1970 Rivers and Harbors Act for $3,530,000 and designed to hold 10 years of maintenance dredging. However, the confined area has not been used to date for disposal of dredged materials from maintenance dredging operations because the material dredged is suitable for open lake disposal. The harbor requires maintenance dredging every 3 or 4 years and was last dredged in 1993.

In the FY '93 Appropriations Act (PL 102-377) Congress appropriated $1,000,000 of operations and maintenance funding for the Corps of Engineers"...to plan, design, and dredge an access channel and berthing area for the vessel NIAGARA at Erie Harbor, Pennsylvania, in the area known as the East

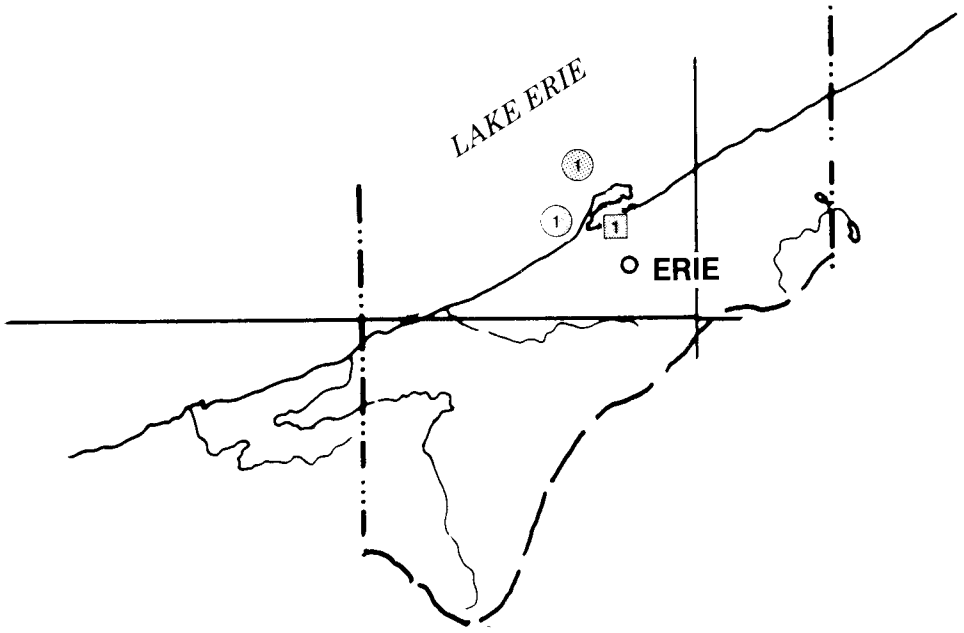
The Lake Erie Basin

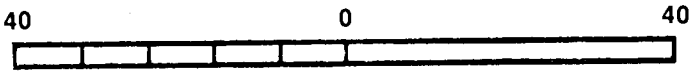


1 ERIE HARBOR

1 PRESQUE ISLE SHORE PROTECTION

1 PRESQUE ISLE SHORE PROTECTION





LEGEND:

	COMPLETED	UNDER WAY	ACTIVE NOT STARTED	OTHER AUTHORIZED PROJECTS
LAKE OR RESERVOIR	1	1	1	1
WATERWAY	1	1	1	1
LOCAL PROTECTION	1	1	1	1
OTHER IMPROVEMENTS	1	1	1	1

Canal "...Buffalo District completed a brief letter report in April 1993 describing a scope of work with an estimated total federal cost of $4,200,000. That scope and project cost will be evaluated as a part of the letter report, which was initiated in March 1994 and is scheduled for completion in January 1995.

Annual waterborne commerce at Erie Harbor consists principally of sand, gravel, and limestone. The majority of the sand and gravel comes from dredge areas in Lake Erie. Annual traffic levels for the period 1984-1993 averaged about 966,000 tons.

BEACH EROSION CONTROL

Presque Isle Peninsula (Cooperative Nourishment Project)

The completed annual beach nourishment project was authorized by the Water Resources Development Act of 1974 and 1976 and initially funded in FY'74. Seventeen years of beach nourishment have been completed, with approximately 2.8 million tons of sand placed on the beaches to restore eroded areas. Total cost of the nourishment work was $21,047,076. Approximately $14.7 million was the federal share and about $6.3 million was the non-federal share.

Presque Isle.

In FY '91 federal funds of $300,000 and non-federal funds of $225,000 were spent for the beach nourishment work. A total of 70,813 tons of upland sand and 30,000 tons of offshore sand were placed in 1991 which was the last year of nourishment under the cited authorities.

Projects Under Construction

SHORE PROTECTION

Presque Isle Peninsula at Erie (Permanent Project—Breakwater Plan)

Construction of the breakwater project, consisting of 58 offshore breakwater segments, was authorized by the 1986 Water Resources Development Act. In fiscal year 1986, the Buffalo District completed all engineering and design for the permanent project. The detailed design and Phase II General Design Memorandum were completed in April 1986 and approved in July 1988.

Contract plans and specifications for construction of the project were approved by NCD on August 3, 1988. The local cooperation agreement (LCA) with the non-federal sponsor (PADER) was fully executed on June 22, 1989. The construction contract was awarded, as a joint venture, to Edward Kraemer and Sons, Inc. and Durocher Dock and Dredge, Inc. for $18,428,700 in August 1989.

Actual construction began in the fall of 1989. It took three construction seasons to build 55 offshore breakwaters and perform the initial beach replenishment. Based upon numerical shoreline simulation completed during the project construction using the computer program, GENESIS, breakwaters 1, 2 and 3 were deferred until an unspecified later date and not constructed under this contract. Construction of the project was completed in the fall of 1992. The total cost for the project was $27,500,000 which was cost shared on a 50-50 basis between the federal government and the commonwealth of Pennsylvania.

A 50 year post-construction annual nourishment program will be performed and cost shared with PADER on a 50-50 basis. The total estimated cost tor the 50 years of nourishment is $106 million.

Special Studies

NAME	PURPOSE	APPROXIMATE DATE TO BE COMPLETED
Lake Erie Wastewater Management Study	To design and develop a demonstration wastewater management program for the rehabilitation and environmental repair of Lake Erie.	Preliminary feasibility report completed in 1975. Final feasibility report completed in 1982. No federal interest determined.

Emergency Stream Bank Protection

STREAM	LOCATION	STATUS
Section 14, Flood Control Act of 1946, as amended		
Little Elk Creek	Girard, Erie County	The shale creek bottom near the Francis Road Bridge was stabilized to prevent continued erosion and undermining of the abutment foundations. Construction was of shotcrete and conventional concrete placement doweled into the underlying shale combined with an additional concrete wingwall. Construction was completed in December 1983.

Emergency Flood Control Activities- Disaster Assistance

Public Law 84-99, as amended, authorizes the Chief of Engineers to expend money annually from a $15 million fund to maintain the Corps of Engineers at a high level of readiness to supplement the maximum efforts of state and local governments in flood emergencies. Corps efforts can include advance measures to protect life and improved property when flooding is imminent, to assist in flood fighting and search and rescue operations during floods, and following subsidence of flood waters, to repair damaged flood control works and federally authorized shore protection projects, and to provide emergency supplies of clean water when the source is contaminated.

Section 917 of the Water Resources Development Act of 1986, Public Law 99-662, further amended Public Law 84-99 by authorizing the Corps of Engineers in the immediate post flood period to implement any operations minimally necessary to relieve suffering and provide urgently needed protection to endangered life and property. These operations are intended to be supplemental and subordinate to maximum state and local efforts and are restricted to a period not to exceed ten days following receipt by the District Commander of a governor's letter confirming that the state has requested a formal disaster declaration by the president of the United States.

The Disaster Relief Act of 1974, Public Law 93-288, as well as its predecessor, the Disaster Relief Act of 1970, Public Law 91-606, as amended, provide for federal assistance to individuals, state and local governments and relief agencies upon the formal declaration of a disaster by the president. At such time, a federal coordinating officer from the Federal Emergency Management Agency (FEMA) is appointed to coordinate flood disaster relief efforts and can assign flood emergency missions to various federal agencies including the Corps of Engineers. These missions may include: conducting preliminary damage assessments; detailed investigations and preparation of Damage Survey Reports (DSR's); emergency repair of public utilities; repair of roads, streets, and bridges; emergency construction of trailer park sites; and minimum housing repairs to make buildings habitable.

It has been under these programs that the Corps of Engineers has responded to disasters from major storms affecting the commonwealth of Pennsylvania. The Pittsburgh, Baltimore, and Philadelphia Districts are responsible for the Ohio, Susquehanna, and Delaware River Basins respectively, and have performed emergency relief work and recovery as mentioned above. The total amount of emergency work by the Corps of Engineers under these laws for the major catastrophes in Pennsylvania in recent years is as follows:

Disaster	Emergency Work PL 84-99	PL 93-288
Tropical Storm Agnes (June 1972)	$11,286,600	$68,843,200
Tropical Storm Eloise (Sept. 1975)	1,927,800	20,370,000
Snow Removal Emergency (Jan., Feb. 1977)		774,489
Johnstown Flood (July 1977)	590,000	8,000,000
Hyndman Flood (August 1984)	102,000	

Snow Removal Emergency

(Jan., Feb. 1977)

On January 29, 1977, the president declared an emergency to exist for 21 counties in the Commonwealth of Pennsylvania because of the abnormal accumulation of snow and ice resulting from a series of blizzards and snowstorms.

The Baltimore District was designated as lead district with Ohio River Division and Philadelphia District as coordinating offices. FDAA requested the Corps of Engineers to provide disaster assistance in the form of snow removal surveys and contract assistance for emergency protection measures to protect life and property. The Corps of Engineers' mission included snow removal and thawing of water lines. The mission ended on February 1977.

Hyndman Flood

(AUGUST 1984)

On August 13, 1984, heavy localized rainstorms caused flooding along Wills Creek and its tributaries in several rural communities in Bedford and Somerset counties. The affected areas received from 7 to 9 inches of preciptation. The hardest hit area was Hyndman, Pennsylvania, 80% of the homes suffered flood damages and 800 persons of the total population of 1,100 were left homeless. A presidential disaster declaration was made for the area, and recovery and restoration efforts were coordinated through the Baltimore District which established a field office in the area. Preliminary damage assessments were made, followed by the preparation of damage survey reports. The Corps also rehabilitated a portion of flood control levee downstream of the town of Hyndman under PL 84-99 a cost of $102,000.

Johnstown Flood

(JULY 1977)

On July 19-20, 1977, a storm system that had developed in northwestern Pennsylvania dumped more than 7 inches of rain on Johnstown and close to 12 inches of rain in other nearby areas in a matter of hours. There was $300 million in damages to property.

On July 21, 1977 President Carter declared an eight county area a major disaster zone. Included were Bedford, Blair, Cambria, Clearfield, Indiana, Jefferson, Somerset, and Westmoreland Counties. Recovery efforts and restoration were coordinated through the Pittsburgh District's Emergency Operations Center.

Three field offices were established to coordinate activities in the immediate area. The Pittsburgh District, with assistance from the Baltimore District, performed preliminary damage estimates and detailed damage survey reports. Other services provided were technical expertise and contracting for debris removal, demolition of structures, and construction of Housing and Urban Development mobile home pads. At the peak of the operation, 117 Corps personnel were involved in flood cleanup activities.

Flood Damages in Johnstown.

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