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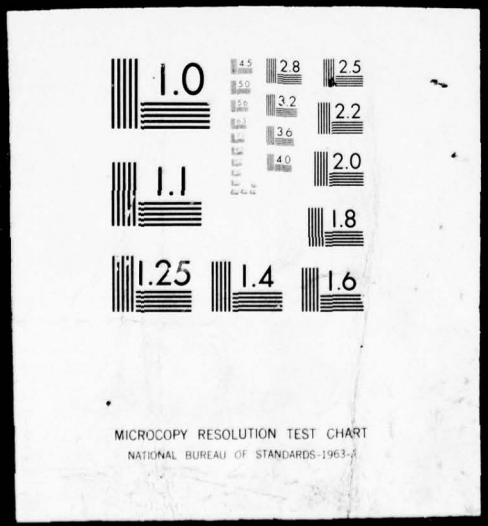
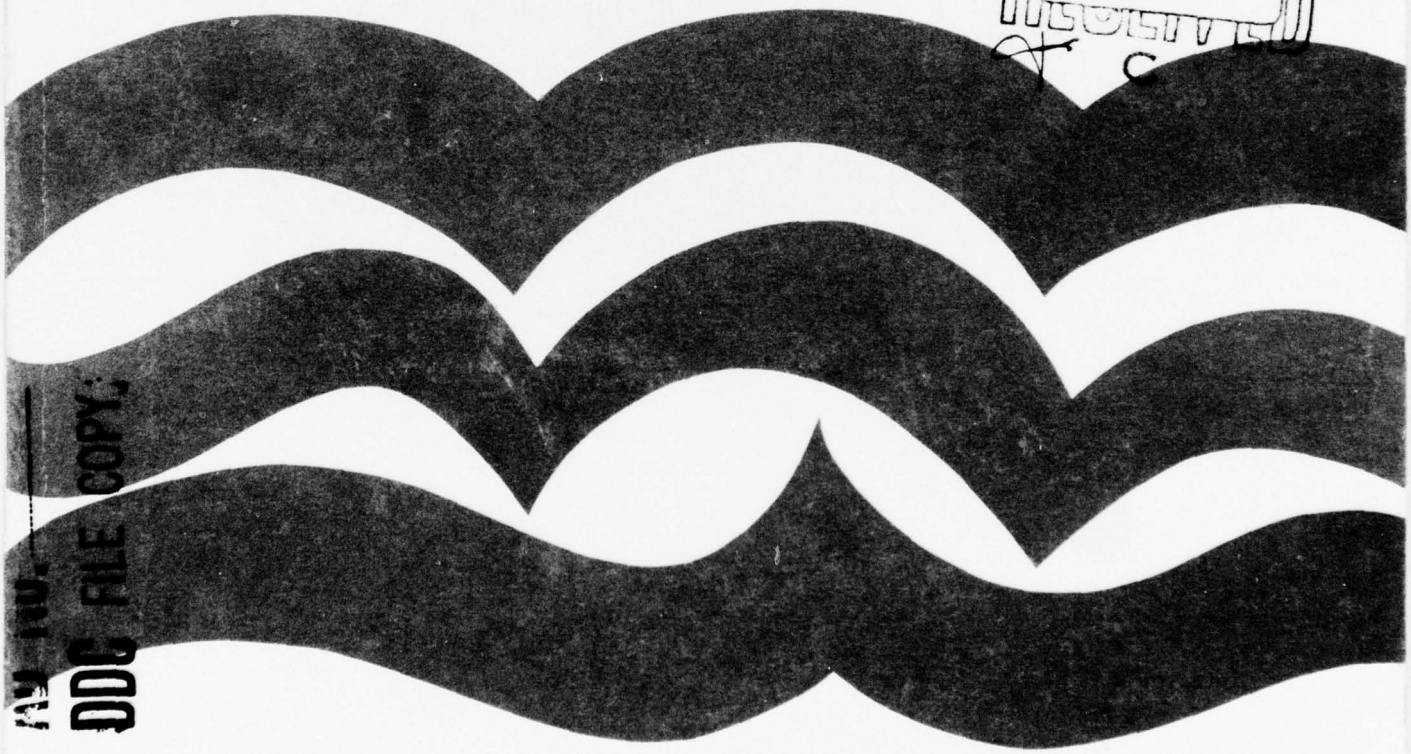


SUPPLEMENT B – PROGRAM SUMMARY

Susquehanna

RIVER BASIN STUDY

JUNE 1970



SUSQUEHANNA RIVER BASIN STUDY COORDINATING COMMITTEE

SUSQUEHANNA RIVER BASIN STUDY – SUPPLEMENT B – PROGRAM SUMMARY

SUPPLEMENT B. PROGRAM SUMMARY.

Susquehanna

RIVER BASIN STUDY

JUNE 1970

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Preface

Supplement B of the Main Report is intended as a companion document to the Summary to provide more detailed information on the Susquehanna River Basin Study Coordinating Committee's recommendations for the Basin. Supplement B gives particular attention to the Plan in each of the eight hydrologic sub-basins identified for the Study. This sub-division, at some risk of being repetitive, is intended to make information on the Plan more accessible at the local and regional level. Specific attention is also given to the responsibility and estimated cost to implement the individual features of the Early Action Plan.

The Coordinating Committee Plan is in two parts, a recommended Early Action Plan, and a Framework Plan for late action. The Early Action Plan lists the specific structural and management measures required to meet the water resource needs anticipated during the early action period, the next 10 years to 1980. The Framework Plan includes those additional structural and management measures that at this point in time appear to be the most effective and desirable means of meeting the needs expected to develop throughout the late action period (to the year 2020). Implicit in the Framework Plan is the capability and flexibility to meet potential problems of water and related land resource management that today are only partially anticipated and understood. Not the least of these potential problems is the future loss of water from the Susquehanna system and its impact on the ecological requirements of the Chesapeake Bay.

The Coordinating Committee recommends beginning immediately to implement all features of the Early Action Plan. It also recommends some continuing collection of information and study, as well as modifications in Federal and State policy to assist in orderly implementation. The features of the Framework Plan, while they now appear to be the best alternative choices available, must be reviewed closer to the point in time when the needs are expected to occur.

Chapters I through VIII describe the water resource needs, the solutions selected, and alternatives to the Coordinating Committee Plan for the correspondingly numbered hydrologic sub-basins shown on Figure 1 following the Preface. The recommendations for early action are identified in somewhat more detail than the measures in the Framework Plan. Throughout this Supplement, the components of the Plan are described in the approximate descending order of magnitude of basin-wide investment required during the early action period. This sequence also corresponds with Appendices K (2) and K (3), which include more detailed information on specific projects and programs.

There are, of course, alternatives to the individual features in the Plan. Where these alternatives in each sub-basin are of considerable merit, in the opinion of the Coordinating Committee, they are described with their advantages and disadvantages. All structural alternatives that were inventoried are summarized in Appendix K (1). Supplement A of the Main Report discusses the treatment of the less specific alternatives considered in this Study and outlines a number of "critical" areas of choice.

Following the description of the features of the Plan, Chapter IX suggests means to carry it into being, including a general recommendation for the relative share of costs between Federal and non-Federal interests. Where individual project reports will be required to implement projects with Federal assistance, it is expected that these reports will provide the detailed basis upon which the actual cost sharing agreements will be made.

The Coordinating Committee fully recognizes the overriding influence that the availability of adequate funds can have at all levels of cooperation and participation -- Federal, State, county, municipal and private. The Summary of the Main Report outlines the financial requirements over time to carry out the Plan, both the early action and the later framework phases. Should the limited financial resources available for investment in water resources over the next 10 or 15 years dictate hard choices among competing opportunities, the relative priorities discussed in the Summary are intended by the Coordinating Committee to be a guide to decisions. The Summary also discusses recommendations for changes in public law and policy related to water resources to improve the chances of carrying out the Plan effectively.

The Susquehanna River Basin Study Coordinating Committee is recommending a Plan to the public at large, to Federal, State, and local agencies, and to groups of concerned citizens for specific steps required to manage the water and related land resources of the Susquehanna River Basin. The Plan reflects a blending of the objectives of the three affected States, the seven participating Federal departments and agencies, and the concerned citizens who, throughout the course of the study, voiced their goals and ideas for the wise use of the Basin's water and related land resources. The Plan is only a starting point; its successful execution is necessary to realize the benefits of resource conservation and development.

SUSQUEHANNA RIVER SUB-BASINS

Figure 1

CHAPTER I - THE PLAN AND ALTERNATIVES - SUB-BASIN I (SUSQUEHANNA RIVER UPSTREAM FROM ATHENS, PENNSYLVANIA)

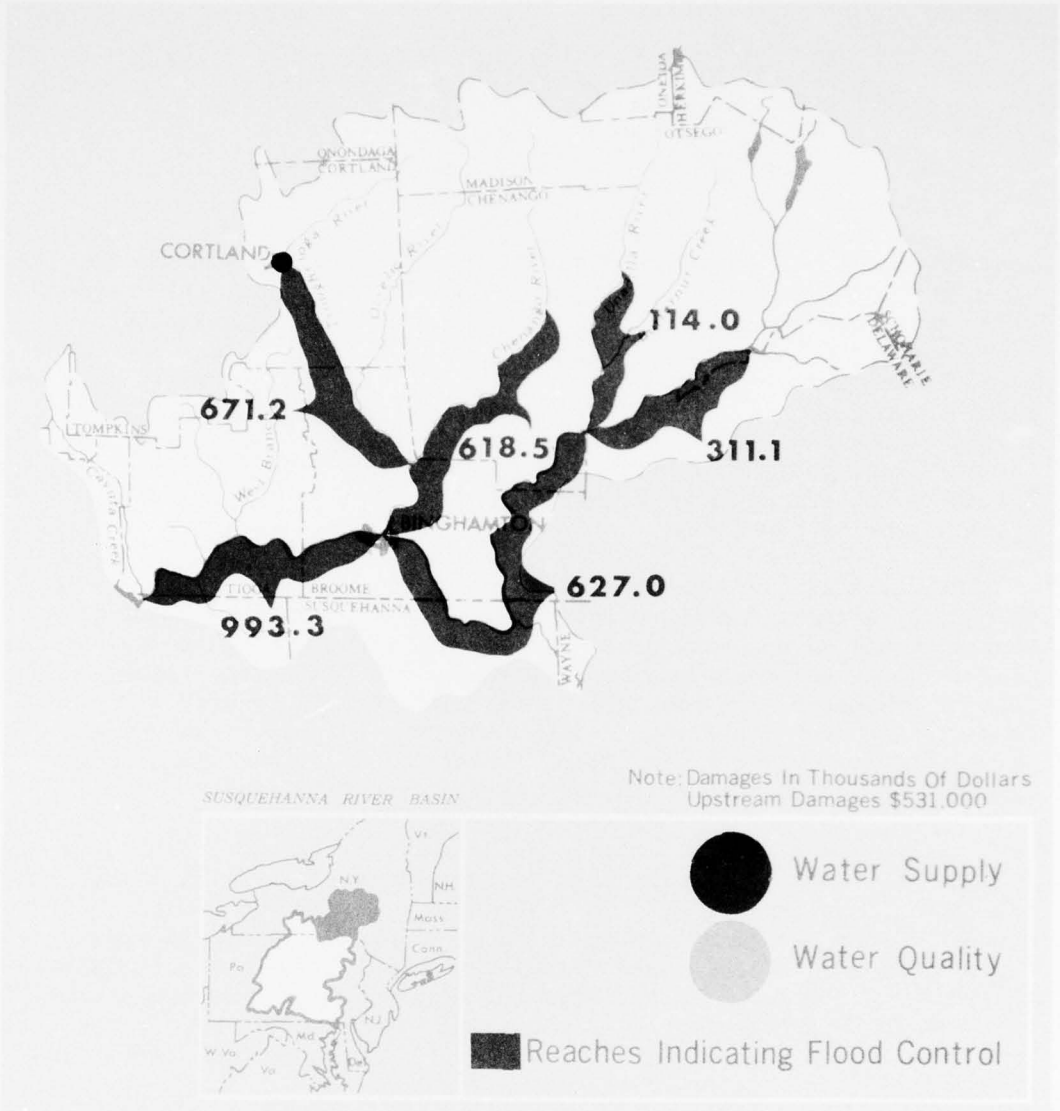
A. WATER RESOURCES REQUIREMENTS

The Susquehanna River, upstream from the mouth of the Chemung River near Athens, Pennsylvania, drains an area of about 4,940 square miles almost entirely within the State of New York. During the early action period to 1980, as shown in Figures 2 and 3, flood damage reduction and increased water-based recreational opportunity will be the two problems most in need of additional investment. This assumes that adequate treatment of municipal and industrial wastes, at least to the secondary level, will have been provided during the early action period in accordance with the more specific treatment requirements of the State of New York.

Substantial flood damages still occur throughout this sub-basin, even with existing flood protection works. The estimated average annual damage on upstream watersheds is $531,000, while the downstream average along major streams is estimated at $3.3 million. These figures are based on a statistical analysis of past records of flooding and probable future floods, and on a survey of the value of real estate in the flood plain. The figures reflect the average damages yearly to be expected over a long period of time.

Two communities particularly prone to flooding are Oneonta and Binghamton. In Oneonta, the most susceptible area is between the right bank and the railroad tracks where the flood hazard has retarded development in the flood plain. Highway 7 is expected to be improved (Interstate 88) and relocated on the flood plain, which should enhance the desirability of adjacent lands for commercial or industrial uses. If the highway is constructed so that the embankment forms a closed levee around the part of Oneonta subject to flooding, this could provide a partial degree of flood protection.

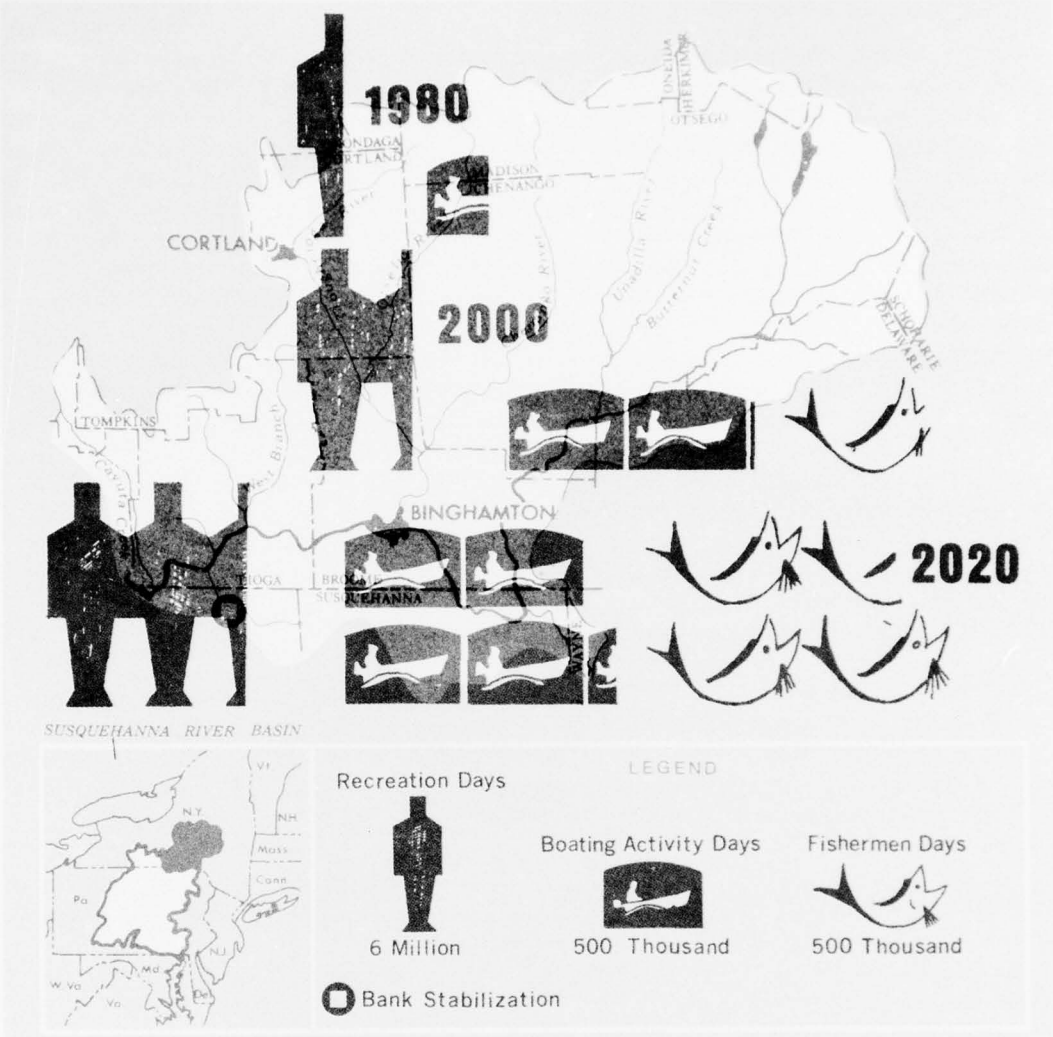
The flood hazard at Binghamton is primarily the danger of overtopping existing protection works. These works were constructed in 1943 to protect Binghamton against slightly greater than the largest floods of record which occurred on the Chenango River in July 1935 and on the Susquehanna River in March 1936. These floods are estimated under existing conditions to recur in Binghamton on the average of once in 100 years for the Susquehanna River and once in 500 years for the Chenango River. If the local protection works at Binghamton were overtopped, the present estimated damages would be on the order of $100 million. A storm over the sub-basin with 3 inches of rainfall on top of a melting layer of snow equivalent to 4 inches of water, or a storm of 7 inches of rain in a short period, could result in a flood which would overtop the walls at Binghamton.



SUB-BASIN I : Needs 1980 Figure 2

It should be noted that the existing local protection project at Binghamton was originally authorized as one component of a flood control plan which included seven flood control dams upstream from Binghamton. Five of these authorized dams have not been constructed.

Damages of lesser magnitude and economic impact occur throughout the sub-basin at such towns as Cortland, Norwich, Marathon, Oxford, Greene, Owego, Nichols, Conklin, Kirkwood, and Sidney. Among the upstream areas, severe flash flood damages have occurred at communities such as McGraw on Trout Brook in Cortland County and Georgetown along the Otselic River in Madison County.



SUB-BASIN I : Recreation Needs Figure 3

Since the flood damages are spread throughout the sub-basin, reduction of this damage by structural measures would require a number of carefully located projects, including upstream dams. The reduction of the damage by flood plain management would require widespread zoning of the flood plain, flood proofing of existing damageable property, discouraging improper development of the flood plain, flood warning, and evacuation.

Figure 3 shows the recreational needs expected to occur in this sub-basin by 1980, 2000, and 2020 in three categories: 1) general recreation, 2) boating, and 3) fishing. There will be a demand for about 3.3 million seasonal water-oriented recreation

days over and above the existing capacity by 1980. Boating needs in the early action period will require an additional 396 acres of water surface for restricted boating (motors with less than 20 horsepower) and 2,200 acres of water surface for unrestricted boating. The 1980 fishing demand is estimated at 1.6 million fisherman-days, and 1980 capability of the existing streams and lakes is 2.2 million fisherman-days. This capability, however, is unevenly distributed throughout the sub-basin, leaving some communities a considerable distance away from good fishing. The Plan includes fishery development that will distribute the fishing opportunity more evenly, and will broaden the base of a recreation industry in this area to assist in stimulating the local economy through recreational expenditures and the related investment.

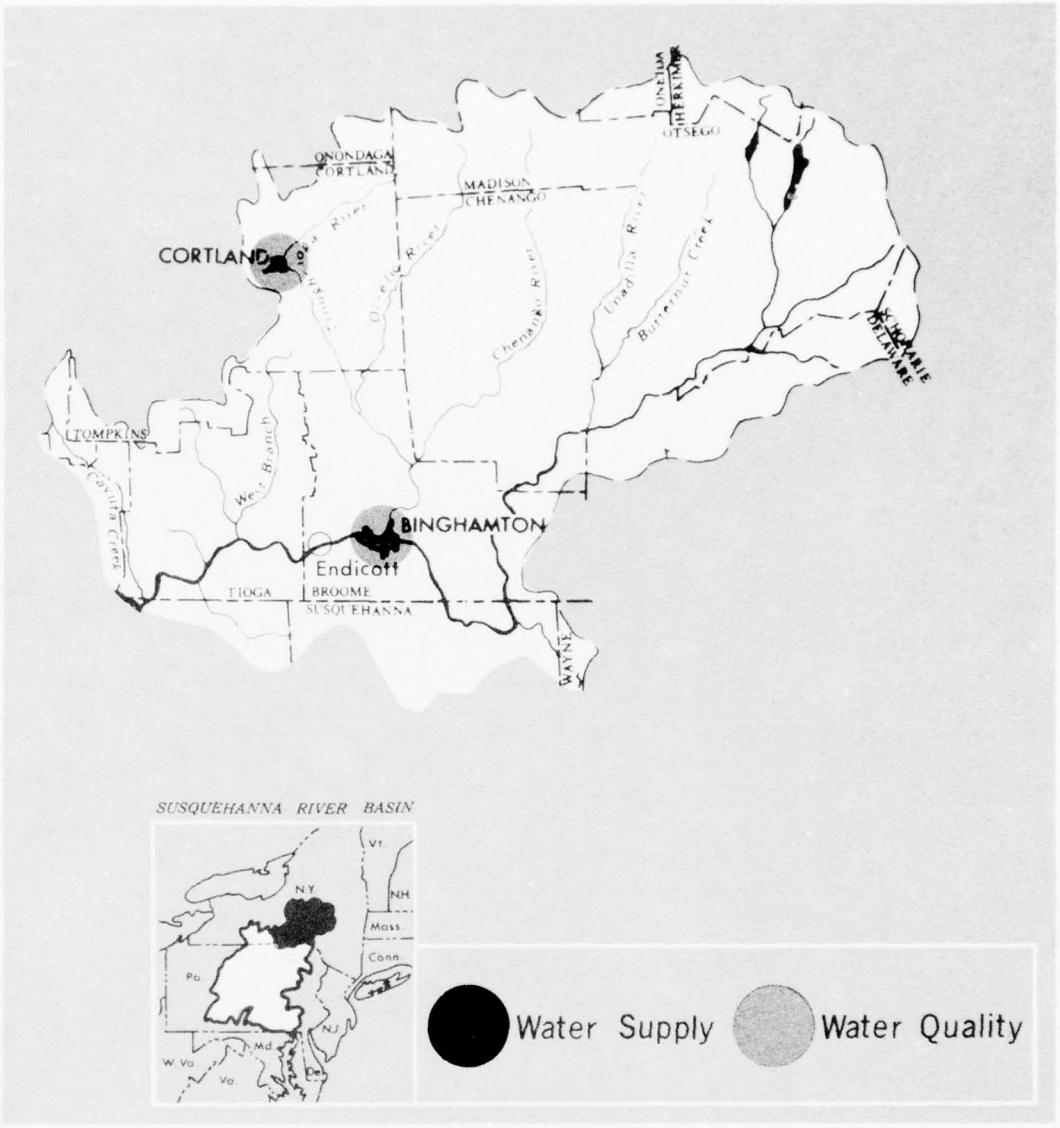
Approximately 20,048 acre-feet of surface water is expected to be used annually in this sub-basin for irrigation by the year 2020. A large portion of the irrigation water will be lost to the stream-flow system due to evapotranspiration. For this reason the Plan includes reservoir storage to compensate for almost 50 percent of the projected surface water irrigation use.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and in addition would include critical areas needing treatment.

The Coordinating Committee has also considered the need for advancing regional development and enhancing environmental quality in this sub-basin, particularly during the early action period. Regional growth could be stimulated by water resources development that would enhance the area for industrial plant location. A ready supply of clean water can attract new industries or encourage existing industries to expand, as would the availability of previously flood-prone land suitable for such use. However, a major contribution to regional development by water resource programs in Sub-basin I would be in enhancing the overall attractiveness of the area to new industry.

Recreational development around water serves both to improve the attractiveness of an area to new industry, and to generate some regional growth of itself. Investment in recreational facilities around a major impoundment, for instance, can produce new income and jobs for the communities and businesses that would provide the services and supplies for the recreation visitors.

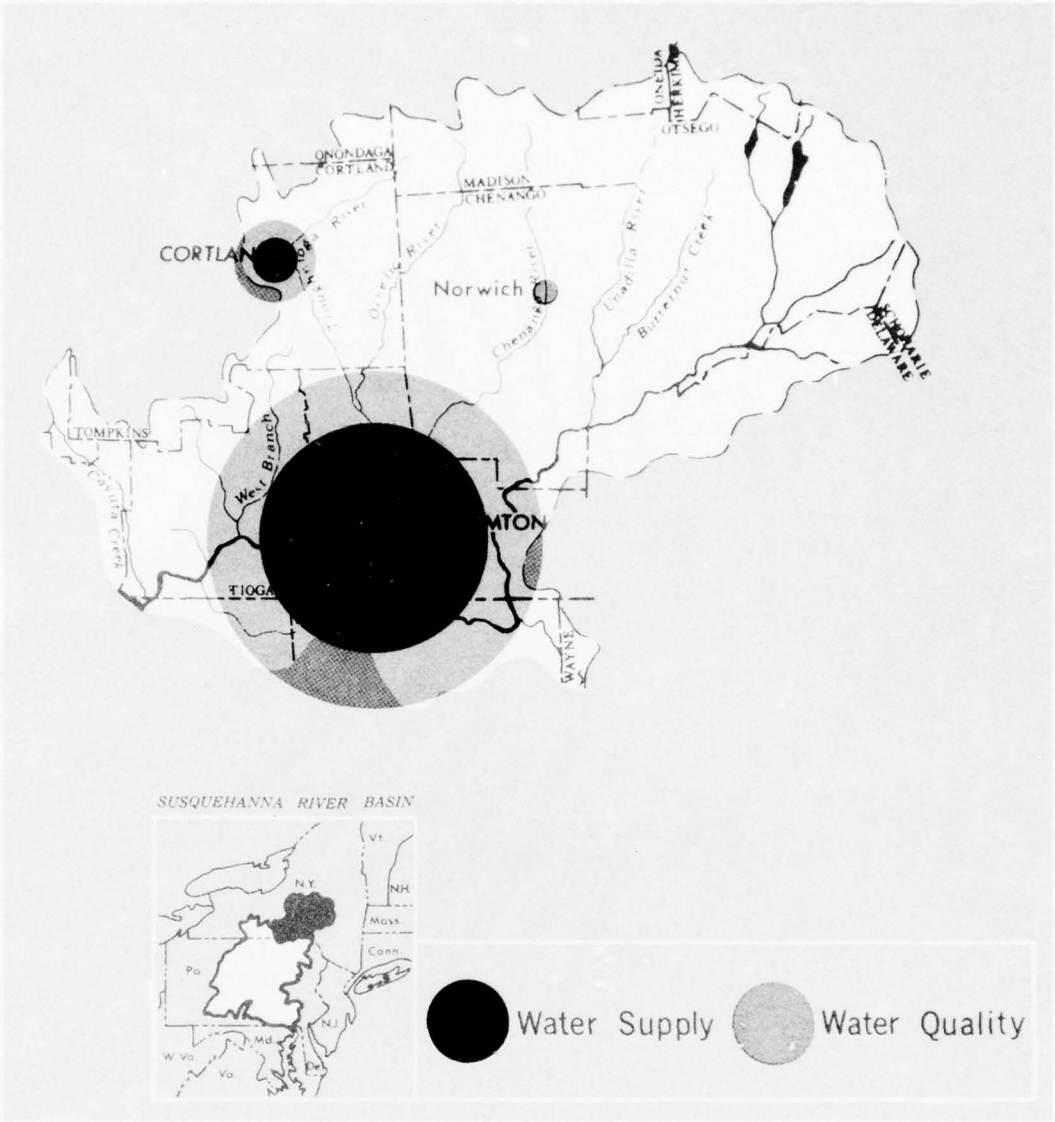
The Coordinating Committee's consideration of environmental quality recognized the values inherent in maintaining the Susquehanna River in a relatively free-flowing condition by recommending major impoundments only on tributaries rather than on the River itself. In



SUB-BASIN I : Needs 2000 Figure 4

addition, judicious flood plain management and compatible streamside recreational development work together to reduce flood damages and to protect scenic areas for recreational uses. Augmentation of low streamflows to enhance the recreational use and attractiveness of the Susquehanna River, as well as some of the major tributaries, can be accomplished with reservoirs that will, themselves, enhance their respective settings.

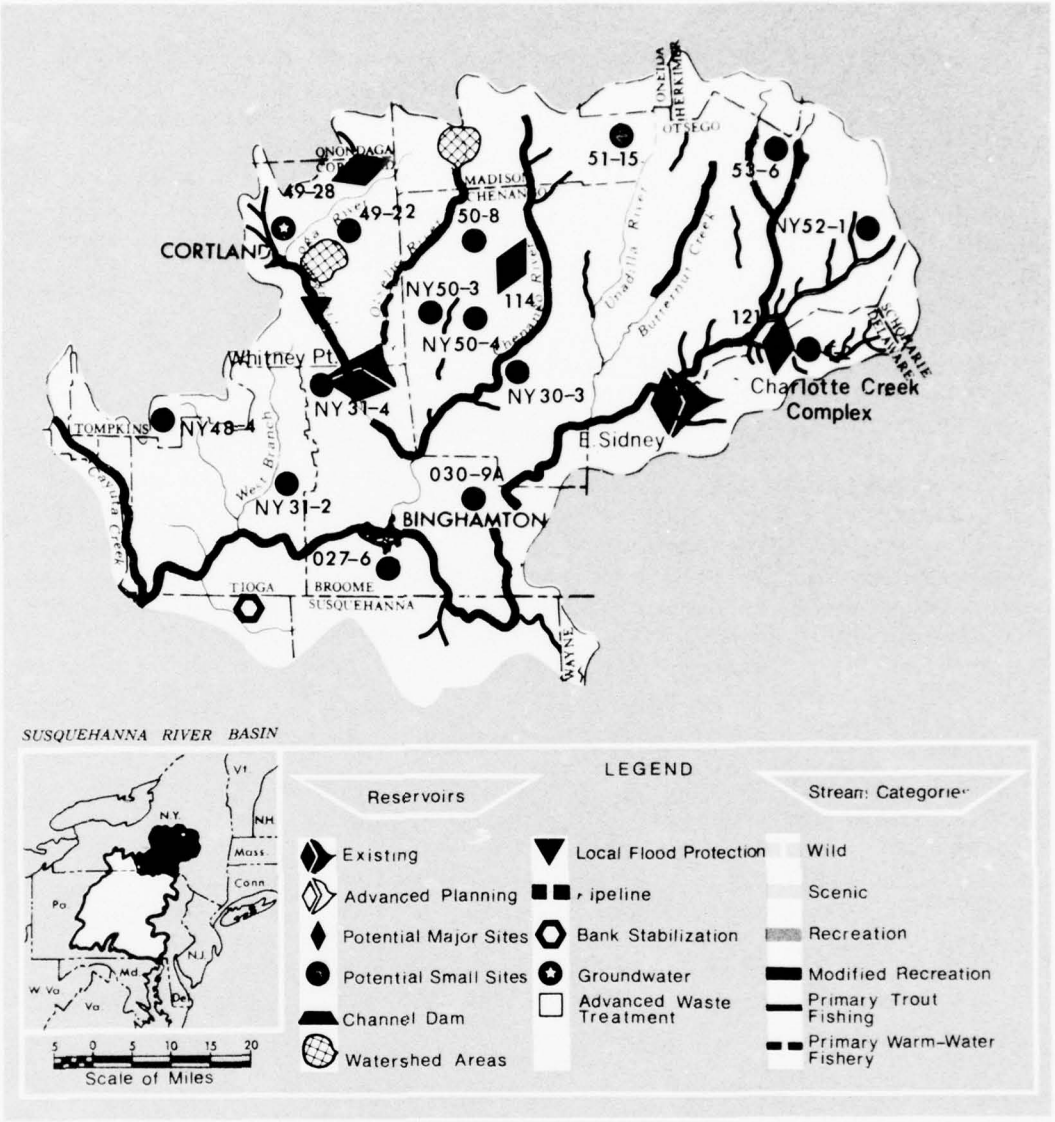
The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 4 and 5.



SUB-BASIN I: Needs 2020 Figure 5

B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin I includes three major multiple purpose reservoir developments; 14 small reservoirs for recreation, including fishing; ground water development for water supply at Cortland; one channel improvement project; two upstream watershed projects; one bank stabilization project; an extensive program of land, stream, and flood plain management; a program of water quality surveillance; and a recommendation for certain additional investigations. Figure 6 locates the specific features of the Early Action Plan.



SUB-BASIN I: Early Action Recommended Plan Figure 6

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the State of New York. This will necessitate the initiation of secondary treatment at seven service areas and the construction of new or expanded collection facilities at nine service areas.

Assuming the implementation of the measures discussed in the preceding paragraph, the anticipated natural streamflows in the Tioughnioga River will not be adequate to meet the water quality standards at Cortland. The Coordinating Committee, therefore, recommends the construction of the Fabius project which will include storage for low flow augmentation in the Tioughnioga River. Additional measures for water quality management are included in the Framework Plan.

Major Multiple Purpose Reservoirs

Charlotte Creek. The Coordinating Committee recommends a water resource development complex on Charlotte Creek consisting of one of the alternative combinations described in the New York portion of Appendix B. The optimum combination, based on the analyses by both the Coordinating Committee staff and the New York State consultants, appears to be a multiple purpose reservoir project at the authorized Davenport Center site (121) and a recreational subimpoundment at the T-2 site. The T-2 project is discussed under Reservoirs for Recreation and Fish Habitat. Appendix K(2) contains detailed information on the optimum combination for the Charlotte Creek Complex.

The multiple purpose reservoir project at site 121 would be about 6 miles upstream from Oneonta, New York and would include storage for flood control, recreation, fishing, and low flow augmentation for future municipal and industrial water supply, irrigation, and water quality management. This reservoir would sharply reduce floods from the damsite to the mouth of the Unadilla River and, to a lesser extent, along the entire Susquehanna River to its confluence with the Chemung River at Athens, Pennsylvania.

The project would eliminate about 90 percent of the expected average annual damages at Oneonta, about 70 percent at Unadilla, and about 30 percent of damages at Sidney, New York.

About one-third of the total damages that would be prevented is to residences and about one-third to transportation systems. The remaining damages prevented are commercial, industrial, public utilities, and agricultural.

The reservoir would provide protection at Oneonta, New York, against the recurrence of a flood which could be expected on the average of once in 100 years, thereby enhancing 125 acres for a much wider range of uses. Overall, the project is expected to enhance about 680 acres of land not presently protected, including the area at Oneonta, by reducing the flood threat. Some of this land will be available for industrial or other uses not presently

suitable because of the danger of flooding. The Charlotte Creek multiple purpose reservoir would be operated in conjunction with the existing East Sidney and Whitney Point Reservoirs to obtain maximum reduction of flood crests from the mouth of Charlotte Creek to the confluence of the Susquehanna and Chemung Rivers.

The optimum project at site 121 (Davenport Center) would contain conservation storage of 83,000 acre-feet, which is intended for future low flow augmentation and to provide for early recreational and fishing use. The conservation pool would be about 2,350 acres in size and would provide an opportunity for 690,000 recreation days each year. About 80 percent of this visitation would occur during the summer recreational season.

Ultimate visitation at this project is expected to reach 1.2 million recreation days. The present recreational use of the proposed project area is estimated at 10,000 recreation days annually. The proposed recreational facilities also are outlined in Appendix K(2).

The fishery potential increase, at the site and downstream, resulting from the project is estimated at 168,500 fisherman-days annually. Included in this estimate is a tailwater fishing opportunity estimated at 9,000 annual fisherman-days which the project would create. At the site itself, about 5,600 fisherman-days of warm water fishing yearly would be replaced by about 51,800 fisherman-days, also warm water fishing. The remaining 113,300 fisherman-days represent the added stream fishing opportunity gained through low flow augmentation.

The future water supply needs of the Binghamton water service area through 2020 could be assured with about 10,000 acre-feet of storage. The need begins to occur about 2010, assuming that Binghamton will continue to take its water supply from the Susquehanna River. In order to satisfy the future water quality requirements expected for the Binghamton water service area by 2020, an additional 32,000 acre-feet of storage would be needed.

The Charlotte Creek project will also be used for projected irrigation demands along the Susquehanna River between the project and Binghamton. Irrigation withdrawals in these reaches are expected to be either directly from the River or from wells adjacent to the stream. In the latter case, the river bed is such that the well withdrawals are expected to decrease the natural flow in the River itself. Regardless of which of the two types of irrigation sources is used, these withdrawals will decrease the natural River flow and should be accommodated from storage to prevent consumptive losses. The estimated storage required in the Charlotte Creek project for irrigation withdrawals from the Susquehanna upstream of Binghamton is 3,800 acre-feet in 1980 and about 10,000 acre-feet in the year 2020.

The Charlotte Creek project would make the Oneonta, Sidney, and Unadilla communities more attractive because of the proximity of the lake and the added recreational and fishing opportunity. Together with the improved flood protection, the project would remove water-related constraints to growth in these communities, as well as downstream at Binghamton, where an adequate water supply would be assured.

An agricultural impact study of the Charlotte Creek project concluded that there would be measurable displacement effects on the local economy, but at the regional and national level these effects would be so dispersed as to make them insignificant. Any temporary economic loss to the local economy in taxes and personal income would be replaced by new investment and services stimulated by the project. An economic analysis of the project including an estimate of both primary and secondary benefits and costs is given in Appendix K(2). (See also Appendix B, New York State Report.)

South Plymouth. The South Plymouth reservoir project (114) would be located on Canasawacta Creek about 2 miles upstream from Norwich. This reservoir is proposed for flood control, recreation, fishing, and, in the future, for water supply for the Town of Norwich. The project as proposed has 21,000 acre-feet of conservation storage which would create a lake of 565 acres. The project would initially provide 511,000 annual recreation days with an ultimate capacity of 1.1 million recreation days. The proposed fishing opportunity is a combination of warm water fishing and trout fishing. The tailwater fishing opportunity would increase by 12,000 the annual trout fisherman-days as a result of the project. The reservoir site has the opportunity for about 600 trout fisherman-days annually at the present time.

The proposed project would have 17,000 acre-feet (5.5 inches of runoff) for flood control storage. One-third of the estimated yearly reductions of $253,000 would occur at Norwich along Canasawacta Creek, and at Oxford and Greene, New York. The remaining two-thirds would occur at Binghamton and downstream areas. Approximately 170 acres of land suitable for industrial development would be protected from the 100-year flood by this project. Expansion benefits would result due to the added flood protection.

Norwich is expected to need an additional source of water supply around the turn of the century when the Chenango River flow is projected to be inadequate to meet the needs. Storage in the South Plymouth project would meet water supply needs beyond 2020. In the early action period, the reservoir would function for recreation, fishing, and flood control. Because of limited storage, it would be more economical for Binghamton to depend on other sites (such as Charlotte Creek) to meet its needs for storage.

The South Plymouth site's proximity is expected to enhance the economy of the Norwich area as a result of the recreational activity. In addition, it would make Norwich more attractive to new residents and industry because of the recreational and fishing opportunity afforded by the site. It is expected that recreational visitors would also come from the Binghamton, Utica, and Syracuse areas.

An agricultural impact study of the South Plymouth project area revealed that few properties would be affected and economic losses would be minor. An economic analysis of the project, including primary and secondary benefits and costs, is given in Appendix K(2).

Fabius. A third multiple purpose reservoir (49-28) proposed for Sub-basin I in the early action period would be on the West Branch Tioughnioga Creek about 16 miles northeast of Cortland, New York. This reservoir would provide recreation, fishing, low flow augmentation, and flood control benefits.

The Fabius project has a conservation storage of 21,000 acre-feet which would create a pool of 1,300 acres for recreation. The project is expected to realize an ultimate 647,000 recreation days each year. About 292,000 recreation days annually are expected to be realized by 1980.

The project would provide 10,000 acre-feet or 5.0 inches of flood control storage. The primary reach protected extends from the site along the Tioughnioga River, to Cortland, but stages would also be reduced downstream to the confluence with the Otselic River. Much of the reduction in annual flood damages would be along the agricultural reaches of the Tioughnioga River.

This project would be well located to enhance the economy of the region. It would be of considerable value to the Syracuse area as well as to Cortland. A number of ski resorts already exist in the area, and construction of the reservoir would create a year-round recreational complex, which would serve many visitors. The economy of the Town of Fabius should be greatly enhanced by the construction of this project. Although the project would adversely affect a portion of a trout stream, the Coordinating Committee believes that the regional development potential of this project and the need for flood control and water-oriented recreation in this area offsets the trout stream fishery loss. Appendix K(2) provides additional information on the Fabius project.

Reservoirs for Recreation and Fish Habitat

There are 14 small tributary reservoirs recommended in the Early Action Plan for recreation and fishing, including the sub-impoundment of the Charlotte Creek Complex. These reservoirs are discussed in the following paragraphs.

The Coordinating Committee is recommending a reservoir (T-2) which would be a sub-impoundment of the previously discussed multiple purpose reservoir on Charlotte Creek. Together these two projects comprise the Charlotte Creek complex. The T-2 site would be 13 miles upstream from Oneonta and 1/4 mile downstream from Meadow Brook. It would complement the proposed multiple purpose project. This reservoir would have a surface of 400 acres and would provide 5,500 acre-feet of storage maintained permanently for recreation. The project would provide 1 million recreation days and 16,000 fisherman-days annually, in addition to the recreational and fishing benefits resulting from the multiple purpose project. All but 100 acres of the land required for the T-2 project is within the maximum water surface area of the downstream reservoir.

A 93-acre fishing site (49-22) is recommended on Bundy Creek, 1-1/2 mile east of Chenango in Cortland County, New York. This project would provide 8,600 trout fisherman-days annually.

A fishing site (50-8) is recommended on East Branch Canasawacta Creek, 13 miles northwest of Norwich and upstream from the recommended multiple purpose South Plymouth site. The fishing reservoir, in Chenango County, would be 46 acres in size and would provide about 5,000 trout fisherman-days annually.

An upstream reservoir (51-15) for recreation, fishing, and flood control is recommended on Beaver Creek in Madison County. This reservoir would create a lake of 745 acres and the initial annual opportunity for an estimated 229,000 recreation days and 29,800 fisherman-days. The dam would provide some 2,180 acre-feet of flood storage to help protect Brookfield and other reaches downstream.

An upstream site (53-6) is recommended by the Coordinating Committee for recreation and fishing for Allen Lake, which is 3 miles from Otsego Lake in Otsego County. The reservoir would provide approximately 38,000 annual recreation days initially and 88,600 recreation days ultimately. The project would also create opportunity for 9,000 fisherman-days. It would serve Richfield Springs and Cooperstown, New York, and be located close to U.S. Route 20.

A reservoir (027-6) is recommended on the West Fork Little Snake Creek, 5 miles south of Binghamton in Broome County. This reservoir of 125 acres would annually provide 47,000 recreation days initially and 84,500 recreation days ultimately. It would also provide 12,500 trout fisherman-days at the reservoir. Proximity to Binghamton was a main factor in the selection of this site.

A reservoir (030-9A) is proposed on Still Creek in Broome County, 11 miles east of Binghamton, for recreation and fishing. The reservoir will have a 45-acre lake and is expected ultimately to attract 44,000 visitors annually for recreation purposes and to create 1,800 fisherman-days. The Coordinating Committee is recommending this project because

of its proximity to Binghamton and its potential to satisfy part of the recreational demand developing from people living in Binghamton, as well as those living in the towns between Binghamton and Sidney.

A fishing reservoir (NY 30-3) is recommended on Mud Pond Run, 5 miles southeast of Oxford in Chenango County, New York. This 180-acre reservoir would provide 22,000 trout fisherman-days annually.

A 159-acre fishing site (NY 31-2) is recommended on a tributary to Crocker Creek, 4 miles northwest of Union Center in Tioga County, New York. This reservoir would provide 23,800 trout fisherman-days annually.

A 63-acre fishing site (NY 31-4) is recommended on Nanticoke Creek, 4-1/2 miles northwest of Nanticoke in Broome County, New York. This reservoir would provide 11,000 trout fisherman-days annually.

A 303-acre fishing site (NY 48-4) is recommended on Michigan Creek, 2 miles north of the Tioga County line in Tompkins County, New York. This reservoir would provide 45,400 trout fisherman-days annually.

A 150-acre lake (NY 50-3) is proposed on a tributary to Five Streams, 4 miles southeast of Pitcher in Chenango County, New York. This project would provide 18,500 trout fisherman-days annually.

A 200-acre reservoir (NY 50-4) for recreation and fishing is proposed on Mill Brook, 5 miles northwest of Oxford in Chenango County, New York. This reservoir would ultimately provide 192,500 recreation days per year and also provide 25,700 trout fisherman-days annually. This reservoir would primarily meet demands arising from the Norwich-Oxford area.

A fishing site (NY 52-1) is recommended on a tributary to Oak Creek, 15 miles east of Cooperstown in Otsego County, New York. An 82-acre lake would provide 8,200 trout fisherman-days annually.

Ground Water for Municipal and Industrial Water Supply

The Coordinating Committee is recommending that the City of Cortland expand its existing wellfields to meet part of the projected additional water supply need by 1980 of 3 million gallons a day. It appears that if ground water development continues beyond 1980 at Cortland to meet increasing demands, these withdrawals will begin to reduce the stream flows in the Tioughnioga River before the turn of the century.

Local Flood Protection Projects

A project is recommended by the Coordinating Committee for the Village of Marathon, New York, on the Tioughnioga River. This project

would not provide complete protection against flooding for the Village but would reduce or eliminate the damage from the more frequent floods. The channel improvement would eliminate about $233,500 annually or 80 percent of the estimated flood damages at Marathon based on the statistical averaging of the damages over a long period of time.

This local flood protection project would be part of a flood control system operating within the Tioughnioga River basin above the confluence with the Otselic River. The other components of the system would be the multiple purpose Fabius project, the existing flood protection for the City of Cortland, and the recommended watershed work plan for Trout Brook (description follows).

Upstream Watershed Projects

The Coordinating Committee is recommending that two upstream watershed projects in Sub-basin I be implemented during the early action period - one on Trout Brook, a tributary of the Tioughnioga River and the other on the Upper Ostelic River.

The Trout Brook upstream watershed project in Cortland County, southeast of Cortland, would consist of two structures, one of which would be a single purpose flood prevention structure (49-15A). The other reservoir (49-34) would be a multiple purpose flood prevention and recreation structure. The single purpose structure would be located on Smith Brook, a tributary to Trout Brook, 1/2 mile southeast of McGraw. The multiple purpose structure would be located on Trout Brook, 2 miles east of McGraw. It would have a 76-acre lake for recreation which would be expected to accommodate ultimately 204,000 recreation days annually. Most of this visitation would originate from McGraw, Cortland, Binghamton, and Syracuse. The two structures involved would reduce flood damages at McGraw by $131,000 which is an estimated 98 percent of the total average annual flood damages in the watershed. McGraw was subject to severe flooding in the summer of 1969, as well as July 1935.

The Upper Otselic River project would consist of two single purpose flood prevention structures designed to reduce flood damages at Georgetown, New York. Both of the reservoirs would be in Madison County. One would be on a tributary of the Otselic River (49-2), 3 miles above Georgetown; the other (49-3) would be on the Otselic River, 4 miles northeast of Georgetown. The latter structure would support incidental fishing amounting to 3,900 fisherman-days annually, even though no facilities will be provided. These two structures operating together would reduce the average annual flood damages at Georgetown by $50,000 which represents 73 percent of the estimated total average annual damages. The last severe flood at Georgetown was during July 1935.

Other Structural Measures

Streambank Stabilization Measures. The Coordinating Committee recommends that 12 miles of selected streambank stabilization be carried out on Wappasening Creek from Warren Center, Pennsylvania to the New York line in Bradford County.

Management Measures

The management measures other than specific structural investments being recommended by the Coordinating Committee include land treatment, stream management to enhance recreational and fishing potential, flood plain management, water quality surveillance, and additional special studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 27,000 acres of land. This program would add to the existing land treatment and management practices on 609,000 acres of forest, crop, pasture, urban, and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 300 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers and on primary trout streams and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Recreational	County
1. Otselic River from Georgetown to Cortland County Line	Madison Chenango
2. Butternut Creek from source to Morris	Otsego
3. Oaks Creek, entire length	Otsego

B. Modified Recreational	County
1. Cayuta Creek, entire length	Chemung
2. Chenango River, source to Chenango Bridge	Madison, Broome, Chenango
3. Susquehanna River from source to Sayre, Pennsylvania	Otsego, Delaware, Chenango, Broome, Tioga, Susquehanna, Bradford
4. Tioughnioga River from Cortland to its mouth	Cortland Broome

C. Primary Trout Fishing

1. Chenango County

a.) Bucks Brook, b.) Fly Creek, c.) Genegantslet Creek from mouth to Smithville Flats, d.) Genegantslet Creek from lower Rt 220 road bridge to source, e.) Great Brook, f.) Handsome Brook and tributaries, g.) Otselic River, h.) Sangerfield River from mouth to Madison County Line, i.) Wheeler Brook, lower 3.5 miles.

2. Cortland County

a.) Cold Brook, b.) Factory Brook, c.) Otselic River, Gee Brook to Chenango County line, d.) East Branch Owego Creek, e.) West Branch Tioughnioga Creek, f.) West Branch Tioughnioga River.

3. Madison County

a.) Handsome Brook and tributaries, b.) Otselic River from Chenango County line to Georgetown, c.) Sangerfield River from Chenango County line to Hubbardsville.

4. Onondaga County

a.) Fabius Brook and tributaries above reservoir on Tioughnioga River, b.) West Branch Tioughnioga Creek.

5. Tioga County

a.) West Branch Owego Creek from Tompkins County line to mouth.

6. Tompkins County

a.) West Branch Owego Creek, b.) Pony Hollow Creek from Schuyler County line to 2 miles upstream.

7. Otsego County

a.) Butternut Creek, from Morris upstream, b.) Otsdawa Creek and East Branch, c.) Sand Hill Creek, d.) Spring Brook, e.) Otego Creek, from Laurens upstream, f.) Schenevus Creek, g.) Elk Creek, h.) Little Elk Creek, i.) Moorhouse Creek, j.) Parker Creek, k.) Potato Creek, l.) Fly Creek, m.) Herkimer Creek, n.) Ocauionis Creek, o.) Wharton Creek, p.) three small unnamed streams.

8. Delaware County

a.) Ouleout Creek, from Franklin upstream, b.) East Handsome Brook, c.) West Handsome Brook, d.) Houghtaling Hallow, e.) Roaring Brook, f.) Charlotte Creek from Fergusonville upstream, g.) Clapper Hollow, h.) Dona Brook, i.) Nigger Brook, j.) Prosser Hollow, k.) Pumpkin Hollow, l.) Simpsonville Creek, m.) Horse Brook, n.) Tedle Brook, o.) seven small unnamed streams.

9. Susquehanna County

a.) Silver Creek, b.) Snake Creek, c.) Starrucca Creek.

D. Primary Warm Water Fishing

1. Cortland County

a.) Otselic River from Broome County line to Gee Brook.

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be

adequate. The following lists summarize this determination for the full 50-year planning period.

1. Intensive flood plain management program

a.) Oneonta, b.) Unadilla, c.) Sidney, d.) Susquehanna River from Great Bend to Binghamton, e.) Conklin, f.) Kirkwood, g.) unprotected portion of Endicott, Johnson City, and Vestal, h.) Susquehanna River from Endicott to Owego, i.) Owego, j.) Norwich, k.) Oxford, l.) Greene, m.) Chenango River from Genegantslet Creek to Port Dickinson, n.) Cortland, o.) Tioughnioga River from Cortland to Otselic River, p.) East Branch Owego Creek, q.) Tioughnioga River above Cortland, r.) Otselic River above Whitney Point Reservoir, s.) Schenevus Creek, t.) Ouleout Creek above East Sidney Reservoir, u.) Tracy Creek, v.) Appalachin Creek, w.) Choconut Creek, x.) Canowacta Creek, y.) Drinker Creek, z.) Castle Creek

2. Warning and evacuation program

a.) Susquehanna River from Oneonta to Unadilla River, b.) Susquehanna River from Unadilla River to Great Bend, c.) Binghamton above Chenango junction, d.) Binghamton below Chenango junction, e.) Susquehanna River from Owego to Nichols, f.) Nichols, g.) Susquehanna River from Nichols to Athens, h.) Chenango River from Norwich to Genegantslet Creek, i.) Unadilla River from New Berlin to Butternut Creek, j.) Unadilla River from Butternut Creek to Susquehanna River, k.) Tioughnioga River from Whitney Point to Chenango River, l.) West Branch Owego Creek, m.) Cayuta Creek, n.) West Branch Tioughnioga River, o.) Chenango River above Norwich, p.) Unadilla River above New Berlin, q.) Otego Creek, r.) Saterlee Creek, s.) South Starrucca Creek, t.) Big Brook, u.) Page Brook, v.) Occanum Creek, w.) Belden Creek, x.) Wylie Creek, y.) Kelsey Creek, z.) Pipe Creek.

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above, using criteria outlined in Appendix K(3), stream reaches and damage centers having a priority need for flood plain management were identified. These locations require early detailed flood plain management studies to develop a fully integrated management program for use of flood-prone lands. The following early action study program is recommended for Sub-basin I:

(1) Susquehanna River from the Great Bend to Binghamton.

(2) Chenango River from the Chenango Bridge to Binghamton.

(3) Susquehanna River at Endicott, Johnson City, and Vestal.

(4) Tioughnioga River at Marathon (timed to coordinate with the other components of the flood control plan for the Tioughnioga Basin).

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Chenango River below Norwich.

(2) Tioughnioga River below Cortland.

(3) Susquehanna River below Sidney.

(4) Susquehanna River below Endicott.

(5) Payne Brook below Hamilton.

Details are given in appendix K-3.

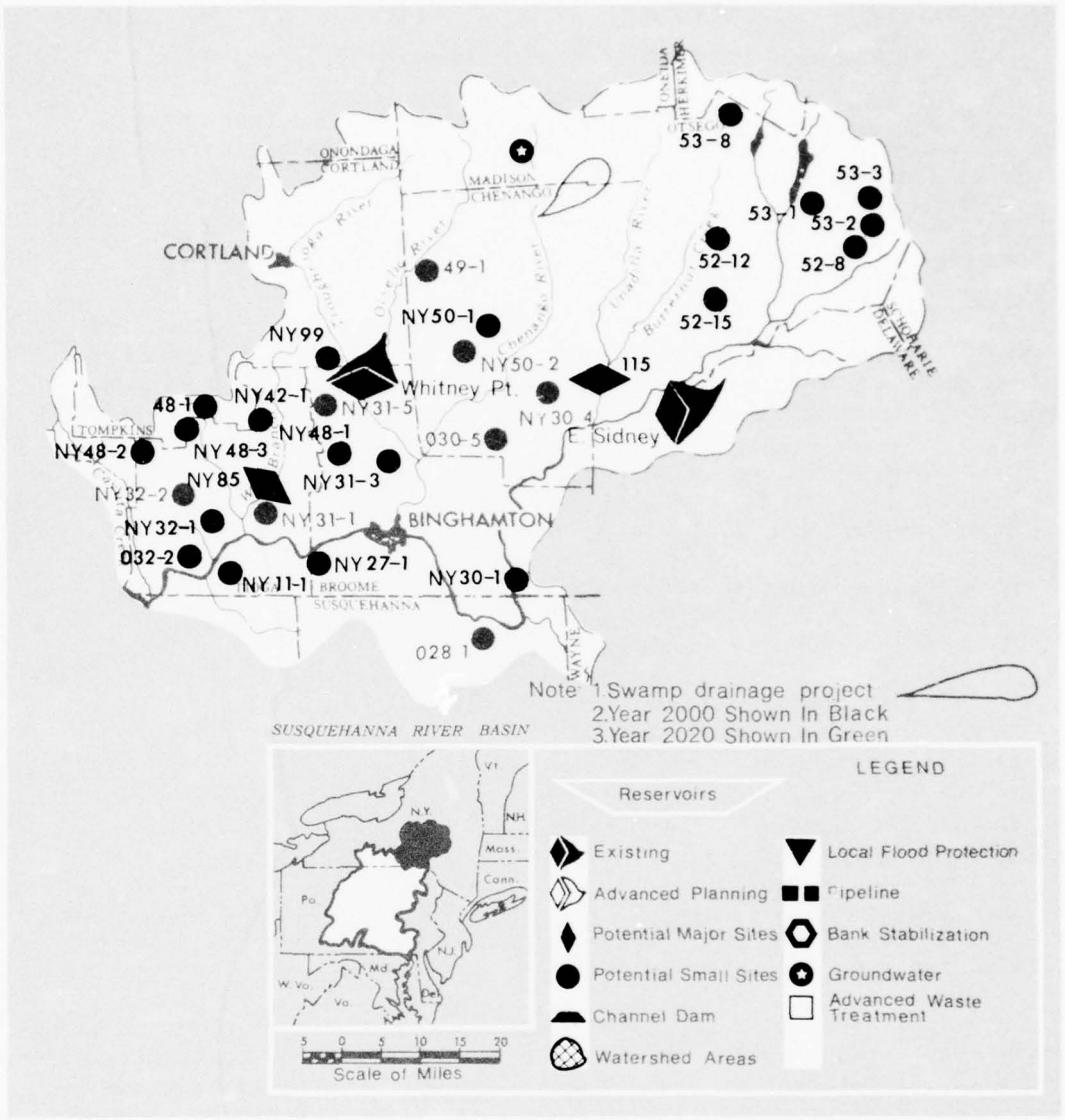
Additional Studies

Low Dams. A feasibility study should be made by the State of New York of low-level dams for recreation on the Tioughnioga River below Cortland and the Susquehanna River near Binghamton.

Regional Sewerage Study. The Coordinating Committee also recommends that a survey scope study be made of the potential for a regional sewerage system in the Binghamton area. This study, which would include the service areas of Binghamton, Port Dickinson, Vestal, Endicott, Johnson City, and Endwell, should recommend the optimum combination of sewerage system elements for the region, the appropriate cost sharing between Federal and non-Federal interests, the appropriate construction agent, and the appropriate authority to operate and maintain the system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs occurring after 1980 includes some continuation of programs recommended for the early action period, as well as additional projects to meet the needs as they become evident. Figure 7 locates the specific features of the Framework Plan.



SUB-BASIN I: Framework Plan

Figure 7

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the State of New York. This will necessitate the initiation of secondary treatment at two service areas, the expansion of secondary waste treatment at seven service areas, and the construction of new or expanded collection facilities at nine service areas.

Additional storage for low flow augmentation for water quality management is included in the major multiple purpose reservoir on the Unadilla River discussed below.

Major Multiple Purpose Reservoir

A major multiple purpose dam and reservoir (115) is included in the Framework Plan as the optimum development on the Unadilla River. This reservoir (East Guilford) would be operated for flood control along the Susquehanna River and would reduce damages as far downstream as Danville, Pennsylvania. It should be noted that this reservoir would significantly reduce the probability of water overtopping the existing levees at Binghamton, New York. (See Attachment 6 to Supplement A.) The project would have a water surface area of 5,000 acres for recreation and would ultimately provide the annual opportunity for 2.4 million recreation days and 351,000 fisherman-days. This site has excellent potential for low flow augmentation purposes should the need arise anywhere in the Basin along the Susquehanna River, or in the upper Chespeake Bay.

Reservoirs for Recreation and Fish Habitat

Large Tributary Reservoirs. A large tributary reservoir (NY 85) is proposed on the West Branch Owego Creek in Tioga County at Weltonville, New York. This project would have a water surface area of 1,255 acres and provide the annual opportunity for 476,000 recreation days ultimately.

Small Tributary Reservoirs. Twenty-seven small tributary reservoirs are included in the Framework Plan and listed in Table 1.

TABLE 1
SMALL TRIBUTARY RESERVOIRS IN FRAMEWORK PLAN IN SUB-BASIN I

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
48-1 (2000)	Danby Creek	1.7 mi. N of S Danby	235	144
52-8 (2000)	Oak Creek	2.8 mi. NW of East Worcester 5.2 mi. E of Westford	157	62
52-12 (2000)	West Branch Otego Creek	4.7 mi. NE of Garrattsville 2.5 mi. NW of Hartwick	125	9,100 Fisherman-Days
52-15 (2000)	W. Branch Otsdawa Creek	3.2 mi S of Otsdawa 4.4 mi SE of Maple Grove	172	15,100 Fisherman-Days
53-1 (2000)	Shell Rock Creek	2.5 mi W of Roseboom 5.8 mi NE of Bowerstown	106	32
53-2 (2000)	Trib. to Pleasant Brook	2.0 mi N of S Valley 3.6 mi NE of Pleasant Brook	156	38
53-3 (2000)	Trib. to Cherry Valley Creek	1.3 mi E of Rt 156 2.0 mi NW of Roseboom	98	68
53-8 (2000)	Hyder Creek	4.0 mi W of Richfield Springs 4.9 mi N of Exeter Center	136	32
032-2 (2000)	Tributary to Pipe Creek	3.2 mi NE of Barton 2.3 mi W of Tioga Center	72	7,200 Fisherman-Days
NY 11-1 (2000)	Russell Run	2.2 mi SW of Gibson Corners, 4.7 mi E of Nichols	55	8,200 Fisherman-Days
NY 27-1 (2000)	Mutton Hill Pd	1.5 mi W of Appalachin 4.4 mi SE of Owego	38	5,700 Fisherman-Days
NY 30-1 (2000)	Mud Pond	2.0 mi SE of Damascus 2.8 mi NW of Gult Summit	38	6,600 Fisherman-Days

TABLE 1 (continued)
SMALL TRIBUTARY RESERVOIRS IN FRAMEWORK PLAN IN SUB-BASIN I

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
NY 31-3 (2000)	Glen Castle Creek	2.0 mi SW of Castle Creek, 2.3 mi NW of Glen Castle	44	7,700 Fisherman-Days
NY 32-1 (2000)	Tributary to Pipe Creek	4.2 mi SW of Hubbardtown 2.7 mi W of Catatonk	50	7,500 Fisherman-Days
NY 48-1 (2000)	Tributary to East Branch Owego Creek	.76 mi W of Newark Valley, 3.2 mi NE of Weltonville	35	5,200 Fisherman-Days
NY 48-2 (2000)	Michigan Creek	1.0 mi N of Spencer Lake	107	16,000 Fisherman-Days
NY 48-3 (2000)	Miller Creek	4.7 mi SE of Danby 3.6 mi W of Willseyville	37	5,500 Fisherman-Days
NY 50-1 (2000)	Tributary to Tillotson Creek	2.0 mi SW of Tyner 2.4 mi SE of Smithville Center	63	7,900 Fisherman-Days
NY 99 (2000)	Jennings Creek	.3 mi W of Killawog	212	122
49-1 (2020)	Brakel Creek	1.5 mi E of Cincinnatus, 2.5 mi S of Pitcher	125	20,700 Fisherman-Days
028-1 (2020)	Deacon Branch Mitchell Creek	.4 mi N of Brushville	92	11,400 Fisherman-Days
030-5 (2020)	Wylie Brook	3.0 mi S of Coventry 4.5 mi NE of N Colesville	125	16,500 Fisherman-Days
NY 30-4 (2020)	Yaleville Brook	1.9 mi S of Guilford	86	10,700 Fisherman-Days
NY 31-1 (2020)	Barnes Creek	2.2 mi SE of Flemingsville	32	4,800 Fisherman-Days

TABLE 1 (continued)
SMALL TRIBUTARY RESERVOIRS IN FRAMEWORK PLAN IN SUB-BASIN I

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
NY 31-5 (2020)	Tributary to Nanticoke Creek	2.3 mi SW of Manningville, 3.7 mi N of Nanticoke	41	7,200 Fisherman-Days
NY 32-2 (2020)	Dachman Swamp	2.5 mi NW of Straits Corners, 2.1 mi NE of Halsey Valley	58	8,700 Fisherman-Days
NY 50-2 (2020)	Kedron Brook	1.0 mi N of Smithville Center, 3.2 mi W of Tyner	133	14,400 Fisherman-Days

Ground Water for Municipal and Industrial Water Supply

The Framework Plan includes ground water development to meet the water supply needs of the Hamilton water service area. Surface water, augmented by the three major reservoir projects, Fabius (49-28), South Plymouth (114), and Charlotte Creek (121), should be adequate to meet municipal and industrial water needs at all other water service areas.

Other Structural Measures

A land drainage project, Sangerfield Swamp, is proposed in the Chenango River watershed for 2020.

Management Measures

Land Management

The proposed land management program in Sub-basin I between 1980-2020 is shown in Table 2.

TABLE 2
LAND MANAGEMENT PROGRAM

	Critical Acres To Be Treated	Total Acres To Be Treated
1980-2000	300	412,000
2000-2020	400	246,000

Stream Management

The Framework Plan calls for continuing to use the recommended early action streamside management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990. Also recreational facilities are proposed to be developed on non-categorized streams, which are the Unadilla River, Cherry Valley Creek, and Schenevus Creek.

Flood Plain Management

The recommended early action intensive flood plain management program, and warning and evacuation program should be continued and detailed flood plain management studies should be made at the following locations as soon as practicable after 1980: Oneonta, Unadilla, Norwich, Tioughnioga River from Cortland to Blodgett Mills, Chenango River from Chenango Forks to Chenango Bridge, Owego, Sidney, Oxford, and Greene.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

The apparent optimum structural measures have been selected for water quality management, water based recreational opportunity, flood protection, and water supply. The primary alternatives to the selected measures follow. Additional data on these alternatives are included in Appendix K(1).

Water Quality Management

Binghamton

The primary alternative to the storage allocated in the proposed Charlotte Creek complex for water quality management and improvement is advanced waste treatment at Binghamton and Endicott. The projected average annual cost, without flow augmentation, which would be required in addition to the cost of secondary treatment, is estimated to be $998,000.

The average annual cost allocated to flow augmentation for local water quality in the Charlotte Creek reservoir is estimated at $437,000. An additional $121,000 is allocated in the proposed Fabius project for the incidental flow augmentation which the project provides at Binghamton.

Cortland

The primary alternative to the storage allocated in the proposed Fabius project for water quality management and improvement is advanced waste treatment at Cortland. The projected average annual cost, without flow augmentation, which would be required in addition to the cost of secondary treatment, is estimated to be $483,000.

The average annual cost allocated to flow augmentation for local water quality in the Fabius reservoir is estimated at $294,000.

Recreation and Fishing

Forty-one reservoirs are included in the Early Action and Framework Plans specifically for recreation and fishing. In addition, multiple purpose sites 49-34, the Charlotte Creek Complex, South Plymouth, Fabius, and East Guilford have recreation included as a purpose.

Prime alternatives to the recommended reservoir sites are shown in Table 3.

TABLE 3
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Location	Surface Area (Acres)	Storage Volume (1000 Ac-Ft)	Est. Cost ($Million)
50-2	Chenango River above Eaton	440	17.10	4.7
027-11	Hunts Creek near Loundsberry	66	1.28	1.2
031-2	Thomas Creek near Chenango	90	0.23	0.4
011-9	Wappasening Cr nr Windham Center	430	10.80	7.0
NY 158	Ludlow Creek	280	4.56	4.1
NY 165	Trowbridge Creek	120	7.74	6.2
NY 175	Jennings Creek	231	8.45	5.9

Flow Control

In the early action period, reservoir sites at Fabius, South Plymouth, and Charlotte Creek are recommended to reduce high flows and to increase dependable low flows for the benefit of the Cortland, Norwich, and Binghamton areas. In the framework period, a multiple purpose reservoir site at East Guilford is recommended to be developed with flow control as a purpose.

Non-reservoir alternatives to the flow augmentation features of these projects are advanced waste treatment at Binghamton, Endicott,

and Cortland, and ground water developments at Binghamton and Norwich, which are discussed in the water supply section.

Reservoir alternatives are as follows: (1) Genegantslet Reservoir on Genegantslet Creek instead of the South Plymouth site; (2) Middlefield Reservoir on Cherry Valley Creek instead of the Charlotte Creek project; (3) the Mt. Upton and Copes Corner projects on the Unadilla River and Butternut Creek, respectively, instead of the East Guilford project; (4) site 49-32 on Cheningo Creek in place of the Fabius site; (5) Little Egypt site on the Susquehanna near Great Bend in place of all four recommended sites; and (6) 82 additional relatively small headwater reservoirs in place of all four recommended sites.

Genegantslet Reservoir Alternative

This potential project would be located on Genegantslet Creek about 3 miles above the mouth. It would control 95 square miles of drainage compared with the 57 square miles controlled by South Plymouth.

Flood control storage in the reservoir would reduce flood damages along the Chenango from the Genegantslet confluence to the Binghamton area. It would also increase the reliability of existing local protective works at and near Binghamton. This alternative would not, however, be strategic to Norwich.

This alternative was not selected because of weak economic justification, and because of its non-strategic hydrologic position.

Middlefield Alternative

Site 122 on Cherry Valley Creek was considered as a direct substitute for the Charlotte Creek Complex. It has the advantage of being upstream of Oneonta, but the disadvantage of controlling only half as much drainage area (63 square miles). The reservoir area is predominately pasture with some cropland and one small village. A highway runs along the valley floor, but relocations would not be serious.

Because of the small dependable yield, low flood control potential, and efficiency limitations imposed by the relatively small drainage area, this project was screened out in favor of the Charlotte Creek Complex.

Copes Corner and Mt. Upton Alternatives

Sites 117 on Butternut Creek and 118 on the Unadilla River in combination would be a viable alternative to the East Guilford Reservoir which is recommended for late action development. Site 117 (Copes Corner) had been authorized by the Flood Control Act.

It is located on and approximately 3 miles above the mouth of Butternut Creek, 2 miles south of the town of Gilbertsville. The dam would control 121 square miles of drainage. Site 118 (Mt. Upton) is located above the Butternut Creek confluence and 1 mile north of the Town of Mt. Upton. Its drainage area is 369 square miles.

The combination of these two dams would control 490 square miles compared with the 523 which would be controlled by the East Guilford site. The East Guilford site was found to be more efficient than 117 and 118, and was therefore recommended for future development.

Site 49-32 Alternative

This site is located near the mouth of Cheningo Creek. It would control 27.8 square miles of drainage, compared with the 36.4 square miles which would be controlled by site 49-28 (Fabius). The site is strategic to Cortland. It was not selected, in competition with Fabius, because it would be economically less efficient. However, if the need develops, this site could be used in conjunction with Fabius to control flows on the Tioughnioga. This site is being considered in the continuing systems analysis for the Tioughnioga River Basin.

Little Egypt Alternative

This potential project would be located on the Susquehanna River about 1-1/2 miles east of Hallstead, Pennsylvania. It would control some 2,018 square miles of drainage and would contribute toward meeting the water related needs in the Binghamton area, and down river as far as Harrisburg. Flood control storage in this reservoir could significantly reduce damages due to flooding along the Upper Susquehanna River, and free some highly desirable lands for more intensive use.

Water supply and water quality storage to meet the demands of the Upper Susquehanna could easily be provided in this project. It could also provide recreational facilities for up to 1.5 million visitors annually.

This project, however, would create significant relocation problems. The Towns of Windsor, Nineveh, and parts of Oakland and Afton would be inundated by the project. In addition, the Little Egypt project would conflict with the environmental quality of the Susquehanna River. The Coordinating Committee considers environmental quality the primary objective for the River.

Small Headwater Reservoirs Alternative

Some 82 relatively small headwater dams could control about two-thirds the equivalent drainage area of the four recommended flow

control reservoirs, but proportionately would not as effectively control flood flows at Binghamton. If outflow rates from the small dams were throttled to about 15 cubic feet per second (cfs) per square mile controlled, they could reduce a reoccurrence of the 1936 flood event from 93,800 cfs to 86,000 cfs at Endicott. To compare the cost-effectiveness of the smaller reservoirs to provide both flood control and flow augmentation, approximately 144,000 acre-feet of storage should be added to the most efficient sites which control more than 10 square miles.

Table 4 is a direct comparison between the system of 4 major dams and the two most viable alternatives.

TABLE 4
FLOOD CONTROL SYSTEM ALTERNATIVES

	Area Controlled (Sq. Mi.)	Total Discharge (CFS)	1936 Flood Reduction (CFS)	First Cost ($Mil)	Annual Cost* ($Mil)	Annual Cost/CFS Flood Reduction ($)
Recommended Plan	780.0	70,000	23,800	43.7**	2.62	110
Little Egypt	2,018.0	47,500	43,600	130.0	7.80	179
82 small dams	600.0	86,600	7,200	28.5	1.71	238
No New Projects	0	93,800	0			

* 6% of first cost
**Estimated allocated cost

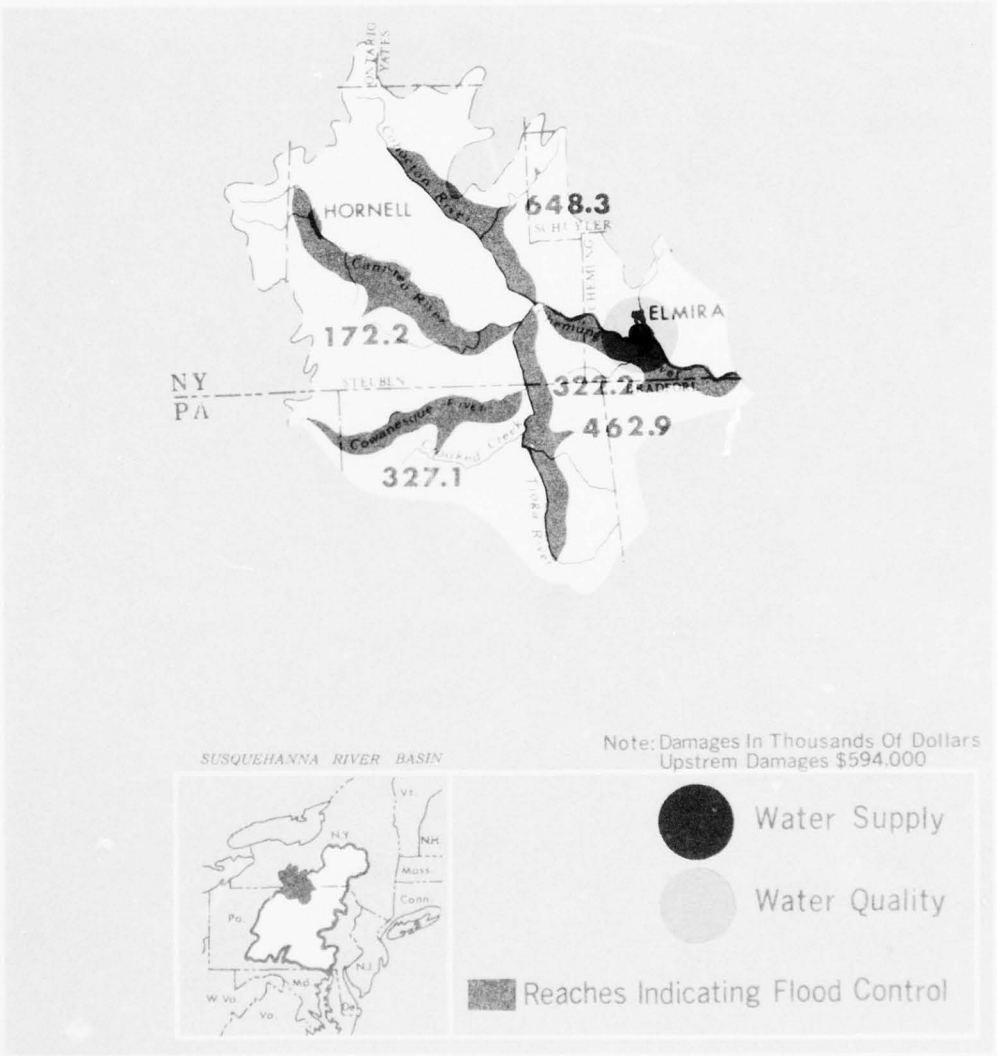
Water Supply

It is estimated that future water requirements for municipal and industrial use at Binghamton and Sidney and irrigation use along the Susquehanna River could be satisfied with extensive wellfield development. The total average annual cost of this development would be about $173,000. The total average annual cost allocated to these purposes (see Sub-Allocations, Appendix K(2)) in the Davenport Center project would be about $95,000.

CHAPTER II - THE PLAN AND ALTERNATIVES - SUB-BASIN II
(CHEMUNG RIVER BASIN)

A. WATER RESOURCES REQUIREMENTS

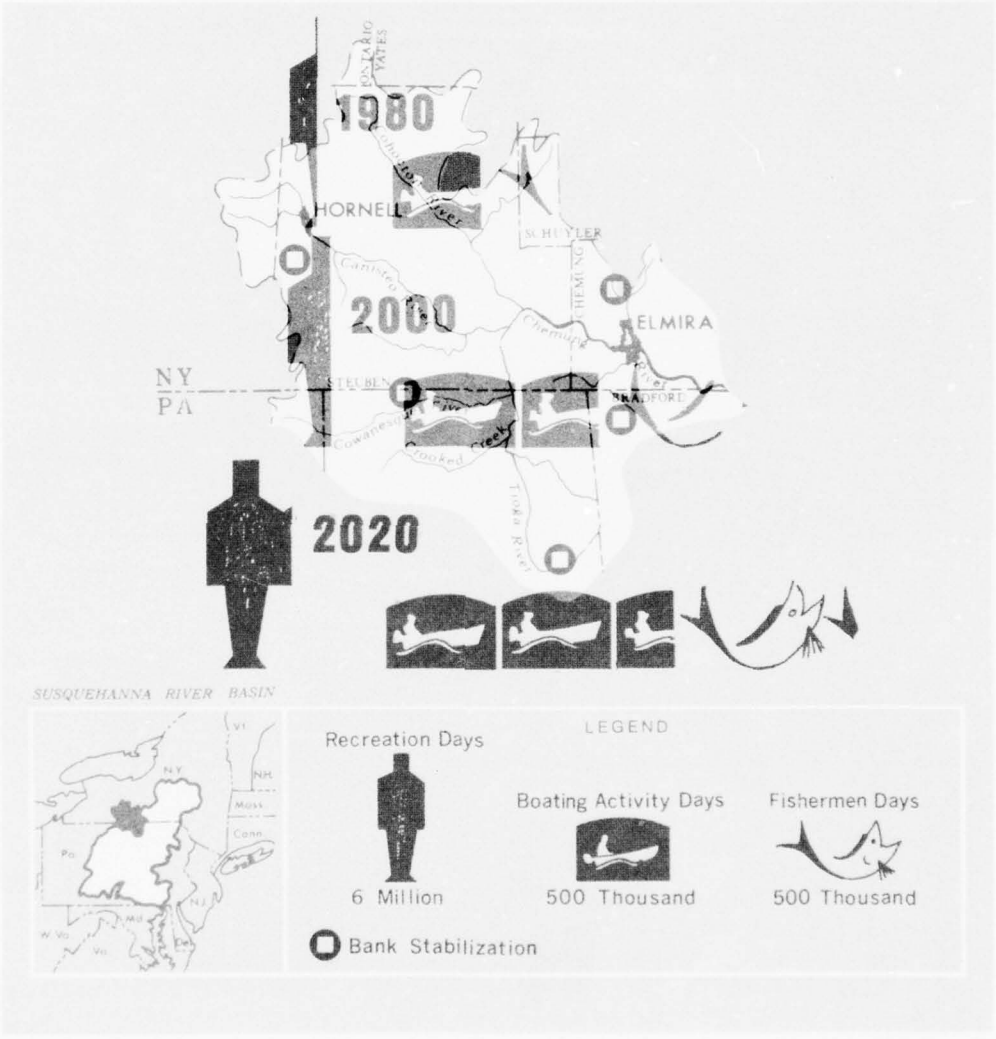
The Chemung River, from its source to its mouth, drains an area of about 2,600 square miles largely within the State of New York. The water and related land resources needs of the sub-basin in the early action period are shown in Figure 8. During the early action period to



SUB-BASIN II: Needs 1980 Figure 8

1980, the need for water quality improvement and increased water-based recreational opportunity will be the two problems most in need of additional investment.

Assuming that adequate treatment of municipal and industrial wastes, at least to the secondary level, will have been provided during the early action period in accordance with the specific requirements of the State of New York and the Commonwealth of Pennsylvania, there will be a water quality deficit in the Chemung River unless there is a provision for low flow augmentation storage above Elmira or advanced waste treatment at Elmira.



SUB-BASIN II: Recreation Needs Figure 9

There is also a serious water quality problem in this sub-basin caused by coal mine drainage pollution in the upper Tioga River Basin. The Commonwealth of Pennsylvania has expressed to the Coordinating Committee that this is an area of top priority for coal mine drainage abatement.

Figure 9 shows the recreational needs expected to occur in this sub-basin by 1980, 2000, and 2020 in three categories: 1) general recreation, 2) boating, and 3) fishing. There will be a demand for about 1.6 million seasonal water-oriented recreation days over and above the existing capacity by 1980. Boating needs in the early

SUB-BASIN II: Needs 2000 Figure 10

action period will require an additional 890 acres of water surface for restricted boating (motors with less than 20 horsepower) and an additional 2,000 acres of water surface for unrestricted boating. There is also a need for about 45,000 fisherman-days above the existing potential of the resource in the early action period.

All water service areas within this sub-basin will experience increases in their municipal and industrial water demands. The Hornell water service area will require increased source development during the early action period.

There is also a need for additional water for irrigation in the upper Cohocton River Basin. Fortunately, this is an area with abundant available ground water.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and in addition would include critical areas needing treatment.

With the exception of the Cohocton River, the upper Cowanesque River, and the upper Tioga River, the main streams of this sub-basin will be fairly well protected against floods by the existing Arkport and Almond Reservoirs and the planned Tioga-Hammond and Cowanesque Reservoirs which are now in the detailed design phase prior to construction. In addition, there are several local flood protection projects located at urban areas throughout this sub-basin. As shown in Figure 8, however, residual flood damages remain, most of which occur in upstream watersheds.

The State of New York has indicated to the Coordinating Committee a strong desire for water resources projects which would enhance regional development in Sub-basin II. The Plan, therefore, reflects the consideration given to the regional development objective.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 10 and 11.

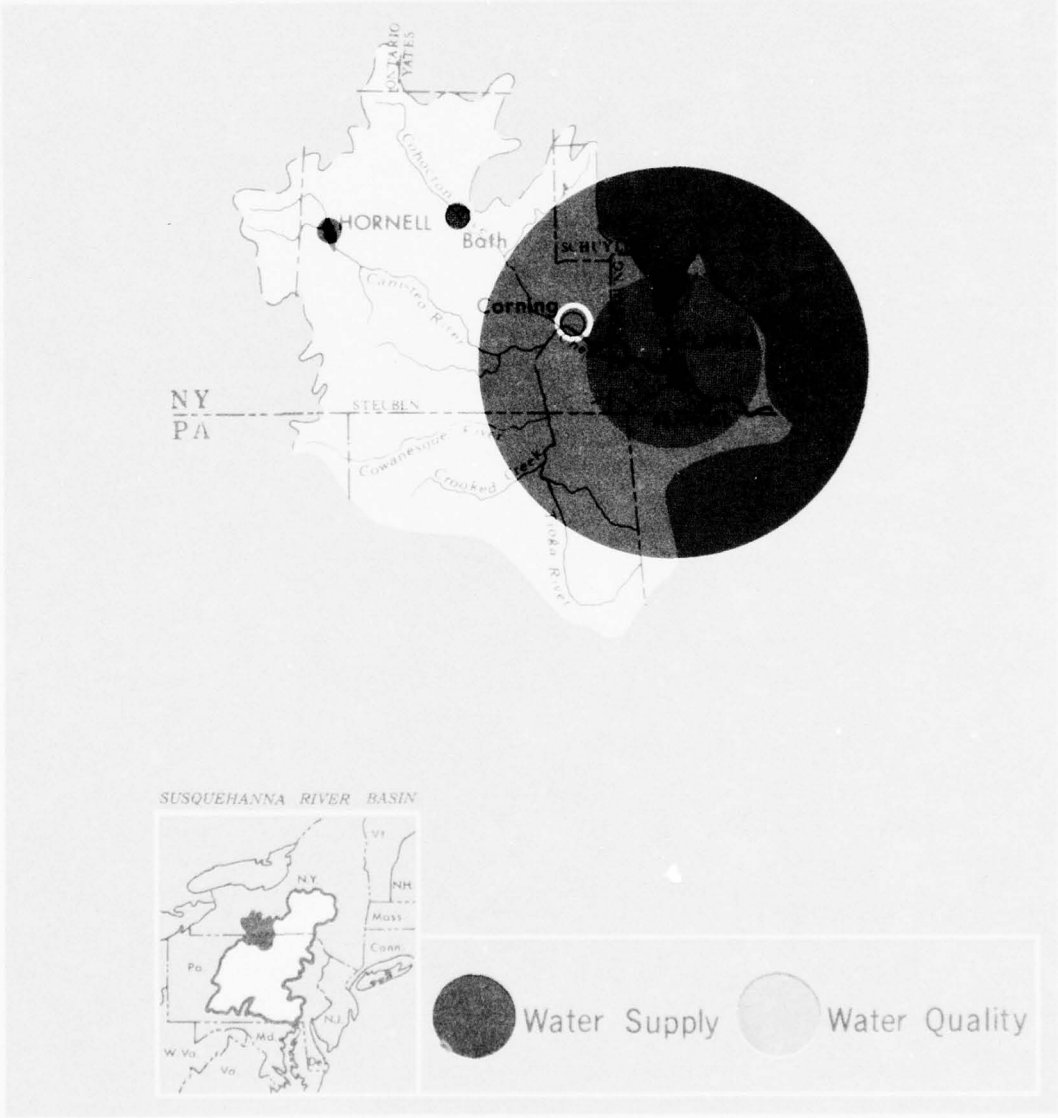
B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin II includes one coal mine drainage abatement project; two multiple purpose reservoirs; eight small reservoirs for recreation, including fishing; one ground water development for water supply; one local flood protection project; one upstream watershed project; ground water development for irrigation; five streambank stabilization projects; an extensive program of land, stream, and flood plain management; a program of water quality surveillance; and a recommendation for additional investigations. Figure 12 locates the specific features of the Early Action Plan.

Structural Measures

Water Quality Measures

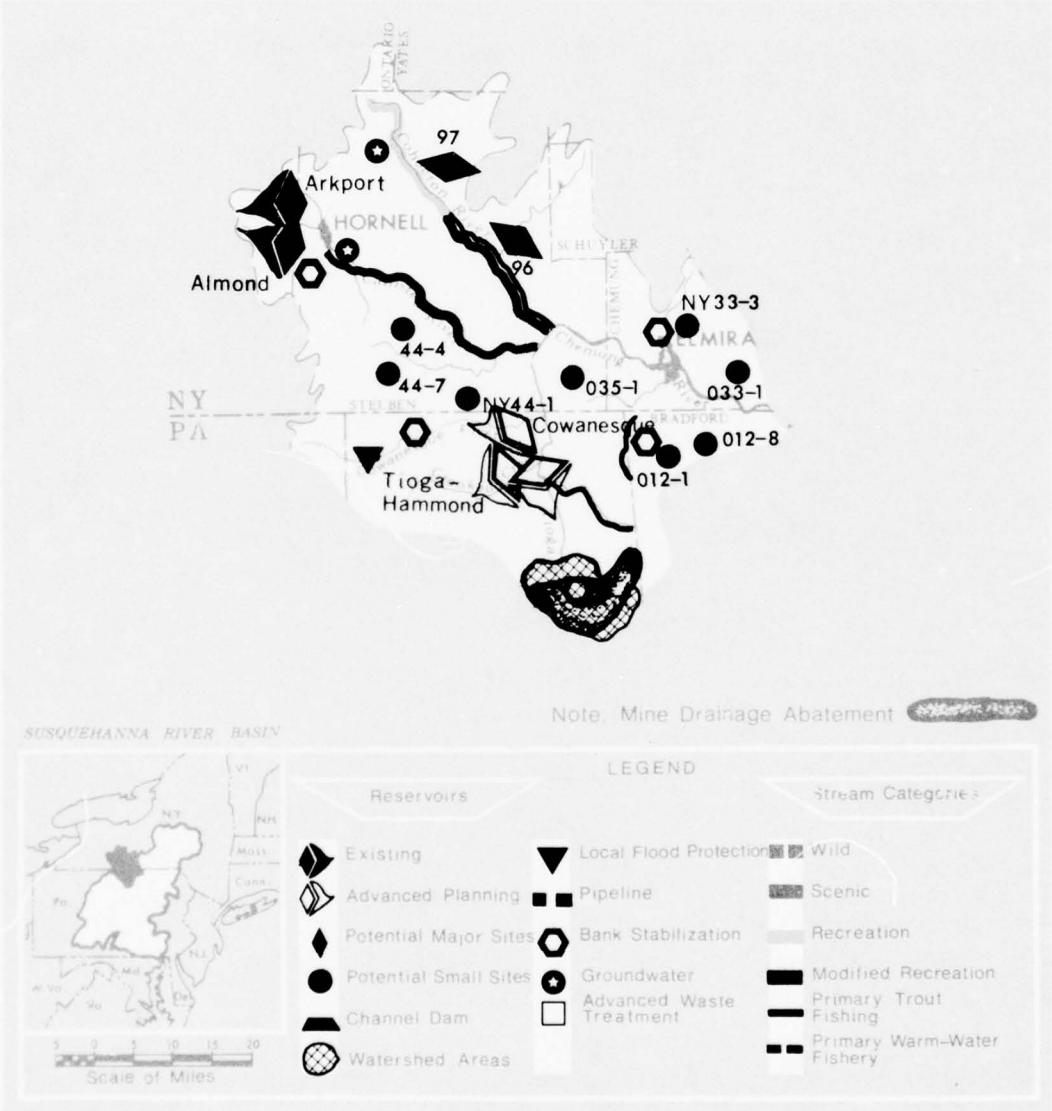
The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the State of New York and the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at one service area and the construction of new or expanded collection facilities at seven service areas.



SUB-BASIN II.: Need 2020 Figure 11

The provision of secondary treatment at Elmira, however, will not satisfy the water quality requirements in the Chemung River. The Coordinating Committee, therefore, is recommending that low flow augmentation be included as a purpose in the proposed Mud Creek and Fivemile Creek Reservoirs.

The Coordinating Committee is also recommending that mine drainage pollution abatement be accomplished on the Tioga River watershed. Abatement measures would be required on Morris Run, Coal Creek, and Bear Creek, which are all tributaries to the Tioga River in the vicinity of Blossburg, Pennsylvania. The abatement would include



SUB-BASIN II: Early Action Recommended Plan Figure 12

a mixture of preventive, collection, and treatment measures. Although the investment in coal mine drainage pollution abatement is greater than the estimated primary benefits (i.e., additional recreational and fishing use of the stream and reduced water treatment costs at water supply treatments plants) the Coordinating Committee thinks that this abatement is necessary to achieve and restore environmental quality in this area and to enhance regional economic growth. An Appalachian Corridor is planned to pass through this region parallel to the Tioga River. If the environment is improved and, more specifically, if the quality of the water is improved, expansion and economic growth should be greatly enhanced in this area.

Major Multiple Purpose Reservoirs

Two major multiple purpose dams and reservoirs are proposed in this sub-basin for the early action period. Both of them are on tributaries to the Cohocton River.

Fivemile Creek. The Fivemile Creek project (97) is recommended to be used for flood damage reduction, recreation, fishing, and low flow augmentation for water supply and water quality in the Elmira area. In meeting the low flow augmentation needs at Elmira the project would accrue incidental benefits for water supply and water quality management at Bath and water quality management at Corning.

The Fivemile Creek project would be upstream from the Village of Bath and would provide flood reductions there as well as downstream on the Cohocton River. Most of the damages prevented by this project are along the Cohocton River. The multiple purpose project would have an 1,100 acre lake and would provide annually 162,000 recreation days initially and 740,000 recreation days ultimately. The project would also provide 36,500 fisherman-days.

This reservoir would serve as one component of a system of two major reservoirs in this sub-basin to augment flows for Elmira. In the early action period, the Fivemile Creek and Mud Creek projects (described below) should together be used to augment flows at Elmira, and should be adequate to take care of the needs to the year 2000.

An economic impact study of the Fivemile Creek project concluded that the economic loss would be minor, since the project would displace only about four farms and two small industries. However, the project would require about 200 persons to relocate.

Mud Creek. The Mud Creek reservoir (96) would be located on Mud Creek about 3 miles north of Savona. This project would have flood control storage for approximately 2.5 inches of runoff to reduce damages along the lower Cohocton and Chemung River reaches. Its

recommended operation for low flow augmentation is mentioned above, under the Fivemile Creek project, as one component of the two-reservoir system operating to meet Elmira's need. This project would have a 2,050 acre lake. It would provide an annual recreational opportunity for 900,700 recreation days initially and 2 million recreation days ultimately. It would also provide the annual fishing opportunity for 145,000 warm water fisherman-days at the reservoir, 6,000 warm water fisherman-days in the tailwater area of the dam, and 24,000 warm water fisherman-days downstream.

The recreational visitation to this reservoir is expected to have a significant impact on the economy of the area, if the necessary investment in service facilities is made. In addition, the project would be an inducement, along with the Fivemile Creek project, to growth and industrial location in the Cohocton River valley.

An economic impact study of this project revealed that most of the land that would have to be taken for the construction of this project is already State-owned. Although only a few farms would be affected, about 35 rural homes and summer cottages would have to be relocated. Although some existing wildlife refuge lands would be inundated, the Coordinating Committee believes that the combined recreational, fishing, and wildlife opportunity afforded by the project will more than mitigate these losses.

Reservoirs for Recreation and Fish Habitat

There are eight small tributary reservoirs proposed in the Early Action Plan for recreation and fishing. These reservoirs are described below.

A 190 acre reservoir (44-4) is recommended on the North Branch Tuscarora Creek, in Steuben County. This project would provide 6,800 warm water fisherman-days at the reservoir and an initial 97,000 recreation days. The ultimate recreational visitation expected would be 147,000 recreation days. Most of the visitation to this project would originate from nearby towns such as Westfield, Elkland, Addison, Canisteo, and Hornell. However, there would be some visitation to the area via the proposed Appalachian Corridor located along the Tioga River and also from State Route 17 in New York (Southern Tier Expressway).

A single purpose fishing reservoir (44-7) is recommended on a tributary to the South Branch Tuscarora Creek in Steuben County, New York. This reservoir would be 69 acres in size and would provide 6,800 trout fisherman-days at the reservoir and 4,000 warm water fisherman-days downstream.

A reservoir (012-1) on Buck Creek about 6 miles south of Wellsburg, New York, is recommended to provide partial flood reduction from Checkerville, Pennsylvania, to Wellsburg, New York, and to provide recreation and fishing. The 100-acre project would create 4,000 warm water fisherman-days at the reservoir. It would provide the annual recreational opportunity for 38,000 recreation days initially and 75,000 recreation days ultimately. The project is being considered as part of the Endless Mountains Resource Conservation and Development Project.

The Coordinating Committee recommends a recreation and flood control reservoir (012-8) on a tributary to Fall Creek, 3 miles east of Bentley Creek. It would provide partial flood reductions from Bentley Creek, Pennsylvania, to Wellsburg, New York. The reservoir would have a 41 acre lake and would provide annually 50,000 recreation days initially and 88,000 recreation days ultimately.

A 198 acre reservoir (033-1) is proposed for wildlife enhancement on Wynkoop Creek in Chemung County. The site is 5 miles from the confluence of Wynkoop Creek and the Chemung River. The project would also enhance fishing and would provide 19,300 trout fisherman-days at the reservoir.

An additional recreational project (035-1), 65 acres in size, is recommended at the source of Hendy Creek. This project would annually provide an initial recreation opportunity of 19,000 recreation days. The ultimate recreational opportunity to be realized has been estimated at 31,000 recreation days.

A single purpose fishing site (NY 33-3), 57 acres in size, is recommended on Baldwin Creek, 3 miles south of Bresport in Chemung County. This project would provide 11,400 trout fisherman-days annually at the reservoir.

A 132 acre single purpose reservoir (NY 44-1) is proposed on Elk Creek, 2 miles west of Borden in Steuben County. This project would provide an estimated 13,200 trout fisherman-days annually at the reservoir.

Ground Water for Municipal and Industrial Water Supply

The Coordinating Committee is recommending that ground water be used as the source for additional water supply needed in the early action period for Hornell. The wellfield at Hornell would have to be expanded to provide an additional 1 million gallons per day in the early action period.

Local Flood Protection Projects

The Coordinating Committee is recommending the construction of one local flood protection project in this sub-basin in the early

action period. A channel improvement on the Cowanesque River is recommended in the Borough of Westfield in Tioga County, Pennsylvania. It is estimated that this project would reduce flood damages at Westfield by an average annual amount of $55,800.

The Coordinating Committee has concluded that major reservoirs are very expensive in Sub-basin II due to conflicts between reservoir sites and new highways and due to poor foundation conditions. It should be emphasized, therefore, that there will be very little additional opportunity for reservoir storage in the future beyond what is recommended for early action in this sub-basin and the municipalities and States involved should give very careful consideration to use of their flood plains and to flood plain management.

Upstream Watershed Project

One upstream watershed project is proposed in this sub-basin for early action. The project would consist of four detention reservoirs, in the upper portion of the Tioga River Basin above Blossburg, Pennsylvania, and associated land treatment and management measures. All of the four reservoirs would contain flood storage and together would greatly reduce future flooding at Blossburg. The reservoirs are discussed in the following paragraphs.

An 80 acre multiple purpose flood protection and recreation reservoir (46-1) would be located on the Tioga River, about 8 miles east of Blossburg in Tioga County, Pennsylvania. It would be used for recreation and fishing, and would annually provide 14,500 trout fisherman-days at the reservoir. The project would also annually provide the recreational opportunity for 94,000 recreation days initially and 156,000 recreation days ultimately. The flood storage would provide partial flood protection at Blossburg, Covington, and Canoe Camp, Pennsylvania.

A single purpose flood prevention structure (46-2) would be located on the Tioga River approximately 2-1/2 miles southeast of Blossburg. It would provide partial flood reductions from Blossburg to the slack water of the Tioga-Hammond Dam.

A single purpose flood prevention structure would be located on Johnson Creek (46-15), 2-1/2 miles southwest of Blossburg, for partial flood reduction at Blossburg. Another single purpose flood prevention structure (46-16) would be located on Bellman Run, a tributary to Johnson Creek, 2-1/2 miles southwest of Blossburg. Together the structures on Johnson Creek and Bellman Run would offer flood protection along Johnson Creek and partial flood protection along Tioga River from Blossburg to Canoe Camp.

The Coordinating Committee investigated the possibility of putting storage for water supply and/or recreation in the site 46-16, 2-1/2 miles southwest of Blossburg on the Tioga River, but did not deem that it would be a wise use of this storage because of the steep topography and unfavorable water quality. Other alternatives for water supply for downstream towns, especially Mansfield, appear to be better solutions. In fact, the data indicate that there will be adequate flow in the Tioga River to meet the needs of these localities. However, the Tioga River is polluted from coal mine drainage and this condition must be corrected before the River can be used as a water supply source. The Committee's recommendation for this abatement has been discussed above.

Other Structural Measures

Irrigation. The Coordinating Committee is also recommending that ground water be developed to meet the projected irrigation needs in the upper Cohocton River watershed. Although some irrigation water could be obtained from the recommended Fivemile Creek reservoir, the analysis by the Committee reveals that it should be less costly for the irrigators to obtain their water from the ground. The aquifer is such that this withdrawal from the ground in the Bath area for irrigation will not significantly reduce the flow in the Cohocton River watershed.

Streambank Stabilization Measures. Streambank stabilization projects are recommended by the Coordinating Committee for this sub-basin at five locations as noted below:

1. Purdy Creek adjacent to a cemetery at Hartsville in Steuben County.

2. Newtown Creek for 1 mile through the City of Horseheads in Chemung County.

3. Along the Cowanesque River for 26 miles from Potter Brook to Osceola in Tioga County, Pennsylvania.

4. Coal Run for 1/2 mile in the town of Blossburg in Tioga County, Pennsylvania.

5. Bentley Creek for 6 miles from Middletown, Pennsylvania, to the New York State line in Bradford County, Pennsylvania.

Management Measures.

The management measures being recommended by the Coordinating Committee include land management, stream management to enhance recreational and fishing potential, flood plain management, water quality surveillance, and additional studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 31,000 acres of land. This program would add to the existing land treatment and management practices on 341,000 acres of forest, crop, pasture, urban, and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 700 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams, and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Recreational	County
1. Cohocton River from source to Bath	Livingston Steuben

B. Modified Recreational	County
1. Cohocton River from Bath to mouth	Steuben
2. Canisteo River from Hornell to mouth	Steuben

C. Primary Trout Fishing

1. Steuben County
   a.) Cohocton River from source to Bath
2. Bradford County
   a.) Seeley Creek
3. Tioga County
   a.) Mill Creek
   b.) Seeley Creek

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood-proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following lists summarize this determination for the full 50-year planning period.

1. Intensive flood plain management program

   a.) Blossburg, b.) Canisteo River from Arkport Dam to Hornell, c.) Cohocton River from Fivemile Creek to Tioga River, d.) Junction of Tioga River and Cohocton River to Elmira, e.) Big Flats, f.) Bentley Creek.

2. Warning and evacuation program

   a.) Tioga River from Blossburg to Mansfield, b.) Tioga River from Canisteo to Cohocton River, c.) Cowanesque River from Mills to head of Cowanesque Reservoir, d.) Canisteo River from Hornell to Bennett Creek, e.) Canisteo River from Bennett Creek to Tuscarora Creek, f.) Unprotected portion of Addison, g.) Canisteo River from Tuscarora Creek to Tioga River, h.) Cohocton River from Twelvemile Creek to Fivemile Creek, i.) Chemung River from Elmira to Susquehanna River, j.) Seeley Creek, k.) Cohocton River above Twelvemile Creek, l.) Troups Creek, m.) Mill Creek, n.) Crook Creek, o.) Singsing Creek, p.) Post Creek.

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above, and using criteria outlined in Appendix K(3), one stream reach having a priority need for flood plain management was identified. This reach, the Chemung River from Corning to Elmira, requires an early action detailed flood plain management study to develop a fully integrated management program for use of flood-prone lands.

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Cowanesque River below Westfield and Elkland.

(2) Canisteo River below Hornell.

(3) Cohocton River below Bath.

(4) Chemung River below Corning and Elmira.

Details are given in appendix K-3.

Additional Studies

Low Dam. A feasibility study should be made on a low-level dam for recreation on the Chemung River between Corning and Elmira.

Regional Sewerage Study. The Coordinating Committee also recommends that a survey scope study be made of the potential for a regional sewerage system in the Elmira area. This study, which would include the service areas of Elmira, Horseheads, Big Flats, and Corning, as well as the remainder of Chemung County, should recommend the optimum combination of sewerage system elements for the region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the authority to operate and maintain the system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs after 1980 includes some continuation of programs recommended for the early action period, as well as additional projects to meet the needs as they become evident. Figure 13 locates the specific features of the Framework Plan.

Structural Measures

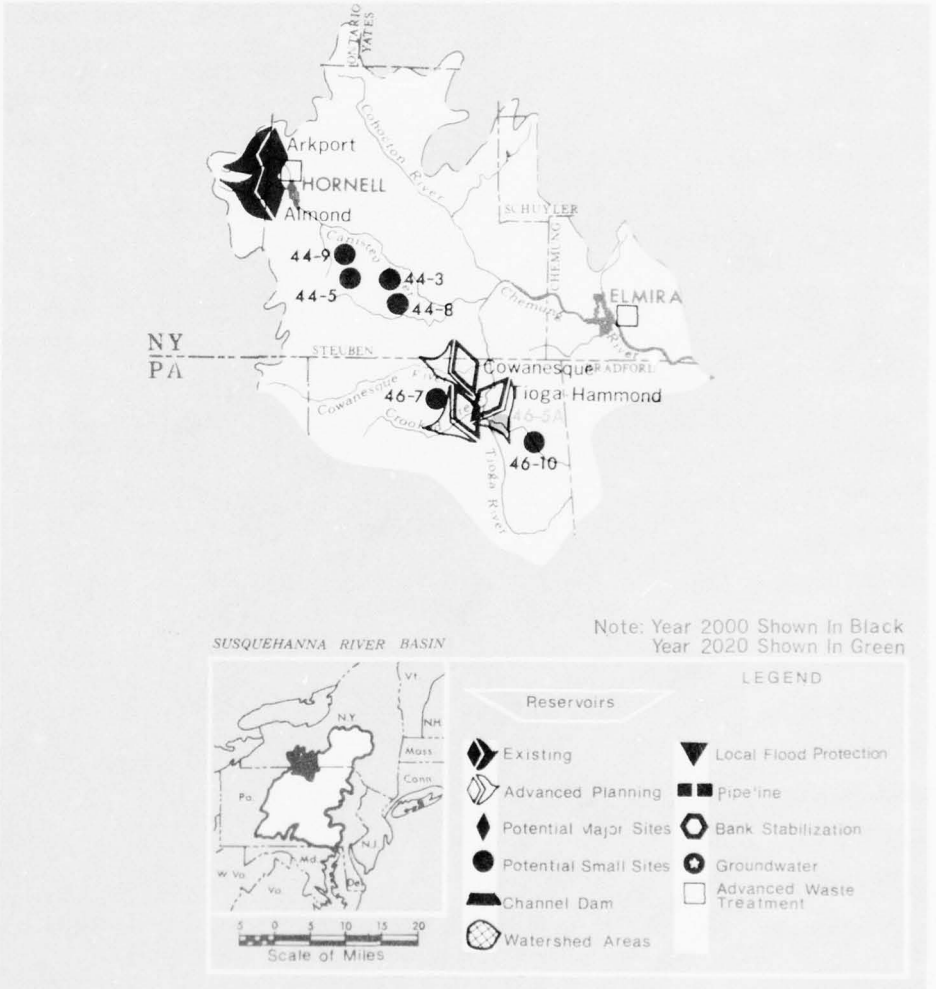
Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to

comply with the specific waste water treatment requirements of the State of New York and the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at four service areas and the construction of new or expanded collection facilities at seven service areas.

An advanced waste treatment plant is proposed at Elmira near the year 2000 to meet the State water quality standards for the Chemung River.

Advanced waste treatment is also proposed for Hornell near the year 2000.



SUB-BASIN II: Framework Plan Figure 13

Low flow augmentation from the Mud Creek and Fivemile Creek reservoirs will also be needed in the late action period to meet the water quality standards in the Chemung River.

Reservoirs for Recreation and Fish Habitat

Seven small tributary reservoirs are proposed for this sub-basin in the Framework Plan and are listed in Table 5.

TABLE 5
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN II

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1000 Recreation Days)
44-3 (2000)	Tracy Cr.	3.0 mi.NE of Hedgesville 1.8 mi.S of Cameron Mills	124	46
44-5 (2000)	Trib. to Tuscarora Cr.	3.6 mi.W of Hedgesville 2.5 mi.N of Jasper	105	107
44-8 (2000)	Trib. to Tuscarora Cr.	2.0 mi.E of Woodhill 3.8 mi.SE of Hedgesville	75	7,400 Fisherman-Days
44-9 (2000)	Talbot Cr.	2.0 mi.E of S Canisteo 4.8 mi.N of Jasper	88	8,700 Fisherman-Days
46-7 (2000)	Elkhorn Cr.	5.1 mi.S of Nelson 3.5 mi.NW of Hammond	80	65
46-10 (2000)	Elk Run	2.8 mi.NE of Mainesburg 3.5 mi.S of Roseville	150	188
46-5A (2020)	Mill Cr.	2.1 mi.NW of Painter Run, 2.1 mi.S of Lambs Cr.	525	105

Management Measures

Land Management

The proposed land treatment and management program in Sub-basin II between 1980 and 2020 is shown in Table 6:

TABLE 6
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	700	217,000
2000-2020	600	111,000

Stream Management

The Framework Plan calls for continuing the use of the recommended early action streamside management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program and warning and evaluation program should be continued and flood plain management studies should be made at the following locations as soon as practicable after 1980: Erwins to Painted Post, and Campbell to Painted Post.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

Structural measures in Sub-basin II have been selected for pollution control, and to provide water-based recreational opportunity, flood protection, and water supply. The primary alternatives to the selected measures are presented below. Additional data on these alternatives are included in Appendix K(1).

Water Quality Management

Elmira

The primary alternative to the storage allocated in the proposed Mud Creek and Fivemile Creek projects for water quality management is advanced waste treatment at Elmira. By the year 2020 some advanced waste treatment would be required at Elmira even with flow augmentation. The flow augmentation, however, would reduce the required level

of treatment at Elmira. The projected average annual cost of the additional increment of advanced waste treatment required at Elmira without flow augmentation is estimated to be $297,000.

The average annual costs allocated to flow augmentation for water quality at Elmira in the Mud Creek and Fivemile Creek projects, respectively, are $67,000 and $56,200*.

Recreation and Fishing

Fifteen reservoir sites are recommended in the Early Action and Framework Plans for recreation and fishing. In addition, multiple purpose sites 46-1, and the Fivemile Creek and Mud Creek reservoirs have recreation included as a purpose. Prime Alternatives to the recommended sites are presented in Table 7.

TABLE 7
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Stream	Surf. Area (Acres)	Storage Vol (1000 Ac-Ft.)	Est. Cost ($Thousand)
43-6	Fivemile Creek	285	3.8	638
43-11	Campbell Creek	340	14.8	7,291
43-12	Twelvemile Creek	110	1.3	1,964
012-3	Miller Run	33	0.4	295
012-4	Bentley Creek	70	1.0	667
012-5	Fall Brook	42	0.6	301
012-6	Bentley Creek Trib	35	0.3	169
012-7	Buck Creek	29	0.6	406
012-9	Trout Creek	24	0.3	307
012-12	Murray Creek	65	0.9	272
012-13	Bentley Creek Trib	32	0.7	864

Flow Control

In the early action period, reservoir sites on Fivemile and Mud Creeks, both tributary to the Cohocton River, are recommended to reduce high flows and to increase dependable low flows for the benefit of the Bath, Corning, and Elmira areas.

Non-reservoir alternatives to the flow augmentation features of these projects are advanced waste treatment at Elmira, Bath, and Corning, and ground water development in the Elmira and Bath areas.

*Fivemile Creek cost allocation was performed considering regional expansion benefits.

Reservoir alternatives are as follows: 1) Site 99 on Tuscarora Creek in place of the Mud Creek site, 2) Site 100 on Bennetts Creek in place of the Fivemile Creek site, and 3) Twenty-one relatively small headwater reservoirs in place of both recommended sites.

Tuscarora Creek (Site 99) Alternative

This potential project is located on Tuscarora Creek about 5 miles above the mouth and 1 mile west of South Addison, New York. Its drainage area is 114 square miles in comparison to the Mud Creek site's 75 square miles.

This site would be less efficient than Mud Creek, not as adaptable to multiple purpose use, and not as strategic to the Cohocton Valley where flood control and water supply needs are anticipated.

Bennetts Creek (Site 100) Alternative

This potential project is located on Bennetts Creek about 3 miles above the mouth and 2 miles south of the Village of Canisteo, New York. Its drainage area is 59 square miles in comparison to the Fivemile Creek site's 66 square miles. Site 100 would be less effective than Fivemile Creek, not as adaptable to multiple purpose use, and not as strategic to the Cohocton Valley.

Headwater reservoirs

A system of 21 headwater reservoirs controlling some 155 square miles was considered as an alternative to the Mud and Fivemile Creek reservoir proposals. Headwater reservoirs are normally built to modify flash storm peaks rather than snow melt runoff. For this reason and because of operational problems, these smaller reservoirs are usually built with ungated outlets. They could be throttled to release an average of 15 cubic feet per second per square mile of drainage area.

Table 8 offers a comparison between the flow control effects of the recommended Plan and its alternatives.

TABLE 8
FLOW CONTROL SYSTEM ALTERNATIVES

System	Drainage Area Controlled (Sq.Mi.)	Low Flow Augmentation Storage (Ac.-Ft.)	Added Flow Potential* (cfs)	Flood Control Storage (Ac.-Ft.)	1946 Flood Reduction** (cfs)
Mud Creek and Fivemile Creek	155.0	61,000	57	28,000	6,000
21 Small Dams	141.0	60,100	58	38,800	6,100

*This potential is measured at the damsite
**Measured at Chemung, N.Y.

Table 9 offers a comparison between the flow control effects of the recommended Plan and its alternatives, considering only the Cohocton Valley.

TABLE 9
FLOW CONTROL IN THE COHOCTON VALLEY

System	Drainage Area Controlled (Sq.Mi.)	Low Flow Augmentation* (cfs)	1946 Flood Reduction (cfs)
Mud Creek and Fivemile Creek	155.0	57	6,000
4 Small Dams	60.3	34	2,600

Although the system of 21 small dams appears to be somewhat less expensive and disruptive, the Mud Creek-Fivemile Creek system was selected because of its greater potential for flood control and regional development in the Cohocton Valley.

Water Supply

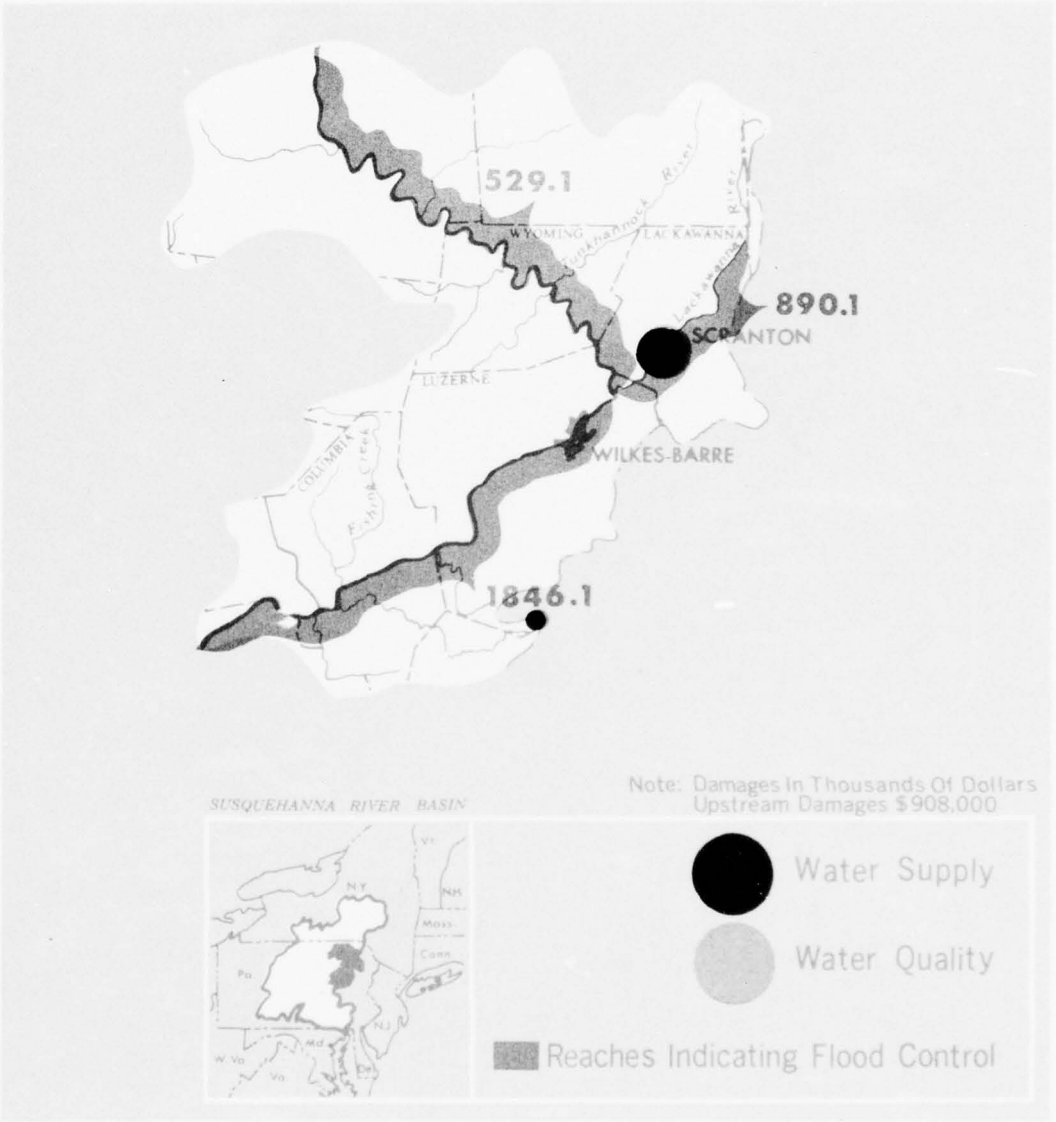
It is estimated that future water supply requirements at Elmira could be satisfied with extensive wellfield development. Such a system, however, would result in frequent periods of zero streamflow above Elmira's sewage outfall, and the costs would exceed the allocated costs for water supply in the Mud Creek and Fivemile Creek projects. The Coordinating Committee also believes the reservoirs offer more opportunity for regional development and more flexibility in enhancing water quality in the Chemung River.

*Measured at the damsite.

CHAPTER III - THE PLAN AND ALTERNATIVES - SUB-BASIN III (SUSQUEHANNA RIVER - SAYRE TO SUNBURY, PA.)

A. WATER RESOURCES REQUIREMENTS

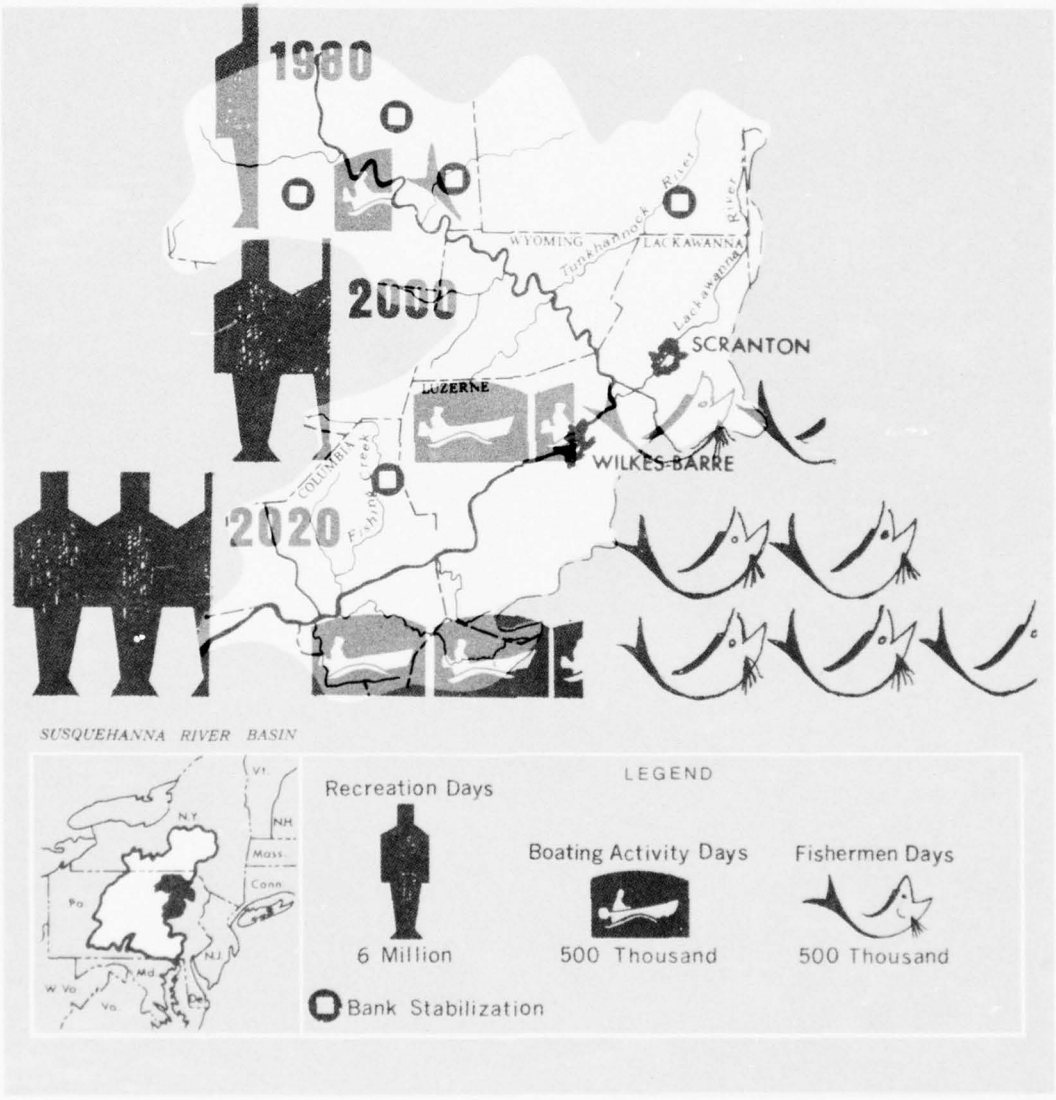
Sub-basin III has an area of about 3,760 square miles. This sub-basin includes the area drained by the Susquehanna River, between Sayer and Sunbury, including the Lackawanna River Basin, but not including the West Branch Susquehanna River Basin. All of this area is within the Commonwealth of Pennsylvania. The water and related land resource needs for Sub-basin III in the early action period are shown in Figure 14. The most significant water resources



SUB-BASIN III: Needs 1980 Figure 14

problem in Sub-basin III, and the problem most in need of investment, is coal mine drainage pollution. Organic pollution is also a problem in the Susquehanna River, below Wilkes-Barre. The planning for water and related land resources development in this sub-basin should be designed to stimulate the economy, restore disturbed areas, and preserve valuable natural areas. The Coordinating Committee, therefore, in Sub-basin III, has given extra weight to the objectives of regional development and environmental quality.

Coal mine drainage pollution has left a scar on the environment of this area. Fortunately, Lackawanna and Luzerne Counties have taken steps to revitalize the economy of the area by attracting new indus-



SUB-BASIN III: Recreation Needs Figure 15

tries. The abatement of pollution and restoration of a pleasing environment should complement the existing activity in this area and enhance its potential as an economic growth complex. Improved environmental quality should also make this area a more attractive place to live, thereby reducing out-migration and attracting newcomers.

As indicated in Figure 15, this sub-basin is expected to have a need for an additional 2.8 million seasonal water-oriented recreation days by 1980. In meeting this need there is also a need for about 5,500 water surface acres for unrestricted motor boating (over 20 horsepower). There is a surplus of smaller boating sites in this sub-basin through 1980. There is also a

SUB-BASIN III: Needs 2000 Figure 16

need, in the early action period, for about 44,000 fisherman-days above the existing potential of the resource. The residents of the Northern Tier area have expressed a strong interest in developing this area as a recreational complex.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and in addition would include critical areas needing treatment.

There are substantial residual flood damages along the Susquehanna River. The most promising alternative to prevent these damages is

SUB-BASIN III: Needs 2020 Figure 17

flood plain management. Flood control would in most cases be impracticable because of the large drainage area that would have to be controlled and because these residual damages occur over a large area. There is, however, one location where a new local flood protection project will be needed, and one location where an improved existing project can provide a substantial increase in the level of protection.

As indicated in Figure 14, surface water is inadequate to meet the 1980 needs for water supply at Scranton and Hazleton.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 16 and 17.

SUB-BASIN III: Early Action Recommended Plan Figure 18

B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for sub-basin III includes two coal mine drainage abatement projects; one low channel dam; 12 small reservoirs for recreation, including fishing; one ground water development; one pipeline for water supply; two local flood protection projects; three upstream watershed projects; six bank stabilization projects; an extensive program of land, stream, and flood plain management; a program of water quality surveillance; and a recommendation for additional investigations. Figure 18 locates the specific features of the Early Action Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the construction of primary treatment facilities at one service area, the initiation of secondary treatment at six service areas, and the construction of new or expanded collection facilities at 14 service areas. These areas are listed in Appendix K(2).

The Coordinating Committee is recommending that two coal mine drainage pollution abatement projects be implemented in Sub-basin III in the early action period. The first of these would be in the Lackawanna River area including the Jermyn Tunnel, the Duryea and Old Forge discharges, and all other discharges in this area. This recommendation is for completion of the abatement started by the Pennsylvania Department of Mines and Mineral Industries. The project measures would be implemented in Lackawanna and Luzerne Counties.

The second project would consist of abatement of coal mine drainage pollution in the Wyoming Valley from the Lackawanna River to Nescopeck Creek including abatement on Mill Creek, Solomons Creek, Warrior Run, Nanticoke Creek, Newport Creek, and others in this area. This recommendation also includes completion of the abatement begun by the Pennsylvania Department of Mines and Mineral Industries.

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. The Coordinating Committee is recommending that a low channel dam be constructed on the Susquehanna River in Luzerne County just upstream from Berwick. This would create a 1,250 acre pool, 10 miles long, for recreation and boating which would extend beyond Shickshinny almost to Retreat. It would

annually provide about 154,000 additional recreation days initially and 1.5 million recreation days ultimately. About 900 acres of land for streamside recreational development would ultimately be required to support the recreation load. Proposed streamside facilities include boat access areas, picnic areas, beaches, and a fishing and hiking trail.

Small Tributary Reservoirs for Recreation and Fishing. The Coordinating Committee recommends the construction of 12 reservoirs in this category in the early action period.

A 180 acre reservoir (34-3) is recommended for fishing and recreation on Beaver Run, 2 miles southwest of Mountain Grove in Columbia and Luzerne Counties. The project is estimated to annually create the opportunity for 106,000 recreation days initially and 219,000 recreation days ultimately and the fishing opportunity for 7,100 warm-water fisherman-days at the reservoir.

A 1,100 acre reservoir for recreation and fishing (36-13B) is recommended on Green Creek in Columbia County. This reservoir would be located adjacent to Interstate Highway 80. This site has the potential for annually providing the opportunity for 646,000 recreation days initially and 871,000 recreation days ultimately, and the fishing opportunity for 40,700 warm-water fisherman-days at the reservoir. This reservoir is also being recommended to meet a portion of the demand for motor boating in Sub-basin III.

The Coordinating Committee also recommends the construction of a reservoir (37-20) on the East Branch Lackawanna River in Susquehanna County. The reservoir would create a 298 acre lake to be utilized for both fishing and recreation. An estimated 206,000 annual recreation days initially and 212,000 recreation days ultimately are the expected visitation to this reservoir. This reservoir would also provide an opportunity for 29,800 trout fisherman-days at the reservoir.

A 75 acre reservoir (38-10) is recommended on the East Branch Tunkhannock Creek, 4 miles north of Dundaff, for fishing only. This project would provide an estimated 11,800 trout fisherman-days annually at the reservoir. It would be located in Susquehanna County.

Also included in the Early Action Plan is a reservoir on Sugar Creek (41-7) between Troy and Sylvania, about 1-1/2 miles northwest of Troy. It would annually provide 136,000 recreation days initially and 324,000 recreation days ultimately. It would provide 30,300 trout fisherman-days at the reservoir. The reservoir would be located in Bradford County, Pennsylvania, and would have a water surface area of 340 acres.

A 277 acre reservoir (07-7) is recommended in Luzerne County on Wapwallopen Creek about 1 mile southwest of Mountain Top. This project would provide incidental flood control benefits downstream from the site as well as fishing and recreational opportunities.

The project would create annual opportunities for 243,000 recreation days initially and 350,000 recreation days ultimately. The added fishing opportunity would be 11,000 trout fisherman-days at the reservoir.

A 391 acre reservoir (08-4) is recommended on Harvey's Creek adjacent to the Pike Creek reservoir in Luzerne County for recreation and fishing. The project would annually provide the opportunity for 350,000 recreation days initially and 412,000 recreation days ultimately, and 37,500 trout fisherman-days at the reservoir.

A 302 acre reservoir (08-9) is recommended on Little Shickshinny Creek, 3-1/2 miles west of Shickshinny in Luzerne County, for fishing and recreation. The project would annually provide the opportunity for 218,000 recreation days initially and 268,000 recreation days ultimately and the fishing opportunity for 12,000 fisherman-days for trout fishing at the reservoir.

A 140 acre reservoir (010-15) for recreation and fishing is recommended on Buttermilk Creek, 1/4 mile above the mouth. This project would be in Wyoming County and would annually provide 97,000 recreation days initially and 109,000 recreation days ultimately. It would also provide the annual opportunity for 5,600 warm water fisherman-days at the reservoir.

A 107 acre lake (011-5) would be created by a dam recommended on Parks Creek, a tributary to Wysox Creek, 3 miles south of Windome Center Township line. This reservoir would be used for recreation and fishing and would annually provide an estimated 63,000 recreation days initially and 88,000 recreation days ultimately. It would also annually provide 4,300 warm water fisherman-days at the reservoir. The project is being considered as part of the Endless Mountains Resource and Conservation Development project in north central Pennsylvania.

A recreation project consisting of dredging an existing reservoir, Andy's Pond, is proposed on Little Wapwallopen Creek in Luzerne County. The Coordinating Committee is recommending this project as a part of a recreational complex in this area consisting of this reservoir, a site on Wapwallopen Creek, a proposed State park, and a PL 566 multiple purpose flood control and recreation project on Nescopeck Creek.

An 88 acre reservoir (PA 499) is proposed on Briar Creek, near its source, for wildlife enhancement. The project would be located in Columbia County. Waterfowl use and increased hunting capacity would be the major use of this reservoir. This project was part of the Briar Creek Watershed Work Plan, but was deleted from the plan by the House Agricultural Committee. The Coordinating Committee is recommending that this project be included in the Plan as a desirable improvement apart from the Watershed Work Plan.

Ground Water and Pipelines for Municipal and Industrial Water Supply

Ground Water. The Coordinating Committee is recommending that Hazleton develop its ground water resources during the early action period to meet future municipal and industrial water supply demands. Wellfield development is estimated to be the least expensive type of solution, considering only sources within the Susquehanna River Basin. Additional demand to be met by the wellfield, between now and 1980, is estimated to be 2 million gallons per day (mgd).

Pipeline. The Committee recommends that a pipeline be constructed from the Susquehanna River to Scranton to meet Scranton's municipal and industrial water supply requirements. The pipeline need only carry 10 mgd to meet the projected 1980 demand, but must carry about 87 mgd to meet the expected 2020 demand.

Local Flood Protection Projects

The Coordinating Committee is recommending that two local flood protection projects be implemented in the early action period. One of these would consist of raising the existing subsided local flood protection projects in the Wyoming Valley to their original height to provide the level of flood protection for which they were originally constructed. The communities protected are Kingston, Edwardsville, Forty Fort, Swoyersville, Wilkes-Barre, and Hanover Township. Raising this protection would reduce average annual damages from floods along the Susquehanna River by $377,400.

The second local flood protection project, consisting of a levee along the Susquehanna River and a flood wall along Fishing Creek, is recommended for Bloomsburg in Columbia County. This project would reduce damages to Bloomsburg caused by flooding along the Susquehanna River and by Susquehanna backwater flooding on Fishing Creek. In addition, the project, by relieving the flood hazard to a rather large, presently unprotected, vacant area of land, would provide the impetus necessary for an expansion of the community's industrial base. This vacant land is ideally located for industrial use which would be compatible with Bloomsburg's Land Use Plan.

Upstream Watershed Projects

The Coordinating Committee is recommending three upstream watershed projects in Sub-basin III in the early action period. These projects would include land treatment and management measures along with structural measures.

The Dundaff Creek watershed project would include a multiple purpose structure (38-6) for flood prevention and recreation. The site is located on Dundaff Creek, 1/2 mile southeast of Clifford at the Lackawanna-Susquehanna County line. This structure would provide flood protection for the community of Clifford. Also the

structure would have a 41 acre recreation pool and could annually provide the opportunity for 19,500 recreation days initially and 50,000 recreation days ultimately. The recreational facilities are expected to be in high demand because of this project's proximity to populated areas along the Lackawanna River.

The second upstream watershed project for Sub-basin III would include a single purpose flood control structure (34-9) on Crooked Creek, a tributary to Catawissa Creek. The structure would provide flood protection primarily to the fish hatchery located on Crooked Run. The structure is expected to reduce average annual flood damages by $37,100. This project would be located in Schuylkill County.

The third upstream watershed project for Sub-basin III would be on Roaring Brook in Columbia County and would consist of one single purpose and two multiple purpose structures. A single purpose flood control structure (06-7) located on Lick Run is part of the project. A multiple purpose flood control and recreational structure (06-6) would create a 110 acre lake on Roaring Creek about 3/4 miles east of Mill Grove. This structure would annually create an opportunity for 50,000 recreation days initially and 88,000 recreation days ultimately. Another multiple purpose flood control, recreational, and fishing structure (06-8) would create a 150 acre reservoir on Mugser Run about 1-1/2 miles east of Fisherdale. This project would annually create an opportunity for 50,000 recreation days initially and 100,000 recreation days ultimately, and fishing opportunity for 10,500 trout fisherman-days at the reservoir.

Other Structural Measures

Six streambank stabilization projects are recommended to be implemented in this sub-basin in the early action period. These projects are:

1) 6 miles along Wysox Creek from Route T571 to Route 187 northeast of Rome, in Bradford County;

2) 7 miles along Towanda Creek intermittently from East Canton to the Susquehanna River, in Bradford County;

3) 6 miles along Wyalusing Creek intermittently from the confluence of Middle and East Branches to the Susquehanna River, in Bradford and Susquehanna Counties;

4) 5 miles along the East Branch Tunkhannock Creek from Elkdate to the confluence with Tunkhannock Creek, in Susquehanna County;

5) 4 miles along the South Branch Tunkhannock Creek from the Erie-Lackawanna Railroad bridge to Tunkhannock Creek, in Lackawanna and Wyoming Counties; and

6) 10 miles along Fishing Creek from Grassmore to the Susquehanna River, in Columbia County.

Management Measures

Management measures, other than specific structural investments, being recommended by the Coordinating Committee include land treatment, stream management to enhance recreational and fishing potential, flood plain management, water quality surveillance, and a recommendation for additional studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 25,000 acres of land. This program would add to the existing land treatment and management practices on 329,000 acres of forest, crop, pasture, urban and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 10,000 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams, and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Scenic	County
1. Schrader Creek for its entire length	Bradford
2. Bowmans Creek from its source to Rt 309	Luzerne Wyoming
3. Mehoopany Creek for its entire length	Wyoming Sullivan
4. Fishing Creek from source to Benton	Columbia Sullivan

B. Recreational	County
1. Susquehanna River from Sayre to the lower Wyoming County Line	Wyoming Bradford

C. Modified Recreational	County
1. Fishing Creek from Benton to mouth	Columbia

D. Primary Trout Fishing

1. Bradford County

a.) Schrader Creek, b.) Millstone Creek.

2. Columbia County

a.) Fishing Creek above Benton, b.) East Branch Fishing Creek, c.) West Branch Fishing Creek, d.) Little Fishing Creek, e.) Roaring Creek.

3. Lackawanna County

a.) Roaring Brook, b.) South Branch Tunkhannock Creek.

4. Luzerne County

a.) Bowmans Creek, b.) Pine Creek, c.) Arnold Creek south of Route 118, d.) Kitchen Creek south of Ricketts Glen State Park, e.) Hunlock Creek.

5. Sullivan County

a.) Mehoopany Creek, b.) East Branch Fishing Creek, c.) West Branch Fishing Creek.

6. Susquehanna County

a.) Butter Creek, b.) West Branch Meshoppen Creek, c.) Tunkhannock Creek, d.) North Branch Wyalusing Creek, e.) Meshoppen Creek, f.) Middle Branch Wyalusing Creek.

7. Wyoming County

a.) Meshoppen Creek, b.) Bowmans Creek, c.) Mehoopany Creek, d.) West Branch Mehoopany Creek, e.) South Branch Tunkhannock Creek.

E. Primary Warm Water Fishing

1. Bradford County

a.) Susquehanna River.

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values.

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following lists summarize this determination for the full 50-year planning period.

1. Intensive flood plain management program

   a.) Susquehanna River, Lackawanna River to Fishing Creek, b.) unprotected part of Plymouth, c.) Shickshinny, d.) part of Bloomsburg, not protected by suggested local protection works, e.) Danville, f.) Carbondale, g.) Scranton, h.) Lackawanna River, Scranton to Susquehanna River, i.) Catawissa Creek, j.) East Branch Tunkhannock Creek, k.) Towanda Creek, below Monroeton, l.) Troy, m.) Newport Creek, n.) Bottomwood Creek, o.) Toby Creek, p.) Sechlers Run.

2. Warning and evacuation program

   a.) Susquehanna River from Athens to Towanda, b.) Towanda, c.) Susquehanna River, Towanda to Lackawanna River, d.) West Pittston, e.) unprotected part of Swoyersville, f.) Nanticoke, g.) Susquehanna River, Fishing Creek to Sunbury, h.) Lackawanna River, Stillwater Dam to above Jermyn, i.) Lackawanna River above Jermyn to Scranton, j.) Olyphant, k.) Nescopeck Creek, l.) Fishing Creek, m.) Tunkhannock Creek, n.) Towanda Creek, above Monroeton, o.) Roaring Creek, p.) Shickshinny Creek, q.) Hunlock Creek, r.) Bowman Creek, s.) Mehoopany Creek, t.) Tuscarora Creek, u.) Meshoppen Creek, v.) Wysox.

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above, using criteria outlined in Appendix K(3), stream reaches and damage centers having a priority need for flood plain management were identified. These locations require early detailed flood plain management studies to develop a fully integrated management program for use of flood-prone lands. The following early action study program is recommended for Sub-basin III:

(1) the Susquehanna River at Bloomsburg;

(2) the Susquehanna River from West Pittston to Plymouth;

(3) the Lackawanna River at Scranton; and

(4) the Susquehanna River at Berwick (related to recommended low channel dam).

Water Quality Surveillance

As a part of an overall water quality surveillance program and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Lackawanna River below Carbondale and Scranton;

(2) Susquehanna River below Plymouth;

(3) Black Creek below Hazleton.

Details are given in Appendix K(3).

Additional Study

The Coordinating Committee recommends that a survey scope study be made of the potential for a regional sewerage system in the entire Lackawanna Valley. This study, which would include the service areas of Carbondale, Jermyn, Dickson City, Scranton, Dunmore, Clarks Summit, Old Forge, and Duryea, should recommend the optimum combination of sewerage system elements for the region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the appropriate authority to operate and maintain the system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs occurring after 1980 includes some continuation of programs recommended for the early action period, as well as additional measures to meet the needs as they become evident. Figure 19 locates the specific features of the Framework Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at seven service areas, the expansion of secondary waste

treatment at five service areas, and the construction of new or expanded collection facilities at 14 service areas. These areas are listed in Appendix K(2).

The Framework Plan includes advanced waste treatment at Hazleton and Scranton by 2000 to meet the water quality standards.

The Coordinating Committee is also proposing that two additional coal mine drainage pollution areas be abated. These are the Nescopeck Creek watershed and the Catawissa Creek watershed.

SUB-BASIN III: Framework Plan

Figure 19

Reservoirs for Recreation and Fish Habitat

Large Tributary Reservoirs. Three large tributary reservoirs are proposed for this sub-basin. They are listed in Table 10.

TABLE 10
LARGE TRIBUTARY RESERVOIRS
IN FRAMEWORK PLAN IN SUB-BASIN III

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
80 (2000)	Wapwallopen Creek	2 mi. SE of Wapwallopen	1,000	2,782
77 (2020)	Huntingdon Creek	1.5 mi. E of Jonestown	1,500	2,178
87 (2020)	Tunkhannock Creek	0.8 mi. SW of Dixon	1,600	1,422

Small Tributary Reservoirs. Six small tributary reservoirs are included in the Framework Plan for this sub-basin. They are listed in Table 11.

TABLE 11
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN III

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
39-1 (2000)	Pettis Creek	1.5 mi. SW of Montrose, 1.7 mi. N of South Montrose	71	73

TABLE 11 (CONT'D)
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN III

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
39-10 (2000)	N. Br. Wyalusing Creek	1.0 mi S of Middletown Center, 2.3 mi. SE of Neath	218	139
40-1 (2000)	Trib. S. Br. Towanda Creek	2.0 mi. SE of Monroeton, 1.0 mi. W of Liberty Corners	95	204
09-2 (2000)	Beaver Run	3.7 mi. W of Beaumont, 1.3 mi. SE of Stull	260	348
010-9 (2020)	Trib. Tuscarora Creek	0.8 mi. SE of W. Auburn, 3.0 mi. NE of Silvara	40	15,200 Fisherman-Days
011-1 (2020)	Rummerfield Creek	1.5 mi. SW of Herrickville, 4.0 mi. N of Rummerfield	54	6,700 Fisherman-Days

Management Measures

Land Management

The proposed land treatment and management program in Sub-basin III between 1980 and 2020 is shown in Table 12.

TABLE 12
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	10,000	254,000
2000-2020	9,000	159,000

Stream Management

The Framework Plan calls for continuing to use the recommended early action stream management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program and warning and evacuation system should be continued and detailed flood plain management studies should be made at the following locations as soon as possible after 1980: Carbondale, Scranton to Pittston, and Tunkhannock.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

Structural measures have been selected for pollution control, and to provide water-based recreational opportunity, flood protection, and water supply. The primary alternatives to the selected measures are discussed below. Additional data on these alternatives are included in Appendix K(1).

Water Quality Management

Scranton

Advanced waste treatment has been recommended in the late action period for Scranton, in conjunction with a mine acid abatement project on the Lackawanna River. One alternative to advanced waste treatment would be a sewer pipeline to carry Scranton's treated wastes to the Susquehanna River. This alternative was not selected because of higher unit costs. Another alternative considered was low flow augmentation from sites 37-20 and 145 in the Lackawanna headwaters. This alternative would be impracticable because of insufficient augmentation capability.

Hazleton

Advanced waste treatment has also been proposed for the Hazleton sewer service area. An alternative to this proposal would be a sewer pipeline to carry Hazleton's treated sewage to the Susquehanna River. The pipeline, however, would be more expensive than the advanced waste treatment.

Recreation and Fishing

Twenty-two reservoirs are included in the Early Action and

Framework Plans specifically for recreation and fishing. Further, it is suggested that 152 miles of natural streams be developed for more intensive recreational use as discussed in Appendix K(3).

Prime alternatives to the recommended reservoir sites are shown in Table 13.

TABLE 13
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Stream	Surface Area (Acres)	Storage Volume 1,000 (Ac-ft)	Est. Cost ($Thousands)
41-10	Brace Creek	95	1.7	693
38-11	East Branch Tunkhannock Creek	105	5.5	1,241
36-10	Maple Run	165	2.6	979
39-11	Deer Lick Creek	88	2.1	1,397
07-8	Little Wapwallopen Creek	216	5.3	1,482
011-4	Johnson Creek	100	3.4	930

Flow Control

In the early action period, no flow control structures are recommended for this sub-basin. Flow control projects recommended for Sub-basins I and II will serve to some limited extent to meet the flow augmentation needs in the lower Susquehanna River and the Chesapeake Bay. Certain sites in this sub-basin should be pointed out as possible alternatives for future consideration. These may be again considered if basin-wide consumptive losses or diversions in the late action period exceed the expected amount (see Supplement A).

The largest and most significant of the potential alternative projects is the Keelersburg Dam (site 85) on the Susquehanna River. This project, located on the Susquehanna River above Pittston, Pennsylvania, has been strongly opposed by local and State governments. It would be severely disruptive, inundating a long stretch of scenic river. A synopsis of the features of this site is given below.

The Keelersburg site is located on the Susquehanna River, 208 miles above the mouth of the River in Wyoming County, Pennsylvania. A dam here would control 9,448 square miles of drainage area. Its purposes would be to provide flood control, low flow augmentation, hydroelectric power,and recreation. The flood controlling capability of this site would enable it to significantly reduce damage all the way to the mouth of the Susquehanna. The project at maximum permissible hydrologic development would have a top of dam elevation of 745 feet and maximum usable storage at an elevation of 708 feet. The usable storage would be 1.5 million acre feet and the water surface area would be 25,000 acres.

Relocations would be very significant, including the towns of Tunkhannock, Meshoppen, Mehoopany, Wyalusing, and part of Nicholson. A major railroad and several arterial highways would also be involved.

There are several other potential alternative structures, all of which would be much smaller than the Keelersburg project. They are:

(1) Stevensville (site 90) on Wyalusing Creek;

(2) Wysox (site 91) on Wysox Creek; and

(3) Franklin Center (site 93) on Towanda Creek.

Stevensville Alternative:

This site is located on Wyalusing Creek approximately 12 miles above the mouth and 1/2 mile upstream from the village of Stevensville in Bradford County, Pennsylvania. The drainage area is 178 square miles. It would be useful for flow augmentation downstream of Wyalusing Creek, and for recreation.

Wysox Alternative:

This site is located on Wysox Creek approximately 2 miles above the mouth near Myersburg, Pennsylvania. The drainage area is 95 square miles. It would be useful for flow augmentation downstream of Wysox Creek and for recreation.

Franklin Center Alternative:

This site is located on Towanda Creek about 11 miles above the mouth and 2 miles west of Franklindale, Pennsylvania. The drainage area is 115 square miles. It would be useful for flow augmentation along Towanda Creek and on the river below Towanda Creek and for recreation.

Water Supply

Scranton

A water supply pipeline from the Susquehanna River above the Lackawanna confluence to Scranton is recommended as Scranton's long range source of municipal and industrial water. Development of ground water close to Scranton was considered as an alternative, but was eliminated because of acid pollution of some ground supplies and cost to develop.

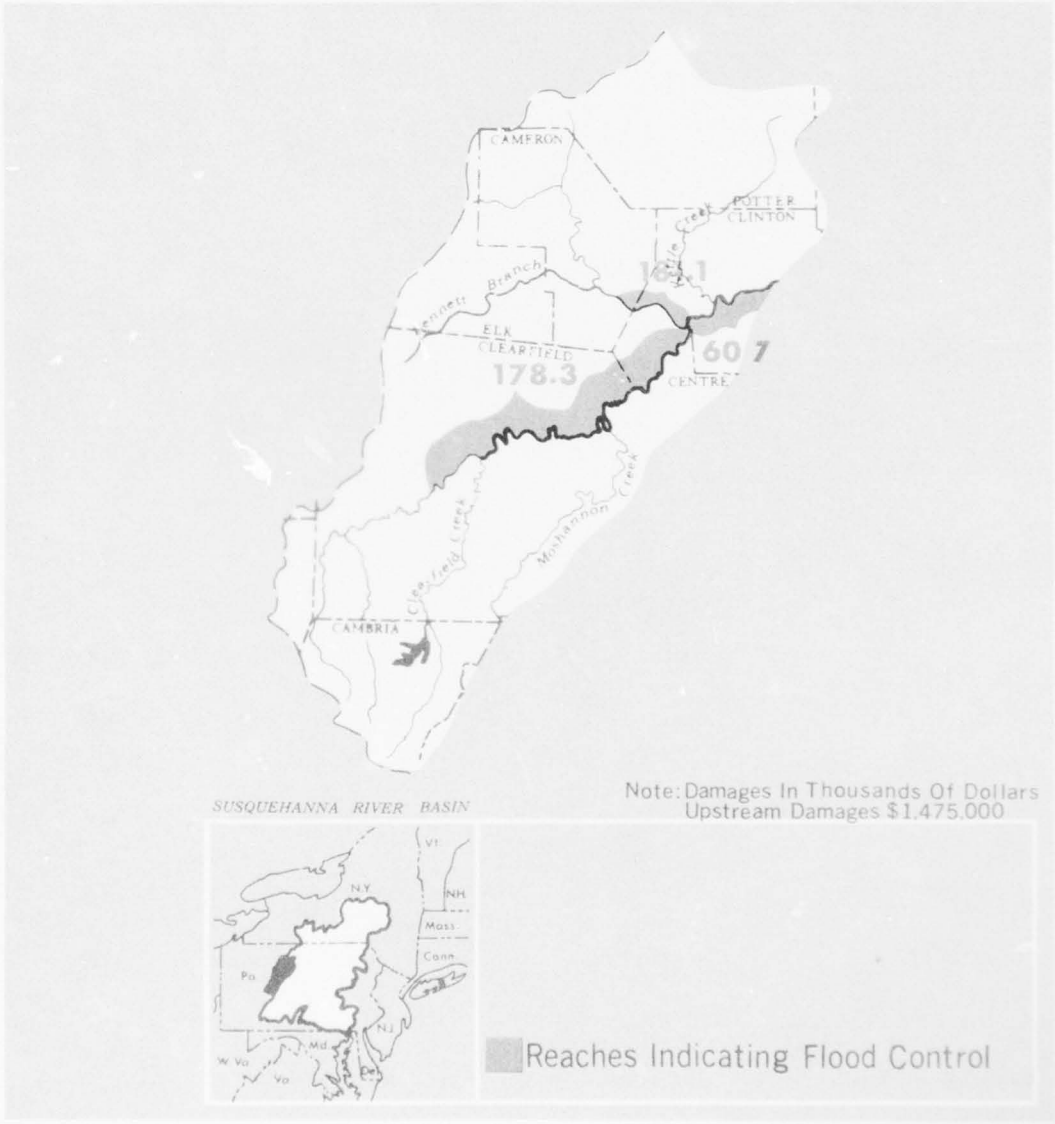
Hazleton

Ground water developments are recommended to satisfy anticipated expanded demand in the Hazleton area. Alternatives considered, within the Susquehanna River Basin, included a pipeline from the Susquehanna. This alternative, however, would be more expensive than ground water development.

CHAPTER IV - THE PLAN AND ALTERNATIVES - SUB-BASIN IV (WEST BRANCH SUSQUEHANNA RIVER-UPSTREAM FROM RENOVO, PENNSYLVANIA)

A. WATER RESOURCES REQUIREMENTS

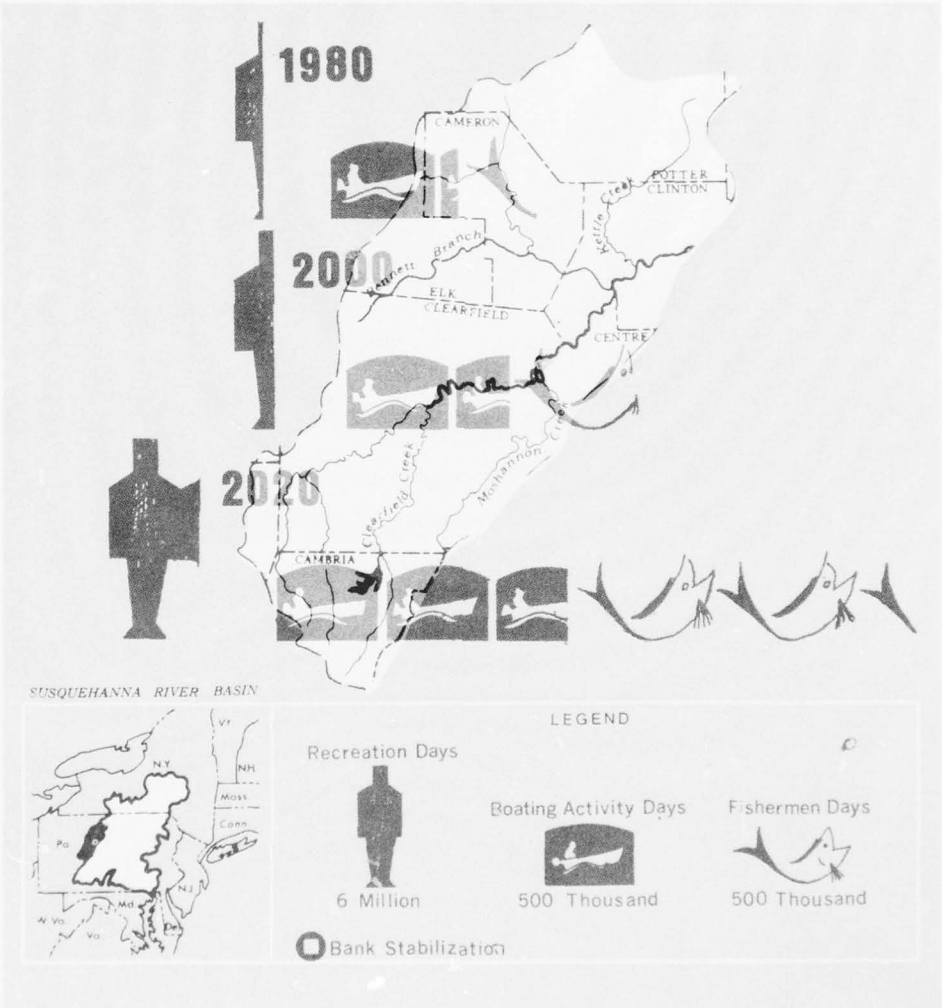
The West Branch Susquehanna River, from its source to Renovo, Pennsylvania, drains an area of about 2,975 square miles entirely within the Commonwealth of Pennsylvania. The water and related land resource needs for this sub-basin in the early action period are shown in Figure 20. The Coordinating Committee designated environmental quality as the prime objective in Sub-basin IV. The



SUB BASIN IV: Needs 1980 Figure 20

most serious water quality problem, and, indeed, the most serious environmental quality problem in this area, is the abatement of the coal mine drainage pollution from abandoned mines and the enforcement of existing law so that mines currently operating will not create pollution problems.

Sub-basin IV has been subjected to extensive strip-mining and, therefore, intensive conservation treatment practices need to be installed to prevent severe erosion. Moreover, an accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during



SUB BASIN IV Recreation Needs Figure 21

intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and, in addition, would include critical areas needing treatment.

The existing flood control projects at Curwensville on the West Branch Susquehanna River, on the First Fork Sinnemahoning Creek, and on Kettle Creek provide a substantial level of flood protection to the West Branch and major tributaries in the sub-basin. The residual average annual flood damages on the downstream reaches are reflected in Figure 20. Major damages occur along the West Branch between Moshannon Creek and Sinnemahoning Creek and along the lower part of Sinnemahoning Creek. There are substantial average annual flood damages estimated for the upstream watersheds in this sub-basin, the most flood-prone streams being Moshannon Creek, Driftwood Branch Sinnemahoning Creek, and Bennett Branch Sinnemahoning Creek. Most of the damages in this sub-basin are transportation damages.

The existing reservoir at Prince Gallitzen State Park satisfies much of the recreational demand in this sub-basin in the early action period. However, as shown in Figure 21, a deficit of 2.3 million seasonal water-oriented recreation days is still predicted for 1980. There is also a need for about 1,700 more water surface acres for restricted boating (motors with less than 20 horsepower), 500 acres for unrestricted boating, and the facilities to provide 116,000 fisherman-days above the existing potential of the resource.

The survey of water supply demands and capabilities by the Coordinating Committee has indicated that surface water supplies will be inadequate by 1980 to meet the projected municipal and industrial demand in the Barnesboro-Spangler-Patton and Emporium areas.*

There do not appear to be any areas in this sub-basin in the early action period which will require waste treatment beyond the secondary level to provide satisfactory water quality, based on a water quality criterion of 5 milligrams per liter of dissolved oxygen. Furthermore, the irrigation needs in this area are such that the existing resources can meet them adequately.

The Coordinating Committee has recognized that this is a very sparsely populated sub-basin. There are a few concentrations of population where economic stimulation would be desirable for regional development. The completion of Interstate 80 in this area and the proximity of the proposed Otocsin Recreation Complex are factors which may stimulate the economy of the region.

B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin IV includes four coal mine drainage abatement projects; five small reservoirs for recreation, including fishing; two ground water developments for water supply; the continuation of

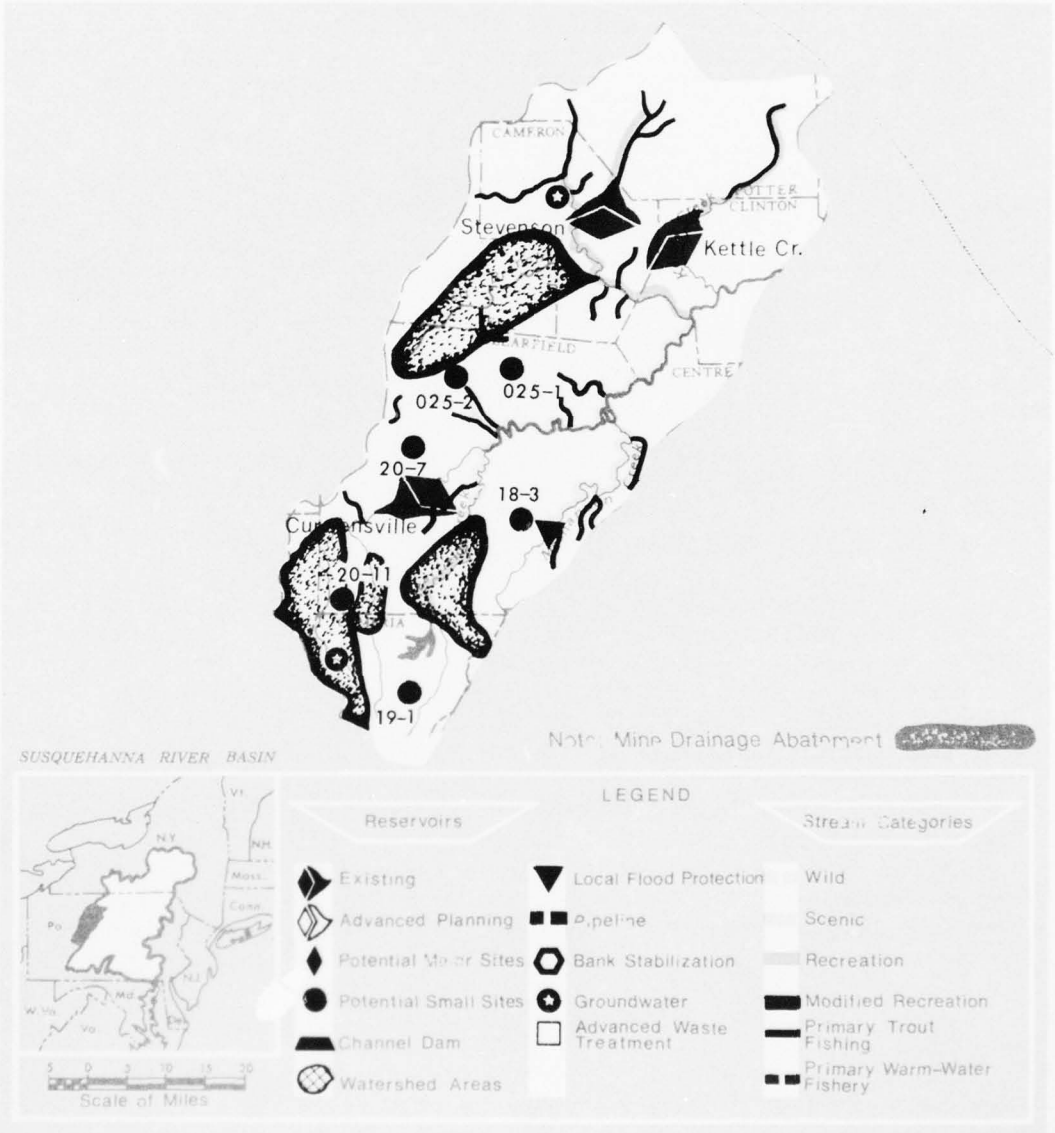
*Not shown in Figure 20, since deficits are less than 10 cfs.

a local flood protection project; one water supply reservoir; and an extensive program of land, stream, and flood plain management. Figure 22 locates the specific features of the Early Action Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of



SUB-BASIN IV: Early Action Recommended Plan — Figure 22

the Commonwealth of Pennsylvania. This will necessitate the construction of primary treatment facilities at two service areas, the initiation of secondary treatment at four service areas, and the construction of new or expanded collection facilities at four service areas.

The Committee is recommending in this early action period that coal mine drainage pollution abatement projects be carried out in the following four areas in order to preserve and reclaim the high natural scenic value of this sub-basin.

(1) The Upper West Branch Susquehanna River from the headwaters to Chest Creek. This area includes 88 major mine drainage discharges and would cover portions of Cambria, Clearfield, and Indiana Counties.

(2) Tributaries to Chest Creek, primarily Brubaker Run, in Cambria and Clearfield Counties.

(3) The entire length of Clearfield Creek. This area includes 78 major mine drainage discharges. The project would cover portions of Cambria and Clearfield Counties.

(4) Bennett Branch Sinnemahoning Creek. This abatement primarily would be on four tributaries to the Bennett Branch in Clearfield and Elk Counties.

Reservoirs for Recreation and Fish Habitat

There are five small tributary reservoirs recommended for recreation and fishing in the early action period. These projects are discussed in the following paragraphs.

A 300 acre reservoir (19-1) is recommended on Beaver Dam Run about 1 mile southwest of Ashville in Cambria County for the purpose of recreation and fishing. This project would annually create the opportunity for 278,000 recreation days initially and 328,000 recreation days ultimately, and for 27,600 trout fisherman-days at the reservoir.

A 180 acre recreation reservoir (20-7) is recommended on Bigler Run about 2-1/2 miles north of Grampian, in Clearfield County. It would create the annual opportunity for 263,000 recreation days initially and 300,000 recreation days ultimately. This recommended reservoir is adjacent to Bigler Rocks, a landmark in this area. The Rocks would be an overlook to the recommended reservoir and would not be inundated by the recommended project.

A 240 acre reservoir (20-11) is recommended on Beaver Run at the Clearfield County-Cambria County line for recreation and fishing. The project would create the annual opportunity for 165,000 recreation days initially and 196,000 recreation days ultimately, and 9,600 warm water fisherman-days at the reservoir.

A 75 acre reservoir (025-1) is recommended on Gifford Run, about 3 miles north of the Knobs Lookout tower in Clearfield County, for the purpose of fishing and recreation. This reservoir would create the annual opportunity for 275,000 recreation days initially and 338,000 recreation days ultimately, and for 7,200 trout fisherman-days at the reservoir.

A 122 acre reservoir (025-2) is recommended on Alex Branch Trout Run about 1-1/2 miles east of George Road in Clearfield County for the purpose of recreation and fishing. This project would annually create the opportunity for 344,000 recreation days initially and 469,000 recreation days ultimately, and 11,900 trout fisherman-days at the reservoir.

The latter two projects would be constructed in an area which is highly attractive in its present state. The Coordinating Committee, however, feels that these projects, in addition to meeting a significant portion of the sub-basin's recreational and fishing demands, would contribute more to the environmental quality of the area than they would remove.

Ground Water for Municipal and Industrial Water Supply

Ground water development for municipal and industrial water supply is recommended at two locations in Sub-basin IV to meet additional needs in the early action period.

Additional development of 300,000 gallons per day is recommended in the Barnesboro-Spangler-Patton area. A wellfield with 2 million gallons per day capacity is recommended at Emporium. In each of these locations, ground water development appears to be a more economical alternative than construction of a reservoir.

Local Flood Protection Project

The Coordinating Committee recommends that the third and fourth phases of the four phase local flood protection project at Philipsburg be expedited. One portion of work, an improved channel 2,300 feet long and 100 feet wide has been completed. A second portion, presently under construction, consists of channel improvements 4,400 feet long and 100 feet wide, and another stretch 1,300 feet long and 80 feet wide, together with a spoil levee 1,300 feet long and 10 feet high. Design

is underway of the third phase of the flood protection project, including 2,000 feet of channel improvements, and a 2,000 foot flood wall. The fourth phase will consist of 8,500 feet of levee and 800 feet of floodwall. The completed project would protect Philipsburg against a recurrence of the flood of record.

Other Structural Measures

Water Supply. A single purpose water supply reservoir (18-3) is proposed on Little Laurel Run, 1 mile upstream from Highway 322. This reservoir would provide municipal and industrial water supply for Philipsburg, in Clearfield County. The estimated yield from the reservoir is 6 million gallons per day which is expected to meet the needs at Philipsburg until 2020 when used in combination with the present dependable flow of surface water and dependable yield from the existing storage facilities serving Philipsburg.

Management Measures

Management measures being recommended by the Coordinating Committee include land management, stream management to enhance recreational and fishing potential, and flood plain management.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 2,000 acres of land. This program would add to the existing land treatment and management practices on 164,000 acres of forest, crop, pasture, urban and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 20,000 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams, and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

		County
A.	Scenic	
1.	Black Moshannon Creek from Black Moshannon Dam to its mouth	Center

		County
2.	Moshannon Creek from Philipsburg to its mouth	Clearfield Center
3.	Clearfield Creek from Madera to mouth	Clearfield
4.	West Branch Susquehanna River from Clearfield to Keating	Clearfield, Clinton, Center
5.	Lick Run for its entire length	Clearfield

B. Recreational

1.	First Fork Sinnemahoning Creek from source to Stevenson reservoir	Potter, Cameron
2.	Sinnemahoning Creek from Emporium to Keating	Cameron, Clinton
3.	Kettle Creek from source to Bush Reservoir	Potter, Clinton, Tioga
4.	Clearfield Creek from County line to Madera	Clearfield

C. Primary Trout Fishing

1. Cameron County

a.) Hicks Run, b.) East and West Branch, Hicks Run, c.) Hunts Run, d.) First Fork Sinnemahoning Creek, e.) Portage Branch Sinnemahoning Creek, f.) Upper Jerry Run, g.) West Creek, h.) Wykoff Run

2. Centre County

a.) Black Bear Run, b.) Black Moshannon Creek, c.) Cold Stream Run, d.) Mountain Branch Moshannon Creek, e.) Six Mile Run

3. Clearfield County

a.) Anderson Creek, b.) Curry Run, c.) Gozzam Run, d.) Gillford Run, e.) Lick Run, f.) Little Clearfield, g.) Medix Run, h.) Mosquito Creek, i.) Sandy Creek, j.) Stone Run, k.) Trout Run

4. Potter County

a.) Cross Fork Creek, b.) Freemans Run, c.) Kettle Creek, d.) Germainia Branch Kettle Creek, e.) First Fork Sinnemahoning Creek, f.) East Fork Sinnemahoning Creek

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values. This recommendation is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in the sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood proofing, ample warning, and temporary or permanent evacuation, or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following lists summarize this determination for the full 50-year planning period.

1. Intensive flood plain management program

   a.) Renovo and South Renovo, b.) Chest Creek, c.) Emporium and vicinity

2. Warning and evacuation program

   a.) West Branch Susquehanna River from Curwensville to Clearfield, b.) Clearfield, c.) West Branch Susquehanna River, Clearfield to Kettle Creek, d.) Sinnemahoning Creek, First Fork to mouth, e.) Moshannon Creek, f.) Clearfield Creek, g.) Kettle Creek, h.) First Fork Sinnemahoning Creek, i.) Moravian Run, j.) Surveyor Run, k.) Lick Run, l.) Trout Run, m.) Dear Creek, n.) Mosquito Creek, o.) Wykoff Run, p.) Cooks Run

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources.

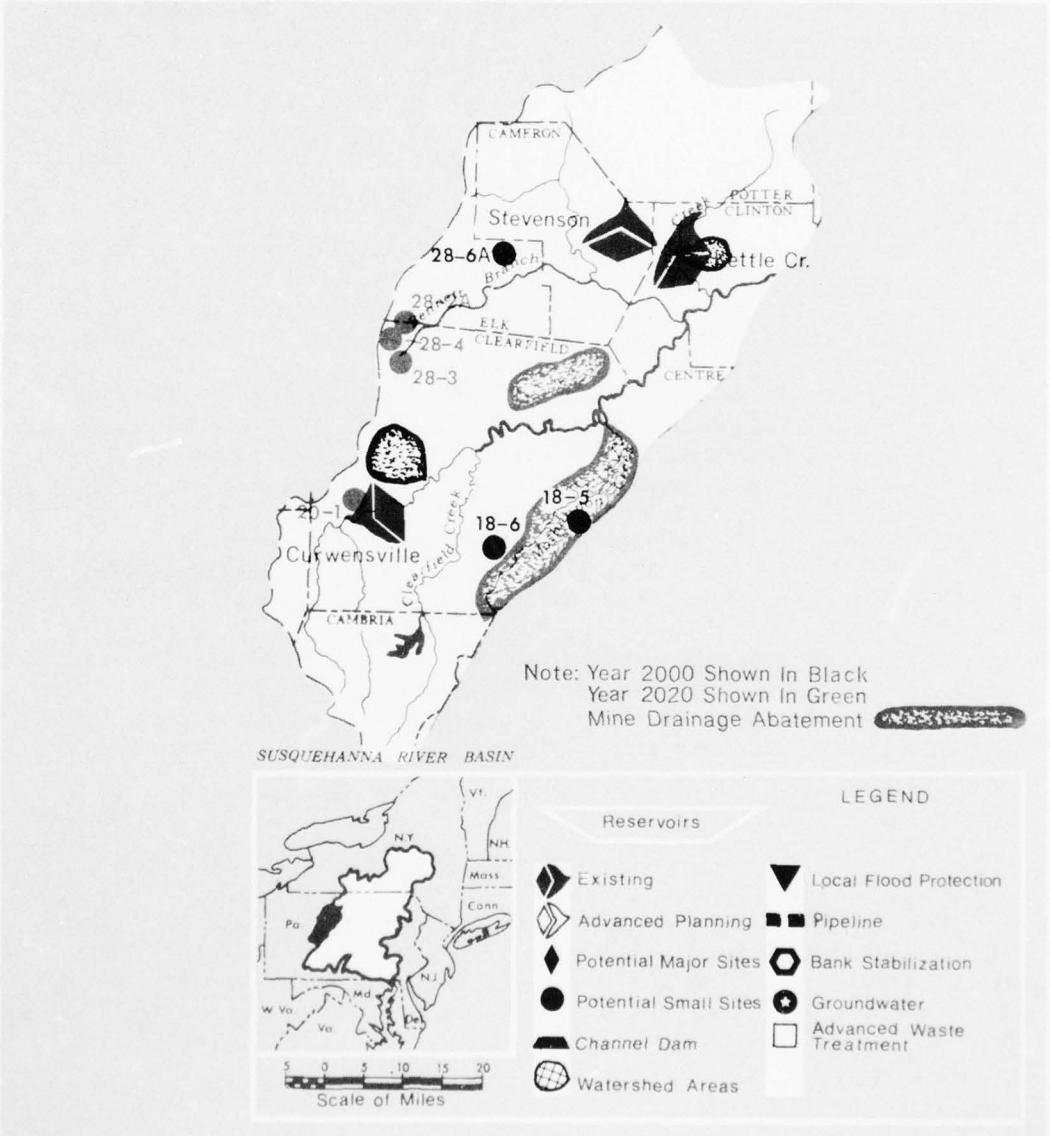
C. FRAMEWORK PLAN

The Framework Plan to meet the needs occurring from 1980 to 2020 includes some continuation of programs recommended for the early action period, as well as additional measures to meet the needs as they become evident. Figure 23 locates the specific features of the Framework Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at three service areas, the expansion of secondary waste treatment at four service areas, and the construction of new or expanded collection facilities at six service areas.



SUB-BASIN IV: Framework Plan

Figure 23

Between 1980 and 2020 the Coordinating Committee is recommending that coal mine drainage pollution abatement projects be carried out on Anderson Creek (2000), Kettle Creek (2000), Moshannon Creek (2020), Cooks Run (2020), Congress Run (2020), Deer Creek (2020), Alder Run (2020), and Sandy Run (2020).

Reservoirs for Recreation and Fish Habitat

Seven small tributary reservoirs to meet late action needs are included in the Framework Plan and are listed in Table 14.

TABLE 14
SMALL TRIBURARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN IV

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1000 Visitor-days)
18-5 (2000)	Six Mile Run	6.5 mi SE of Philipsburg 5.8 mi NW of Port Matilda	120	59
18-6 (2000)	Little Beaver Run	2.5 mi W of Osceola Mills 2.5 mi NE of Houtzdale	120	58
28-6A (2000)	Dents Run	4.5 mi W of Dents Run 3.6 mi NE of Benezette	270	168
20-1 (2020)	Haslett Run	1.5 mi W of Curry Run 3.0 mi NE of Mahaffey	160	57
28-2A (2020)	Wilson Run	1 mi N of Penfield	83	14
28-3 (2020)	Mountain Run	2 mi SW of Penfield	225	90
28-4 (2020)	South Br Bennett Br	3 mi S of Penfield	162	14

Management Measures

Land Management

The proposed land treatment and management program in sub-basin IV between 1980 and 2020 is shown in Table 15.

TABLE 15
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	20,000	175,000
2000-2020	17,600	146,000

Stream Management

The Framework Plan calls for a continuation of the recommended early action stream management program for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program and warning and evacuation program should be continued.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

In this sub-basin structural measures have been selected for water supply at Philipsburg and to provide water based recreational opportunity. The primary alternative to the selected measures follow.

Water Supply

A water supply reservoir site 18-3 is proposed on Little Laurel Run, 1 mile upstream from Route 322. This would be built to supply municipal and industrial water at Philipsburg. An alternative to this would be ground water development in the Philipsburg area, but because of mining activity and ground water pollution, this alternative was not selected.

Recreation and Fishing

In addition to 197 miles of streamside development, five reservoir sites are recommended specifically for recreation and fishing. Alternatives to these recommended reservoir sites are listed in Table 16.

TABLE 16
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Stream	Surf. Area (Acres)	Storage Vol. (1000 Ac-ft)	Est Cost ($Thousand)
20-12	Chest Creek	185	5.0	1,270
27-1	Driftwood Branch Sinnemahoning Creek	180	8.9	3,480
18-15	Moshannon Creek	352	10.5	1,570
025-4	Moravian Run	96	1.9	890

Flow Control

In the early action period, no major multiple purpose dams and reservoirs are proposed for the sub-basin. However, two large dams were considered and studied in detail which would have significant effects on West Branch flows. They are the Dimeling site on Clearfield Creek and the Keating site on the West Branch above Karthus. These sites were not selected, partly because of the disruption they would cause, and partly because of poor water quality caused by coal mine drainage pollution. Both projects would be opposed, at this time, by State and local governments. A detailed description of each follows:

Dimeling Alternative

The Dimeling Reservoir project (site 69) would be located on Clearfield Creek about 7.5 miles above the mouth and would control 372 square miles. At maximum hydrologic development, the project would have usable storage of 90,000 acre feet with a water surface of 3,400 acres. This project would contribute to flood damage reductions down river and could also provide water quality control and recreation, were it not for acid pollution from present and past mining operations upstream.

Relocations caused by this project would be considerable. It would partially inundate an area containing commercial coal and clay. Haul roads to many active coal stripping operations would also be affected.

Keating Alternative

The Keating Reservoir project (site 67), also known as the Zanmore site, would be located some 16 miles upstream from Renovo, Pennsylvania. The drainage area is 1,574 square miles. Maximum development for multiple purpose use, as limited by the power generating plant at Shawville, would store 1.2 million acre feet. Maximum development potential not considering the Shawville generating station, would be

over 1.6 million acre feet. This higher reservoir would provide as much as 30 feet more head for hydroelectric power generation.

This project was not included in the Early Action or the Framework Plans because it did not appear to be needed for regional development and it was deemed to be incompatible with the objectives of economic efficiency and environmental quality, based on cost and benefit data available at the time. However, the site has a great amount of hydro-electric power development potential. Its flood controlling capability would be more significant than the combination of four existing West Branch flood control dams (Stevenson, Bush, Curwensville, and Sayers).

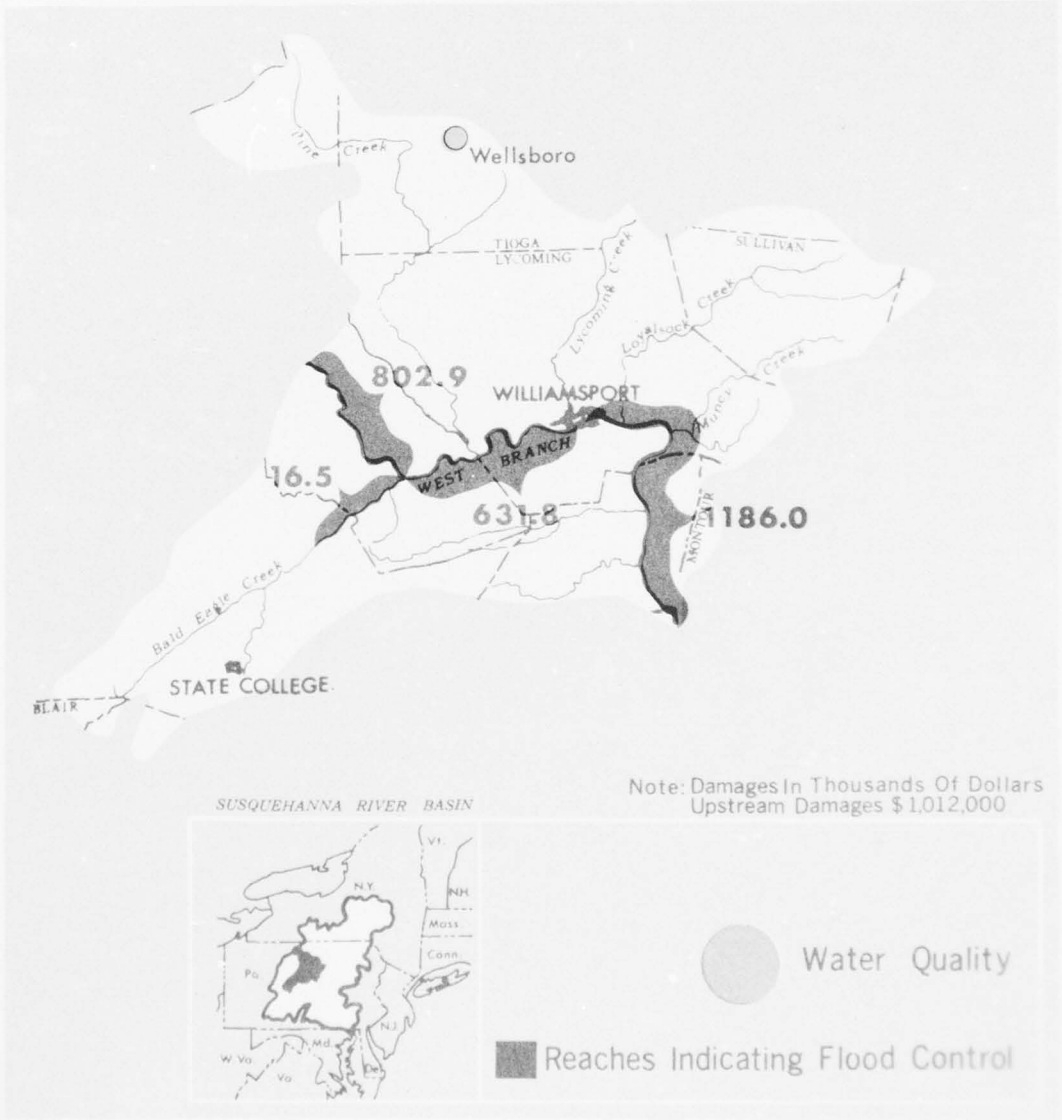
The Keating site is situated in a rugged valley not likely to be extensively developed with additional cultural and transportation improvements. Were the Shawville thermal power station to be phased out in favor of larger and more efficient fossil fuel generating stations such as are now being constructed in western Pennsylvania. the Keating project could be built to a greater height and would thus have a higher electric generating potential.

When and if these changes come about, the Keating site should be reexamined. In the meantime, while it is not at this time recommended as a part of the Susquehanna Plan, it is not meant to be eliminated as a possibility for future water resource development. This site should also be considered as a means of augmenting the flow in the lower Susquehanna River to offset consumptive losses throughout the Basin. Although the need for such augmentation is not clear at this time, an additional early action study on Basin-wide stream flow, which will be part of the Chesapeake Bay Study, would indicate whether a project of this size will be needed in the Framework period.

CHAPTER V - THE PLAN AND ALTERNATIVES - SUB-BASIN V
(WEST BRANCH SUSQUEHANNA RIVER - RENOVO TO SUNBURY, PENNSYLVANIA)

A. WATER RESOURCES REQUIREMENTS

Sub-basin V has an area of about 4,020 square miles and is located in the Commonwealth of Pennsylvania. This sub-basin includes the area drained by the West Branch Susquehanna River between Renovo and its mouth near Sunbury. The water and related land resource needs for Sub-basin V in the early action period are shown in Figure 24. During



SUB-BASIN V: Needs 1980 Figure 24

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the early action period to 1980, flood damage reduction and intense water quality management will be the two problems most in need of additional investment.

Although a heavy investment has already been made in flood control in the West Branch Susquehanna River, this basin still contains an area which is one of the largest potential single sources of flood damages in the entire Susquehanna River Basin. A reoccurrence of the 1936 flood in the West Branch would cause an estimated $38 million in damages from Lock Haven to Sunbury; $16 million of those damages would occur in Lock Haven. The average annual damages at Lock Haven are projected to be $676,000. Similarly high average annual damages are projected along the remainder of the lower West Branch and at Jersey Shore, Muncy, Milton, and Lewisburg. Major upstream watersheds subject to flood damages are Muncy Creek and Fishing Creek.

Assuming that adequate treatment of municipal and industrial wastes, at least to the secondary level, will have been provided during the early action period in accordance with the specific requirements of the Commonwealth of Pennsylvania, there will be two locations in Sub-basin V where water quality deficits will occur. These locations are in Marsh Creek, below Wellsboro, and Spring Creek, below Bellefonte. Both of these deficits can be avoided if advanced waste treatment is provided at Wellsboro and Bellefonte.

Both Babb Creek and Beech Creek are sources of coal mine drainage pollution in Sub-basin V. Loyalsock Creek is a minor source of mine drainage pollution. Additional coal mine drainage pollution in this sub-basin is the result of mine drainage occurring in Sub-basin IV in the tributaries of the West Branch above Lock Haven.

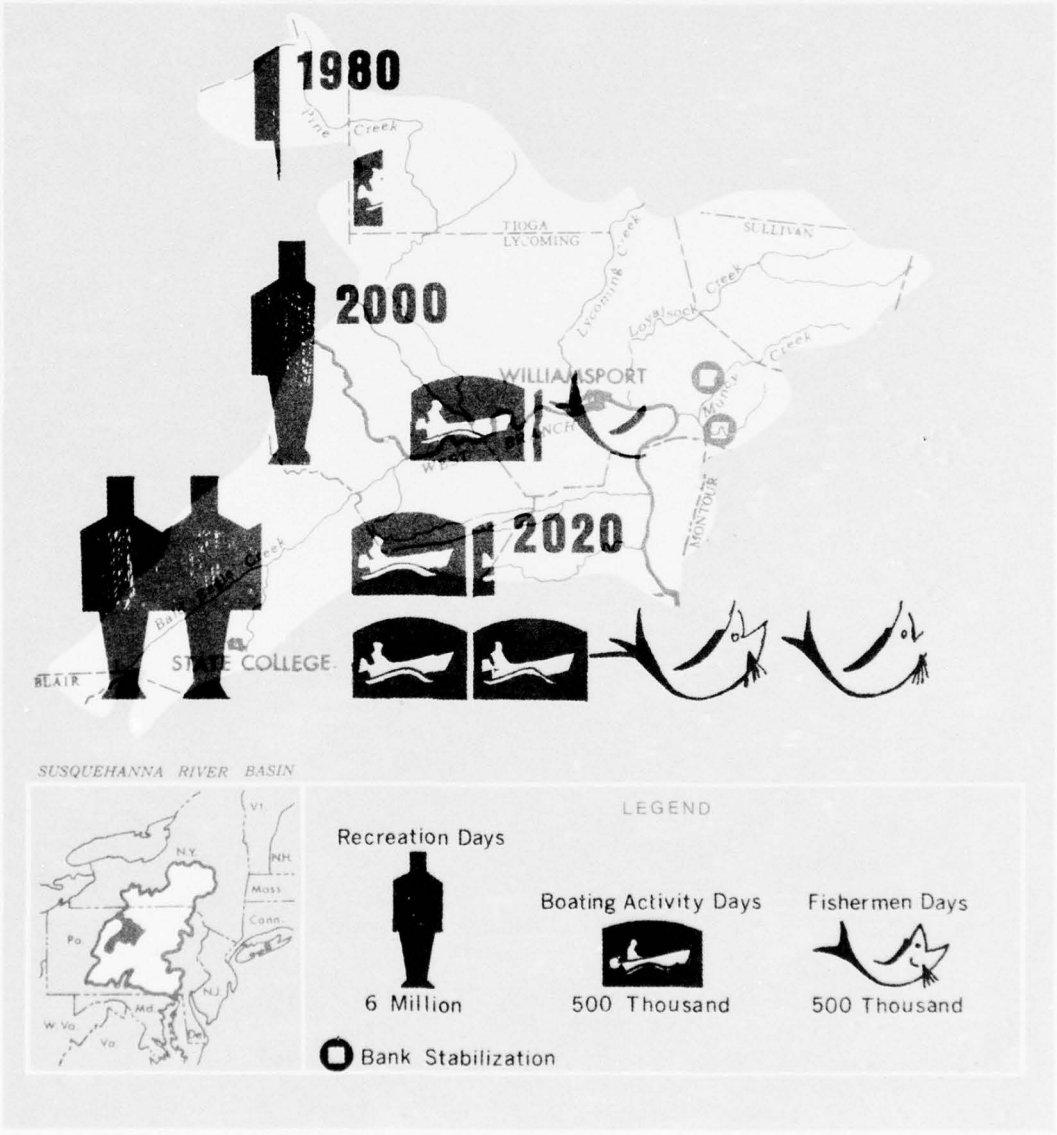
All water service areas within this sub-basin will experience increases in their municipal and industrial water demands. The State College water service area will require additional source development during the early action period.*

Figure 25 shows the recreational needs expected to occur in this sub-basin by 1980, 2000, and 2020 in three categories: 1) general recreation, 2) boating, and 3) fishing. The data indicate the need to provide the opportunity for an additional 1.3 million seasonal water-oriented recreation days by 1980 and for an additional 2,200 acres of water surface for unrestricted (over 20 horsepower) boating. There does not appear to be any need in this sub-basin for small reservoirs for restricted boating (under 20 horsepower) in the early action period. The water-oriented recreation day opportunity, of course, can be provided by large reservoirs, small reservoirs, streamside development, or some combination of these three. The analysis of fishing demand and supply for this sub-basin indicates that the existing resource capability is greater than the demand expected to develop in the early action period.

*Not shown in Figure 24, since deficit is less than 10 cfs.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs, and in addition would include critical areas needing treatment.

The Coordinating Committee has recognized a need to maintain environmental quality in the extreme northern and southern portions of this sub-basin. In the central portion, along the West Branch, the Coordinating Committee feels that the primary objective is regional development. The Lock Haven, Jersey Shore, Williamsport, Muncy, and Lewisburg areas are expected to experience large increases in population. The Plan, therefore, has been formulated



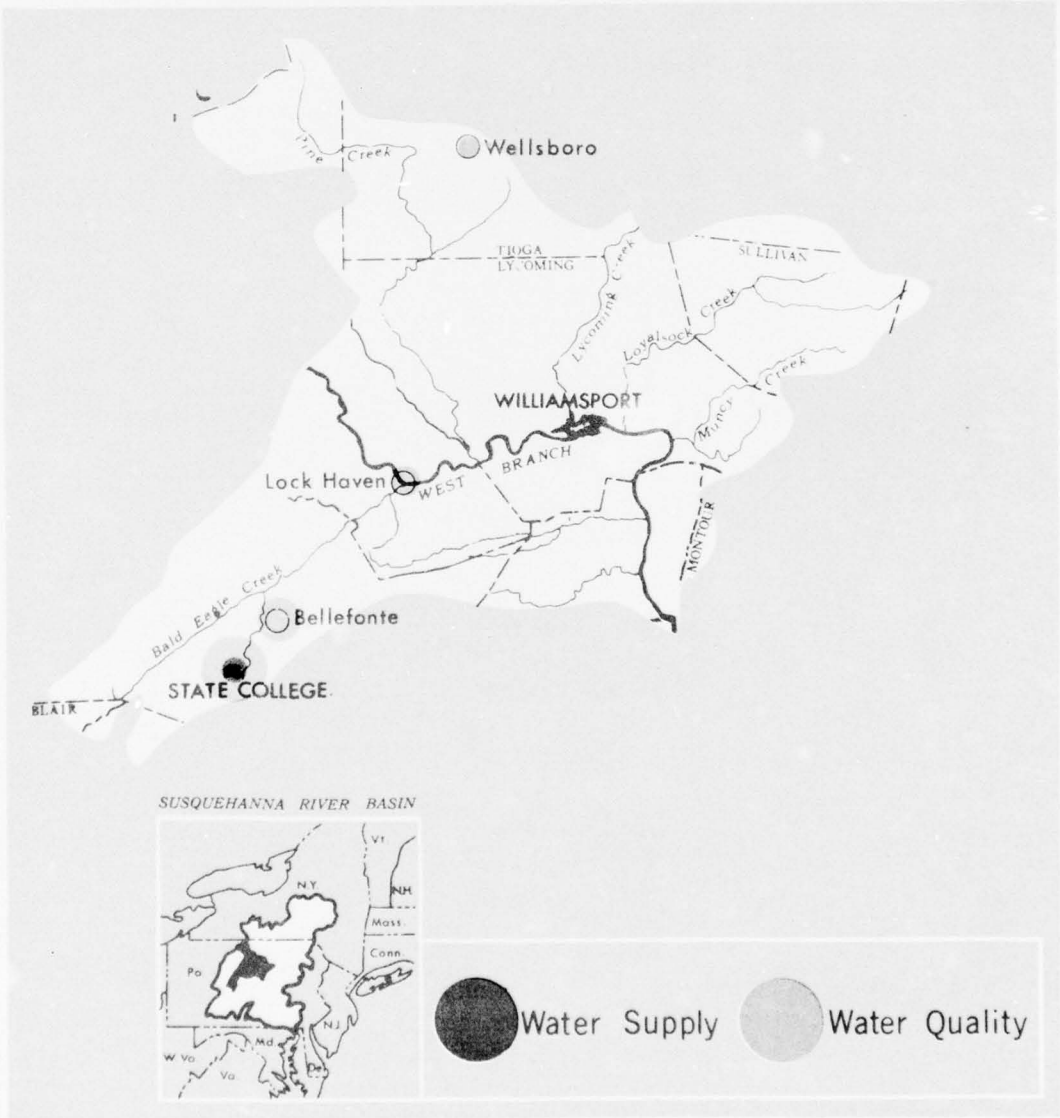
SUB-BASIN V: Recreation Needs Figure 25

to preserve the quality of the environment in the northern and southern portions of the sub-basin, and to enhance economic growth along the West Branch.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 26 and 27.

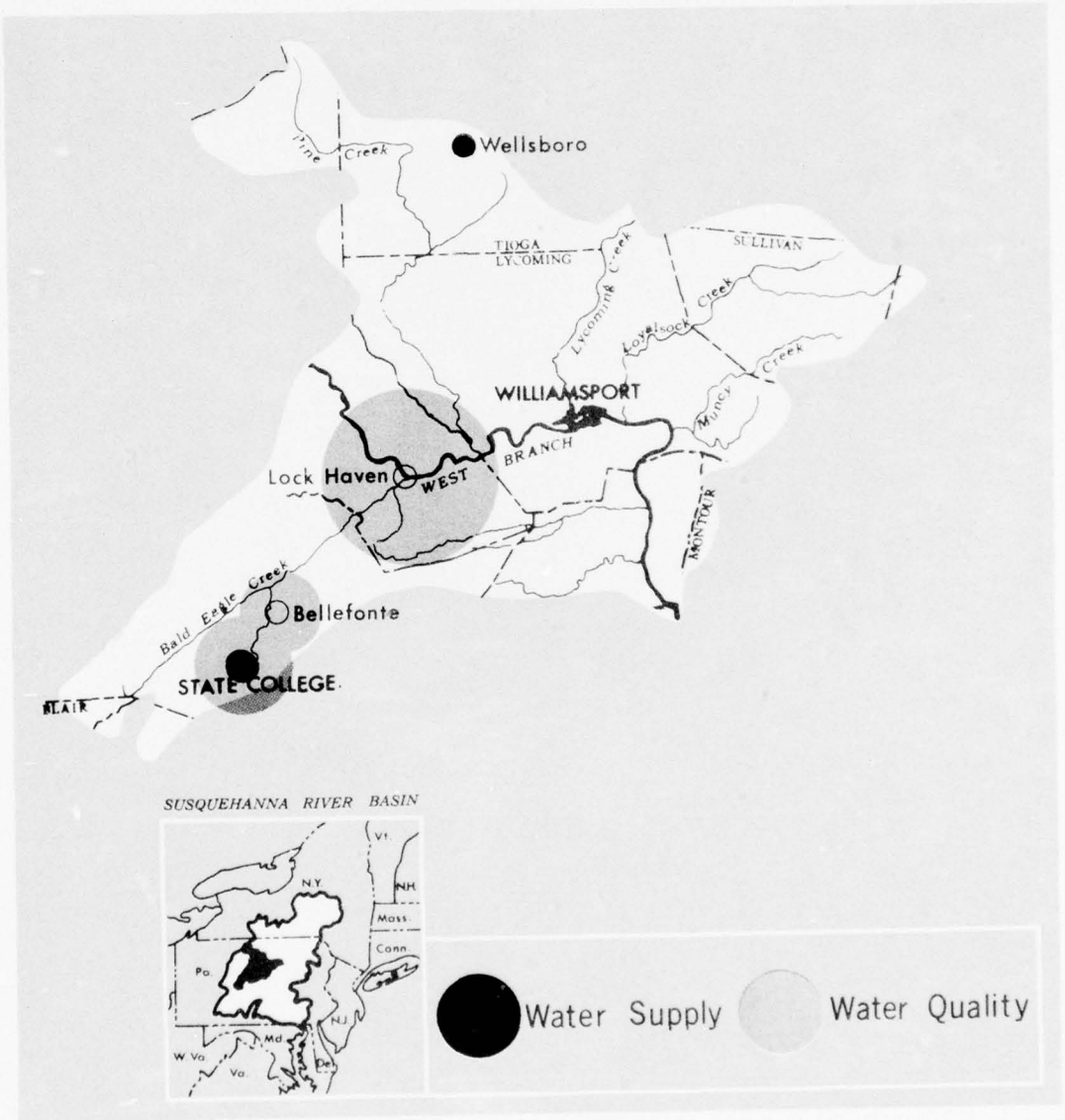
B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin V includes two advanced waste treatment plants; three coal mine drainage abatement projects; one low channel dam;



SUB-BASIN V: Needs 2000 Figure 26

ten small tributary reservoirs for recreation, including fishing; one ground water development for water supply; one local flood protection project; one upstream watershed project; two streambank stabilization projects; an extensive program of land, stream, and flood plain management; a program of water quality surveillance; and a recommendation for certain additional investigations. Figure 28 locates the specific features of the Early Action Plan.



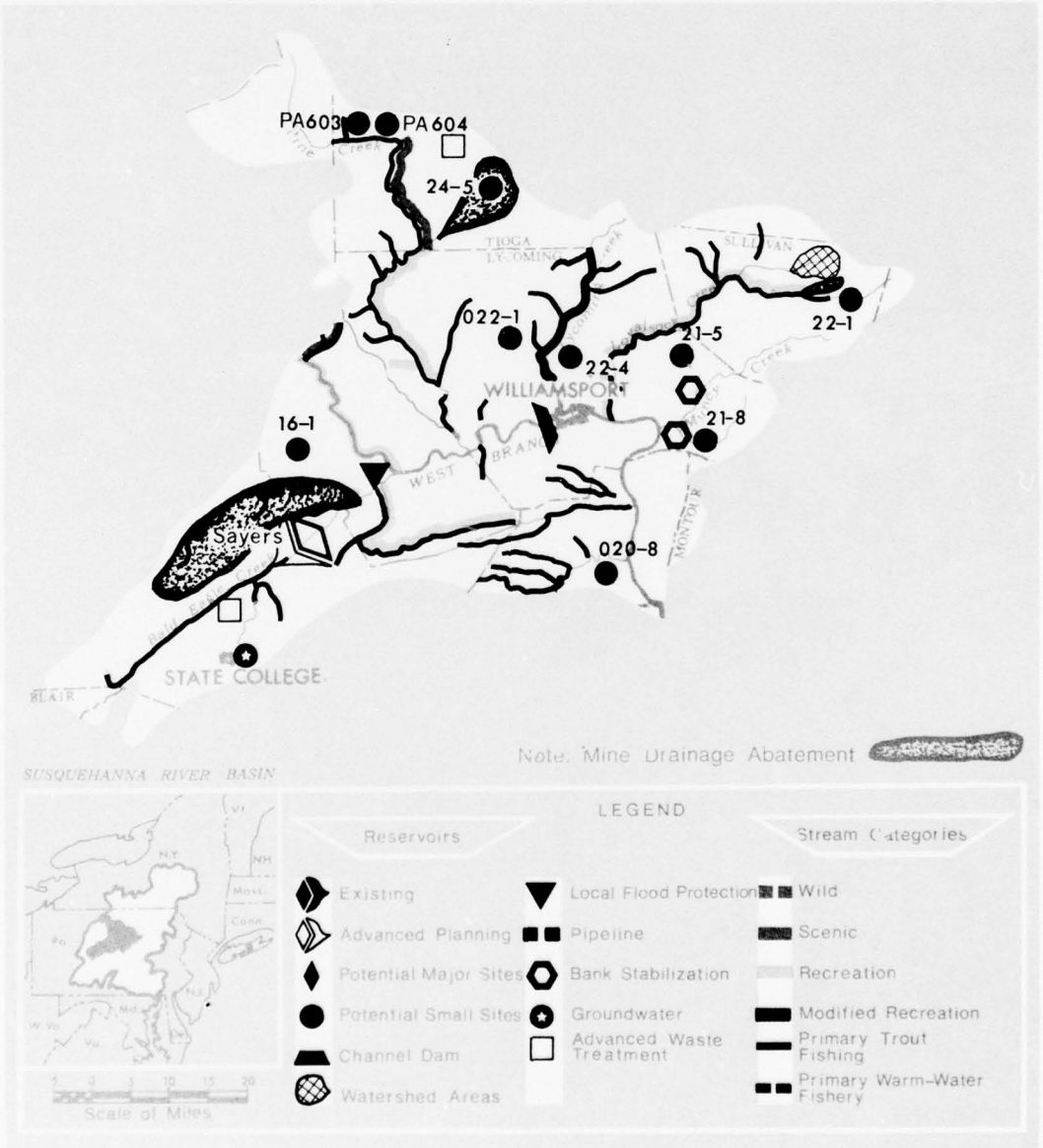
SUB-BASIN V: Needs 2020

Figure 27

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the construction of primary treatment facilities at one service area, the initiation of secondary treatment at nine service areas, and the construction of new or expanded collection facilities at twelve service areas.



SUB-BASIN V: Early Action Recommended Plan Figure 28

The Coordinating Committee recommends that the sewage service areas of Wellsboro and Bellefonte implement advanced waste treatment during the early action period.

Mine drainage pollution abatement should be completed for the entire length of Beech Creek. This recommendation, if implemented, will also abate acid pollution on Bald Eagle Creek and intermittent pollution on the West Branch Susquehanna River below Lock Haven. The abatement project would cover a portion of both Clinton and Centre Counties.

The Coordinating Committee also recommends that coal mine drainage pollution abatement be carried out on Loyalsock Creek 10 miles downstream from Lopez in Sullivan County. This is a very small project, but the Coordinating Committee thinks it should be implemented to enhance the quality and environment of the Loyalsock Creek watershed.

In addition, the Coordinating Committee is recommending that coal mine drainage pollution abatement be carried out on the Babb Creek watershed from Wilson Creek to its mouth. This abatement project would cover a portion of Tioga County and would contribute toward the enhancement of environmental quality in the Pine Creek watershed, which is considered one of the highest scenic value watersheds in the Susquehanna River Basin.

Reservoirs for Recreation and Fish Habitat

Low Channel Dams. The Coordinating Committee recommends the construction of a low channel dam at Williamsport. This dam would be located just above the confluence of Lycoming Creek and the West Branch and would back water up 18 miles to the confluence of Pine Creek and the West Branch just upstream from the town of Jersey Shore. The estimated water surface area of the reservoir, which would remain within the existing streambanks, would be 2,250 acres. Two thousand acres of land adjacent to this reservoir are proposed to be developed ultimately for recreation. This project would initially provide about 308,000 additional annual recreation days and ultimately would provide about 3,084,000 recreation days. Proposed facilities include beaches, concession stands, boat access areas, a marina, a camping area, and fishing and hiking trails. The Coordinating Committee thinks that this recommendation is responsive to their objective of stimulating the economy of this area. A large recreation complex of this type would attract people to live in Williamsport, Lock Haven, Jersey Shore, and other towns in this vicinity. It is also believed that the creation of a reservoir which would stay within the channel of the river would enhance its setting and, if developed, would assure that an 18-mile reach of the river would be available for the recreational use of future generations.

Small Tributary Reservoirs. The Coordinating Committee is recommending the construction of ten small tributary reservoirs.

A 116 acre reservoir (16-1) is recommended on Swamp Branch Big Run, southeast of Highway 144 in Clinton County, for recreation and fishing. This project would create an annual opportunity for an estimated 75,000 recreation days initially and 113,000 recreation days ultimately, and 4,600 warm water fisherman-days at the reservoir.

An 80 acre reservoir (21-5) for recreation and fishing is recommended on Big Run, 2 miles northwest of Tivoli in Lycoming County. This reservoir would create the annual opportunity for 50,000 recreation days initially, 63,000 recreation days ultimately, and 7,800 trout fisherman-days at the reservoir. In the Framework Plan discussed below, this small reservoir would be coupled with a larger reservoir on Muncy Creek to create a recreation complex in this area. The existing Worlds End State Park on the Loyalsock Creek watershed and Eagles Mere constitute a substantial level of recreational development.

A 720 acre reservoir (21-8) is recommended on Little Muncy Creek just above Moreland in Lycoming County. This project has the annual potential for providing 439,000 recreation days initially and 526,000 recreation days ultimately, and the annual fishing opportunity for 67,900 trout fisherman-days at the reservoir. This project would also be considered part of the complex recommended above for Muncy Creek.

A 530 acre reservoir (22-1) is recommended for construction on Loyalsock Creek about 2 1/2 miles east of Lopez in Sullivan County. This project is estimated to provide an annual opportunity for 255,000 recreation days initially and 267,000 recreation days ultimately, and the annual fishing opportunity for 50,600 trout fisherman-days at the reservoir. Although this project is in an attractive natural setting the Coordinating Committee considers it desirable to provide additional recreational opportunity in this area. Considerable support has been expressed for this project by the residents of the Northern Tier area. It is expected that recreation visitation at this project would create some economic stimulation in the surrounding community through recreational expenditures. This dam and reservoir has been included in the Endless Mountains Resource Conservation and Development Project.

A 337 acre reservoir (22-4) is recommended for construction on Mill Creek 2 miles southeast of Calvert for recreation and fishing. This reservoir and dam would be located in Lycoming County. The project would provide the annual opportunity for 278,000 recreation days initially, 303,000 recreation days ultimately, and 13,500 warm water fisherman-days at the reservoir.

A 235 acre reservoir (24-5) is recommended for construction on Babb Creek about 3-1/2 miles west of the town of Arnot in Tioga County. This reservoir would provide an annual opportunity for 136,000

recreation days initially and 186,000 recreation days ultimately, and an estimated 9,400 warm water fisherman-days at the reservoir.

A 200 acre reservoir (020-8) for recreation and fishing is recommended on Turtle Creek, 1/2 mile west of U.S. Highway 15 in Union County. It would create the annual opportunity for 99,000 recreation days initially and 161,000 recreation days ultimately, and the annual fishing opportunity for 8,000 warm water fisherman-days at the reservoir.

A 100 acre reservoir (022-1) is recommended for recreation and fishing on Larrys Creek about 1 mile northeast of Cogan House in Lycoming County. It would create the annual opportunity for 100,000 recreation days initially, 163,000 recreation days ultimately, and 3,900 warm water fisherman-days at the reservoir. This project would be very close to the proposed Appalachian Corridor which is to be located along Lycoming Creek over the drainage divide into the Tioga River watershed in Sub-basin II.

A 30 acre reservoir (PA 603) is recommended for fishing and recreation on Baker Branch Left Branch Asaph Run about 4-1/2 miles northwest of Asaph in Tioga County, Pennsylvania. The project is expected to create the annual opportunity for 28,100 recreation days initially, 34,000 recreation days ultimately, and 1,200 warm water fisherman-days at the reservoir. This structure was originally part of the Marsh Creek PL 566 Work Plan but was deleted by Congress. The Coordinating Committee is recommending that it be reconsidered and constructed.

A 36 acre reservoir (PA 604) is recommended for Right Branch Asaph Run about 4-1/2 miles northwest of Asaph in Tioga County. This project would be for recreation, fishing, and low flow augmentation. The project would create the annual opportunity for 25,000 recreation days initially, 50,000 recreation days ultimately, and 1,400 warm water fisherman-days at the reservoir. Releases from the reservoir would be used to maintain an existing trout fishery. This structure was originally part of the Marsh Creek PL 566 Work Plan but was deleted by Congress. The Coordinating Committee is recommending that it be reconsidered and constructed.

Ground Water for Municipal and Industrial Water Supply

The Coordinating Committee is recommending that State College develop additional ground water resources to meet projected needs. State College is expected to have an additional water supply need of 6 million gallons per day during the early action period.

Local Flood Protection Project

A levee and flood wall project is recommended at Lock Haven in Clinton County to provide a substantial level of protection. This project is estimated to reduce average annual damages at Lock Haven by $560,800 which would be about 85 percent of the

estimated average annual damages without flood protection. This project would complement and increase the protection provided by the four existing upstream flood control reservoirs. The project has been designed to protect portions of Lock Haven on the south side of town which would not be included if economic efficiency or maximization of net benefits was the sole objective. The Coordinating Committee believes it desirable to protect this additional land by building a larger project. The estimated stimulus to the economy resulting from the more efficient use of land appears to be worth the added investment.

Upstream Watershed Project

The Coordinating Committee recommends an upstream watershed project on Little Loyalsock Creek in Sullivan County. The project would consist of land treatment measures and one multiple purpose reservoir (22-6) which would provide flood protection for Dushore and recreation and fishing. The project would reduce estimated average annual damages at Dushore by $14,100 which is 88 percent of the estimated average annual damages that would accrue without the project. This reservoir would provide the annual opportunity for 19,000 recreation days initially and 113,000 recreation days ultimately, and the annual fishing opportunity for 8,900 trout fisherman-days at the reservoir.

Other Structural Measures

Streambank Stabilization Measures. The Coordinating Committee is recommending two bank stabilization projects in this sub-basin in the early action period. A project on Muncy Creek would consist of stabilizing banks for 13 miles from Stoneville to Strawbridge, and from Hughesville to the West Branch Susquehanna River. This project would cover portions of Sullivan and Lycoming Counties.

The second bank stabilization project would be on Little Muncy Creek, a mile from Clarkstown to its confluence with Muncy Creek. This project would be in Lycoming County.

Management Measures

Management measures being recommended by the Coordinating Committee include land management, stream management to enhance recreation and fishing potential, flood plain management, water quality surveillance, and a recommendation for additional studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 12,000 acres of land. This program would add to the existing land treatment

and management practices on 327,000 acres of forest, crop, pasture, urban, and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 4,000 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Wild	County
1. Beech Creek from Pancake to Orviston	Centre

B. Scenic	County
1. Young Women's Creek for its entire length	Potter, Clinton
2. Pine Creek from Ansonia to Blackwell	Tioga

C. Recreational	County
1. West Branch Susquehanna River from Keating to Lock Haven	Clinton
2. Beech Creek from Orviston to Mouth	Centre, Clinton
3. Pine Creek from Blackwell to Waterville	Tioga, Wyoming
4. Loyalsock Creek from Lopez to its mouth	Sullivan, Lycoming
5. Fishing Creek for its entire length	Clinton

D. Modified Recreational	County
1. Lycoming Creek	Lycoming

E. Primary Trout Fishing

1. Bradford County

   a. Lick Creek

2. Centre County

   a. Bald Eagle Creek, b. South Fork Beech Creek,
   c. Little Fishing Creek, d. Logan Branch Spring Creek,
   e. Marsh Creek, f. Spring Creek

3. Clinton County

a. Antes Creek (Nippenose), b. Baker Run, c. Big Fishing Creek, d. North Branch Tangascootack Creek, e. Left and Right Branches Young Woman's Creek

4. Lycoming County

a. Grays Run, b. Hoogland Run, c. Larrys Creek d. Little Pine Creek, e. Loyalsock Creek, f. Pine Creek, g. Pleasant Stream, h. Roaring Run, i. Rock Run, j. Slate Run, k. Spring Creek, l. Trout Run, m. White Deer Hole Creek, n. Antes Creek

5. Sullivan County

a. Elk Creek, b. Hoogland Branch, c. Lick Creek, d. Loyalsock Creek

6. Susquehanna County

a. Cedar Run, b. Long Run, c. Pine Creek, d. Roaring Run

7. Union County

a. Buffalo Creek, b. North Branch Buffalo Creek, c. Laurel Run, d. Rapid Run, e. Spring Creek, f. Spruce Run, g. Weikert Run, h. White Deer Creek, i. White Deer Hole Creek

The Coordinating Committee recommends that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following list summarizes this determination for the full 50-year planning period.

1. Intensive flood plain management program

a.) West Branch, Lock Haven to Jersey Shore, b.) Jersey Shore, c.) West Branch, Jersey Shore to

Williamsport, d.) West Branch, Williamsport to Loyalsock Creek, e.) Muncy, f.) Montgomery, g.) West Branch, Loyalsock Creek to White Deer Creek, h.) Milton, i.) Lewisburg, j.) Big Fishing Creek, k.) Buck Creek, l.) Bald Eagle Creek above Blanchard Reservoir, m.) Muncy Creek, n.) Loyalsock Creek, o.) Upper Pine Creek, p.) Bull Run, q.) Glade Run, r.) Chatham Run

2. Warning and evacuation program

a.) West Branch from Kettle Creek to Lock Haven, b.) West Branch White Deer Creek to Northumberland, c.) Northumberland, d.) Bald Eagle Creek, Blanchard Reservoir to Fishing Creek, e.) Buffalo Creek, f.) Lower Pine Creek, g.) Chillisquaque, h.) White Deer Run, i.) Larrys Creek, j.) Plum Run, k.) Queens Run, l.) Lick Run, m.) Hyner Run, n.) Young Woman's Creek, o.) Drury Run, p.) Laurel Run, q.) Sugar Run, r.) Tangascootack Creek, s.) Hall Run

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above and using criteria outlined in Appendix K(3), stream reaches and damage centers having a priority need for flood plain management were identified. These locations require early detailed flood plain management studies to develop a fully integrated management program for use of flood-prone land. The following early action study program is recommended for Sub-basin V:

(1) West Branch Susquehanna River at Milton

(2) West Branch Susquehanna River from Jersey Shore to Montoursville

(3) West Branch Susquehanna River at Muncy

(4) Bald Eagle Creek from Mill Hall to Lock Haven

(5) West Branch Susquehanna River at Lewisburg

Details are given in Appendix K(3).

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Spring Creek below State College and Bellefonte

(2) West Branch below Lock Haven and Lewisburg

(3) Marsh Creek below Wellsboro

Details are given in Appendix K(3).

Additional Studies

The Coordinating Committee also recommends that survey scope studies be made of the potential for regional sewerage systems in the following three regions: (1) the Williamsport area, which includes the sewage service areas of Williamsport, South Williamsport, and Montoursville; (2) the Spring Creek area, which includes the State College area and Bellefonte; and (3) the Milton-Lewisburg area, which includes the sewage service areas of Milton and Lewisburg. These studies should include the optimum combination of sewerage system elements for each region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the appropriate authority to operate and maintain each system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs after 1980 includes some continuation of programs recommended for the early action period, as well as additional projects to meet the needs as they become evident. Figure 29 locates the specific features of the Framework Plan.

Structural Measures

Water Quality Measures

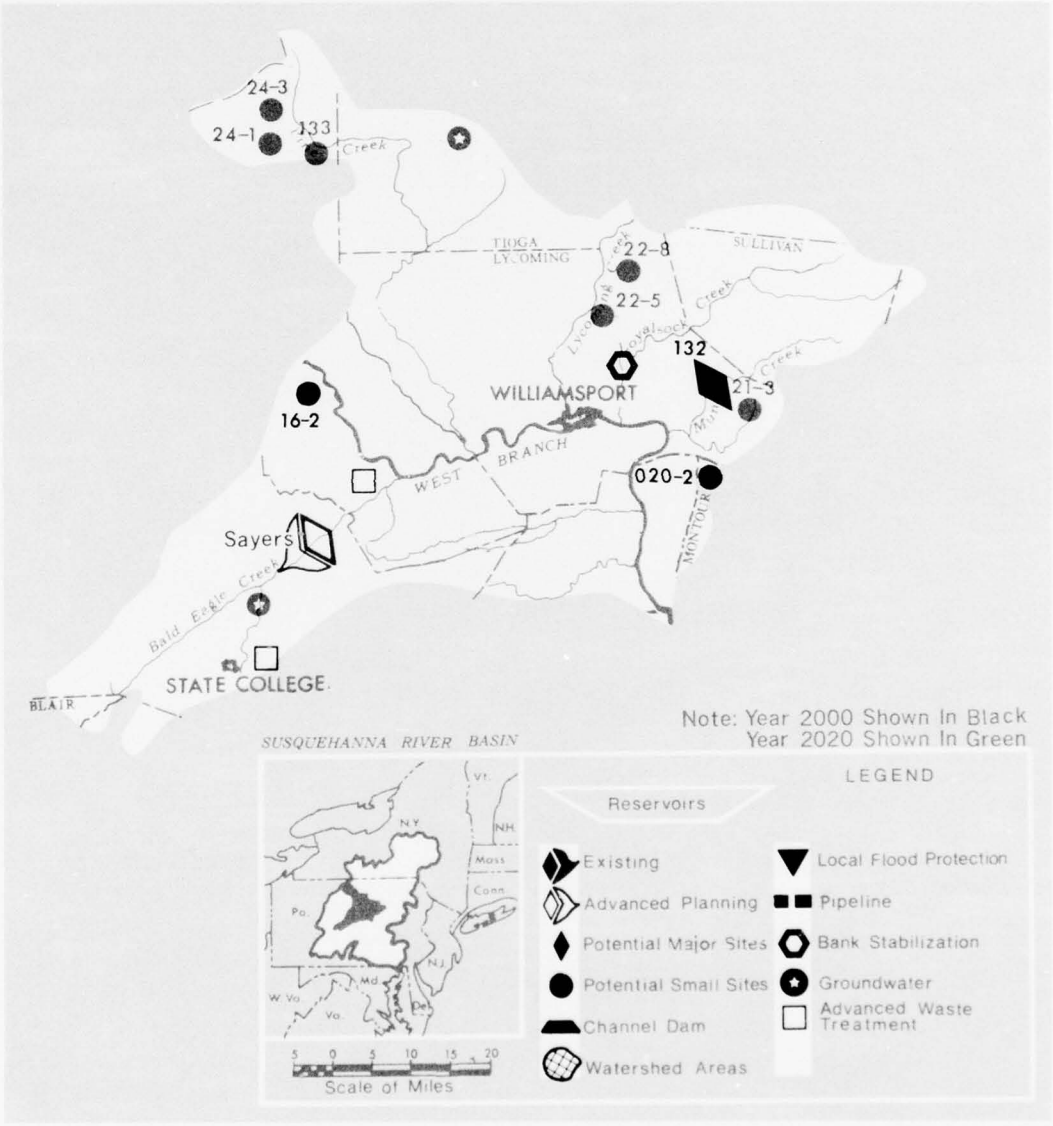
The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at two service areas, the expansion of secondary waste treatment at ten service areas, and the construction of new or expanded collection facilities at 13 service areas.

The Coordinating Committee recommends advanced waste treatment at Lock Haven and State College, and the expansion of advanced waste treatment facilities at Bellefonte and Wellsboro by the year 2000 in order to maintain the water quality standards in the West Branch. The Committee also recommends, by 2020, the expansion of advanced waste treatment facilities at Lock Haven, State College, Bellefonte, and Wellsboro.

Reservoirs for Recreation & Fish Habitat

Large Tributary Reservoir. The Muncy Creek project (132) is included in the Framework Plan (2000) for the purposes of recreation, including fishing, and water supply for Hughesville. This project would be located on Muncy Creek, approximately 13 miles above its mouth, near the town of Tivoli in Lycoming County, Pennsylvania. The reservoir would have a water surface area of 1270 acres and would provide recreational facilities for up to 254,000 annual recreation days.

Small Tributary Reservoirs. Eight small tributary reservoirs are included in the Framework Plan and listed in Table 17.



SUB-BASIN V : Framework Plan

Figure 29

TABLE 17
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN V

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
16-2 (2000)	E. Br. Big Run	8.0 mi SE of Keating 6.3 mi S of Shintown	63	94
020-2 (2000)	W. Br Chillisquaque Cr	1.0 mi N of Exchange 2.5 mi W of White Hall	104	133
21-3 (2020)	Beaver Run	2.4 mi SW of N. 3.0 mi NE of Landsville	170	17,400 Fisherman-Days
22-5 (2020)	Joe Gray Run	3.7 mi SE of Bodines 6.7 mi SE of Barbours	93	5,300 Fisherman-Days
22-8 (2020)	W. Br. Wallis Run	4.1 mi NW of Proctor 5.5 mi E of Bodines	78	62
24-1 (2020)	W. Br. Pine Creek	7.0 mi SW of Galeton 5.8 mi NW of Germania	219	44,600 Fisherman-Days
24-3 (2020)	Nine Mile Run	0.4 mi NW of Walton	160	30
133 (2020)	West Branch Pine Creek	1.0 mi. west of Galeton	320	93

Ground Water for Municipal and Industrial Water Supply

Ground water development is included in the Framework Plan to meet the future municipal and industrial water supply needs of the Bellefonte and Wellsboro water service areas.

Other Structural Measures

A bank stabilization project on Loyalsock Creek is proposed in the Framework Plan to prevent the severe erosion that is now taking place.

Management Measures

Land Management

The proposed land treatment and management program in Sub-basin V between 1980 and 2020 is shown in Table 18.

TABLE 18
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	4,000	328,000
2000-2020	3,000	251,000

Stream Management

The Framework Plan calls for continued use of the recommended early action stream management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program and warning and evacuation program should be continued and flood plain studies should be made at the following locations as soon as possible after 1980:

Lock Haven to Jersey Shore, and Renovo to South Renovo.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

In this sub-basin structural measures have been selected for pollution control, and to provide water based recreational opportunity, flood protection, and water supply. Prime alternatives to the selected measures are discussed below.

Water Quality Management

Bellefonte

Advanced waste treatment has been recommended to maintain water quality standards on Bald Eagle Creek. Variations of advanced waste treatment should be considered such as spray irrigation, but alter-

natives such as flow augmentation or by-pass pipelines are not feasible due, respectively, to the lack of storage potential and the length and expense of by-pass piping.

Wellsboro

Advanced waste treatment has been recommended to maintain standards on Marsh Creek. Potential flow augmentation reservoirs upstream do not have watershed yield capabilities to maintain the standards.

Flood Control

A local flood protection project is recommended for Lock Haven. The need for this project would be reduced or eliminated with the construction of the Dimeling and/or Keating projects which are discussed in Chapter IV.

Recreation and Fishing

In addition to 236 miles of streamside development, 19 reservoirs and one low channel dam are included in the Early Action and Framework Plans for recreation and fishing. Prime alternatives to the recommended reservoir sites are listed in Table 19.

TABLE 19
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Location	Surface Area (Acres)	Storage Vol. (1,000 Ac-Ft)	Est. Cost ($Thousands)
14-1	Rapid Run	123	2.3	662
15-1	Roaring Run	400	8.8	1,506
17-2	Dicks Run	103	3.8	1,600
21-1	Laurel Run	68	2.2	440
22-8	West Branch Wallis Run	78	1.4	42
020-7	Delaware River	180	2.0	302

Water Supply

State College

It is recommended that anticipated growth in water demands in the State College area be satisfied with additional ground water development. Alternatives to this include the use of surface water in either Spruce Creek or Bald Eagle Creek. Both of these alternatives, however, would require the use of surface water storage and expensive pipelines. The costs of each of these alternatives were estimated to be considerably in excess of the cost of ground water development.

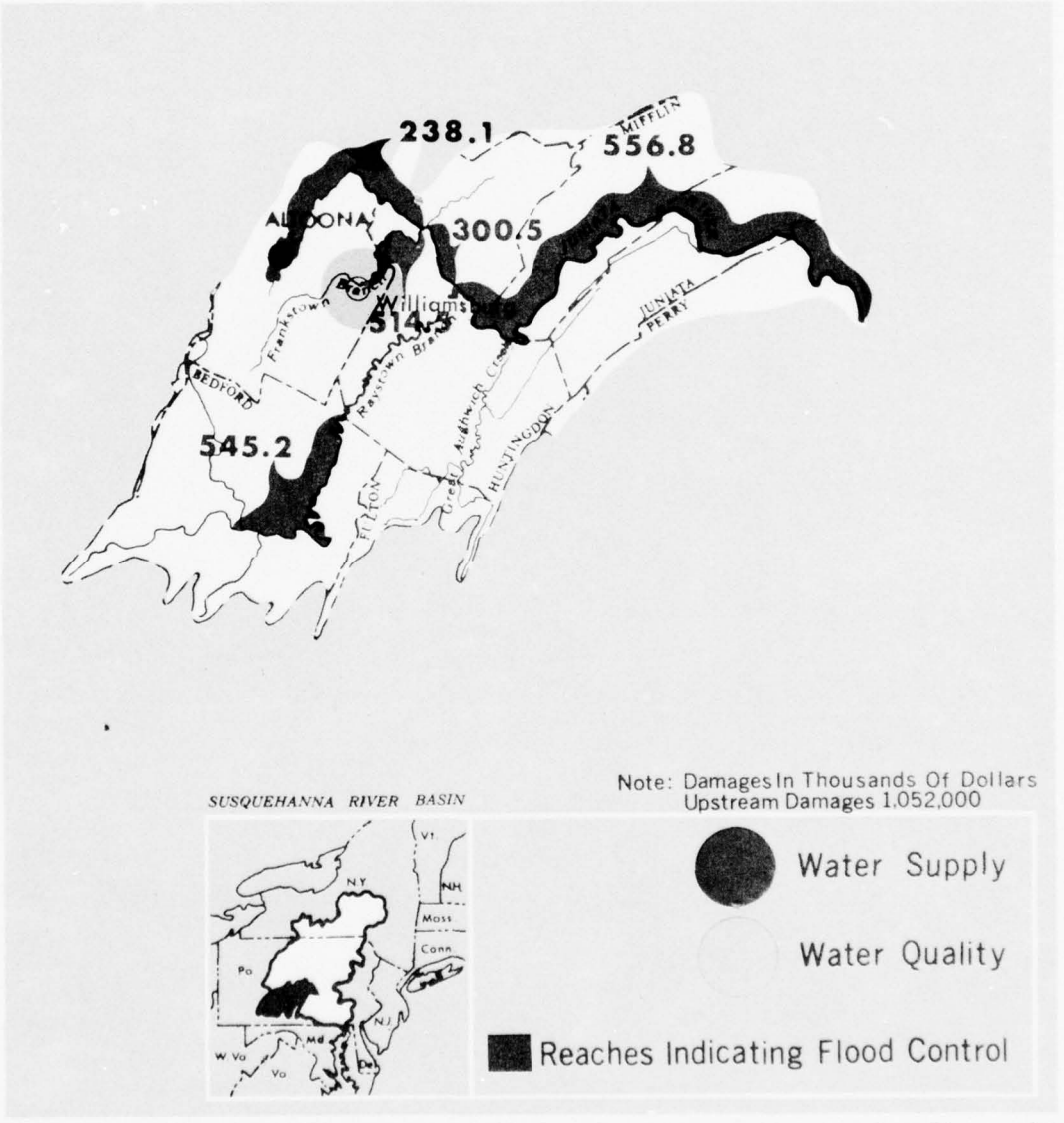
Bellefonte and Wellsboro

Both the Bellefonte and Wellsboro water service areas are handicapped by lack of surface storage potential. A transmission pipeline to Bald Eagle Creek was investigated for the Bellefonte water service area and found to be more expensive than ground water development. The water supply analyses for Bellefonte and Wellsboro were constrained by the small number of feasible alternatives.

CHAPTER VI - THE PLAN AND ALTERNATIVES - SUB-BASIN VI (JUNIATA RIVER BASIN)

A. EARLY ACTION WATER RESOURCES REQUIREMENTS

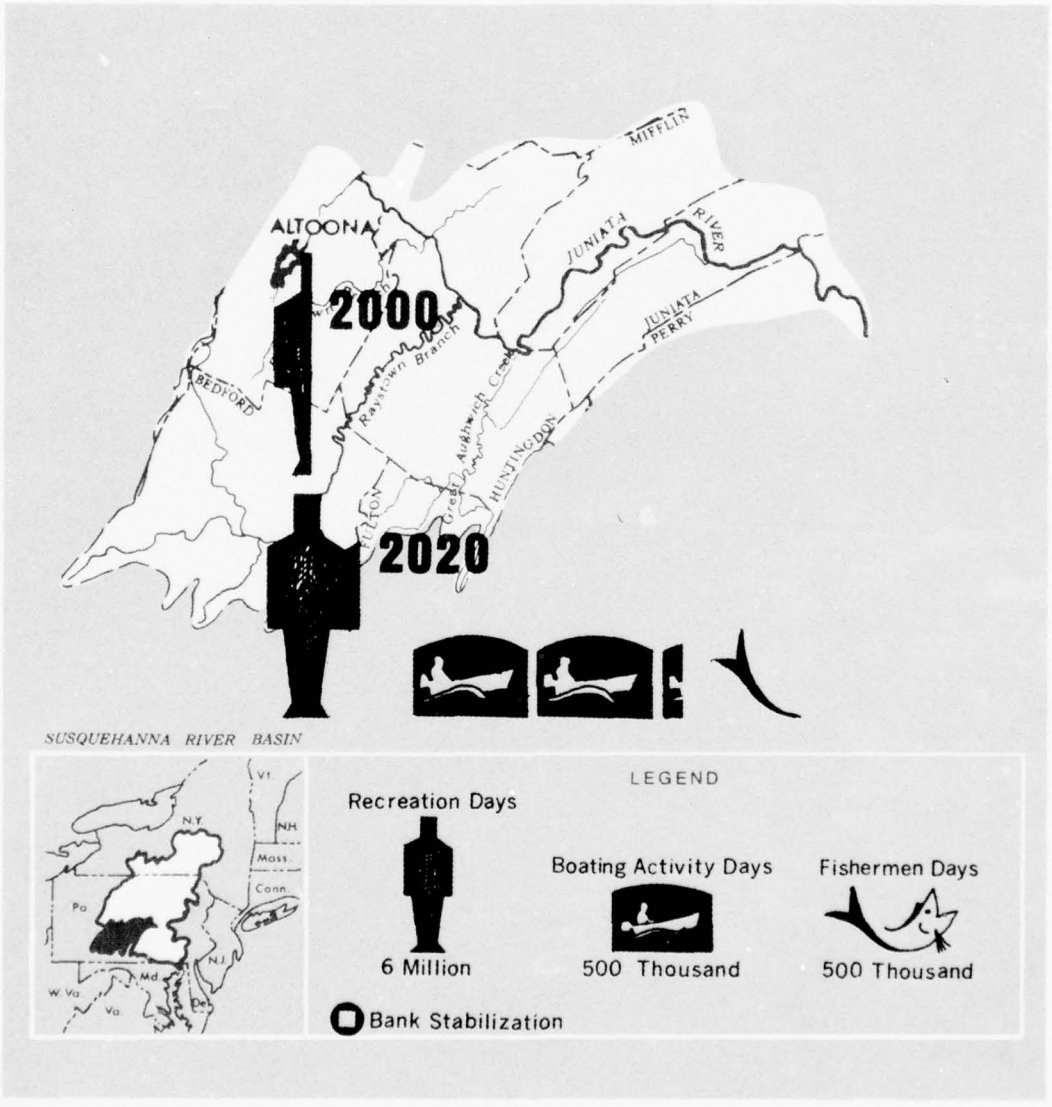
The Juniata River Basin drains an area of about 3,400 square miles entirely within the Commonwealth of Pennsylvania. During the early action period to 1980, as indicated in Figure 30, water quality management and municipal and industrial water supply will be the two problems most in need of additional investment.



SUB-BASIN VI: Need 1980 Figure 30

Most of the water quality problems in Sub-basin VI are due to inadequately treated waste water discharges. The resulting degradation is in evidence in the Little Juniata River below Altoona and Tyrone, in the Frankstown Branch below Roaring Spring and Williamsburg, in the Beaverdam Branch below Altoona and Hollidaysburg, and in the Juniata River below Huntingdon and Lewistown. There is also scattered coal mine drainage pollution in this sub-basin.

The Huntingdon and Lewistown areas need to provide adequate secondary waste treatment. Secondary treatment is being provided at Williamsburg. However, colored discharges from the pulp mill at



SUB-BASIN VI: Recreation Needs Figure 31

Williamsburg are causing downstream degradation. High level waste treatment is or will be needed at Altoona, Tyrone,* and Roaring Spring.*

Three water service areas will experience water supply deficits during the early action period unless further source development is implemented. This development will be required for Altoona, Bellwood,* and Roaring Spring.*

The average annual flood damages indicated in Figure 30 are those expected to be present after the completion of the Raystown Reservoir on the Raystown Branch Juniata River. The damages are spread throughout the sub-basin. The lower portion of the Frankstown Branch and the upper portion of the Raystown Branch remain as rather large damage centers. There are only minor average annual flood damages in the upstream watersheds in this sub-basin.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs, and in addition would include critical areas needing treatment.

Due to the large recreational supply which will be created by the completion of the Raystown project, there are no additional recreational needs anticipated for this sub-basin in the early action period, as shown in Figure 31. The resource capability of the existing fishing streams is also expected to meet the demand in this area for fishing. The Coordinating Committee, however, estimates that the Plan may not satisfy all of the recreational demands in Sub-basins VII and VIII. It will be desirable, therefore, to develop additional recreational facilities in the early action period in Sub-basin VI, realizing that this sub-basin will probably attract recreationists from Sub-basins VII and VIII.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 32 and 33.

B. RECOMMENDED EARLY ACTION PLAN

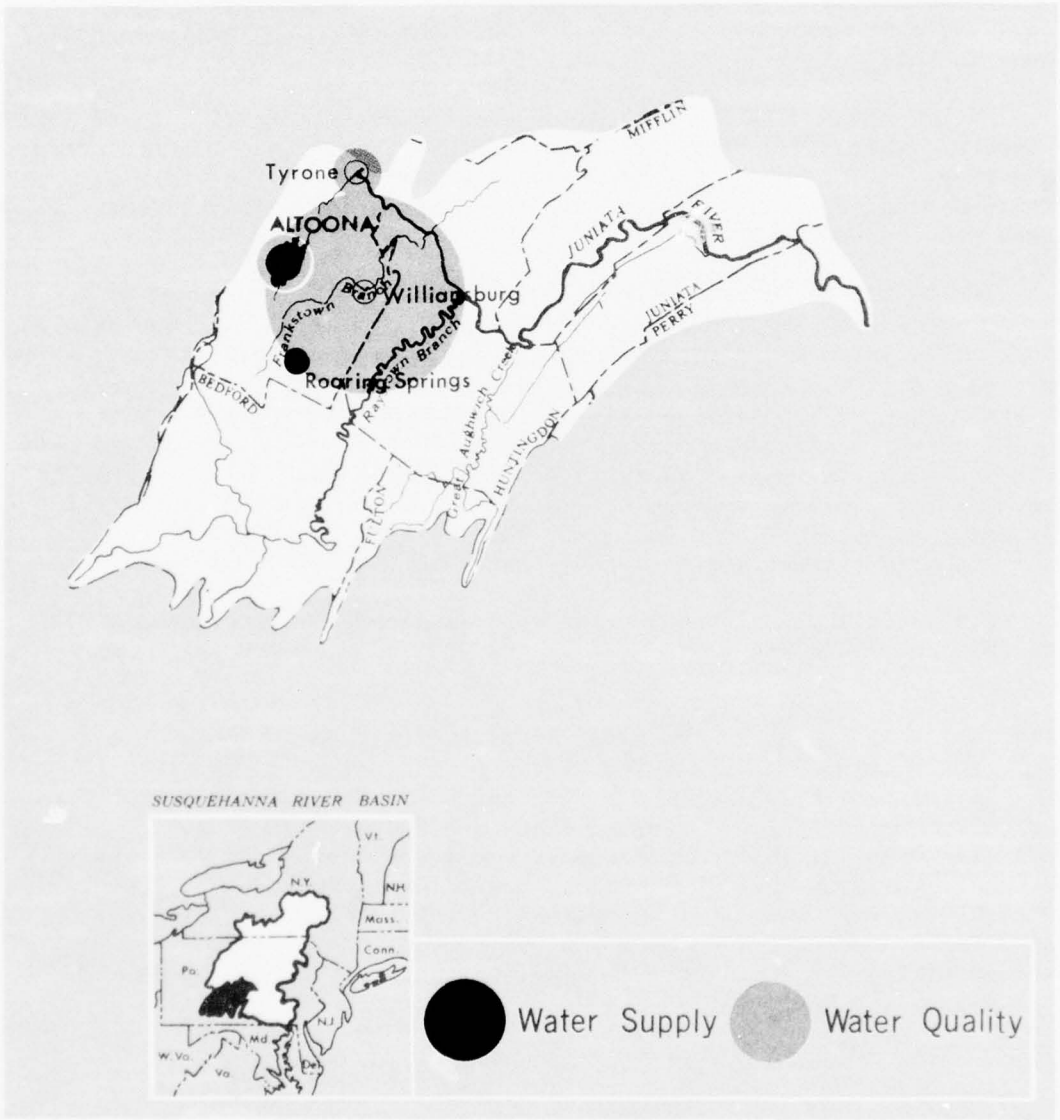
In response to all of the needs, the recommended Early Action Plan for Sub-basin VI includes four advanced waste treatment plants; one coal mine drainage abatement project; one low channel dam; four small tributary reservoirs for recreation, including fishing; three ground water development projects; an extensive program of land, stream, and flood plain management; a water quality surveillance program; and a recommendation for additional studies. Figure 34 locates the specific features of the Early Action Plan.

*Not shown in Figure 30, since deficits are less than 10 cfs.

Structural Measures

Water Quality Measures

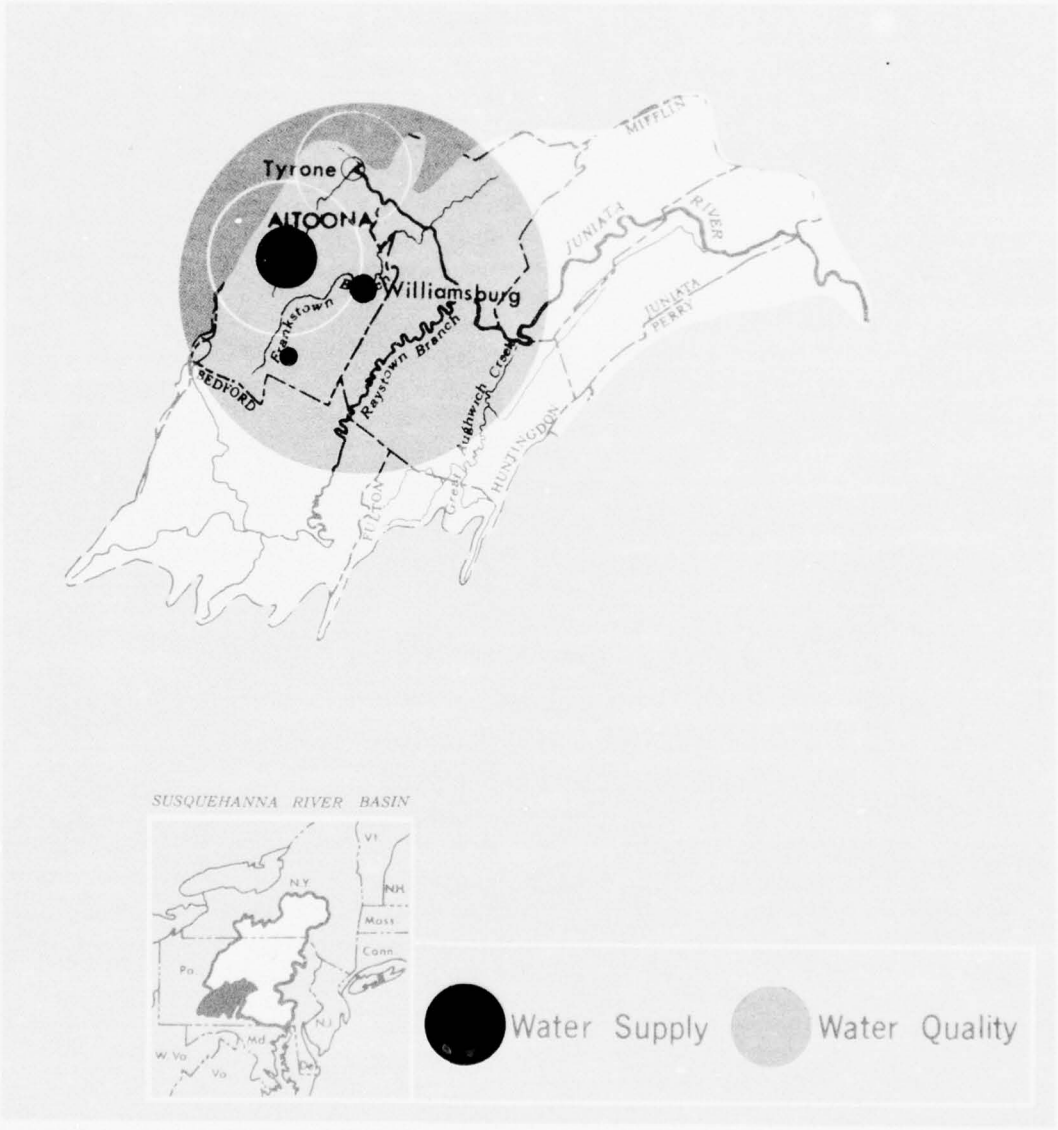
The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at 12 service areas, and the construction of new or expanded collection facilities at 19 service areas.



SUB-BASIN VI: Needs 2000 Figure 32

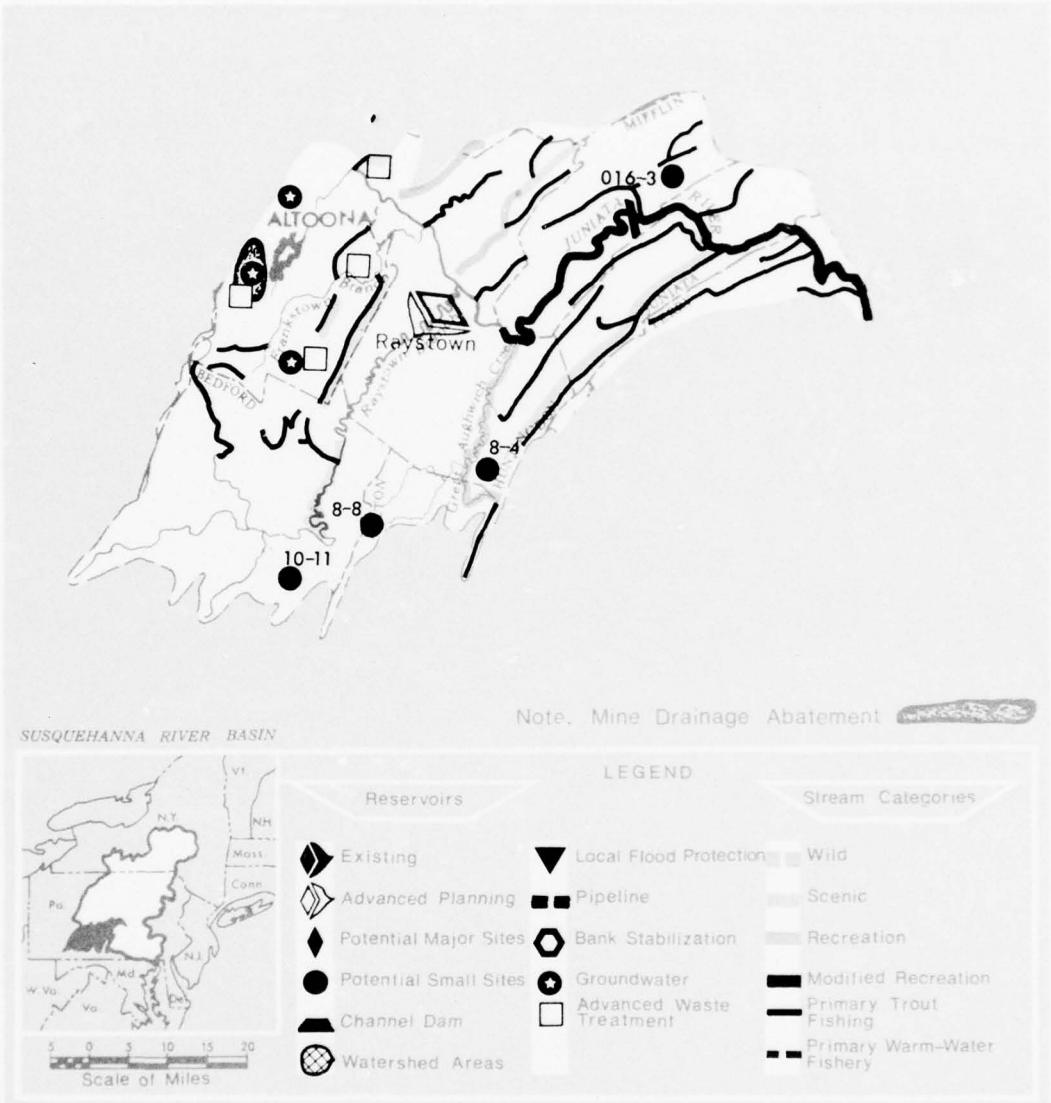
Assuming the implementation of the measures described in the preceding paragraph, water quality deficits would still occur in Beaverdam Branch, below Altoona; Halter Creek, below Roaring Spring; the Frankstown Branch, below Williamsburg; and the Little Juniata River, below Tyrone. The Coordinating Committee, therefore, is recommending that the sewage service areas of Altoona (SW), Roaring Spring, Williamsburg, and Tyrone provide advanced waste treatment in the early action period.

The Coordinating Committee is also recommending one coal mine drainage pollution abatement project for the early action period in Sub-basin VI. This project would be on Beaverdam Branch, a tributary to the Frankstown Branch Juniata River.



SUB-BASIN VI: Needs 2020

Figure 33



SUB-BASIN VI: Early Action Recommended Plan Figure 34

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. The Coordinating Committee is recommending the construction of a low channel dam at Lewistown in Mifflin County, on the Juniata River. This site would provide a surface area of about 600 acres and approximately 7 miles long. The pool would back up to the vicinity of Lockport, but would remain within the existing channel of the Juniata River. In addition to the pool area, 1,000 acres of streamside recreation would ultimately be provided. Ultimately, the recreational facilities would include picnic areas, a camping area, a boat access area, and fishing areas. This project is expected to provide the annual opportunity for 205,000 recreation days initially and 2,050,000 recreation days ultimately. It is expected to stimulate the economy of Lewistown and the surrounding area by attracting residents and new industry.

Small Tributary Reservoirs. The Coordinating Committee is recommending the construction of four small tributary reservoirs for the early action period.

A 330 acre reservoir (8-4) is recommended on the North Branch of Little Aughwick Creek, 1-1/2 mile northeast of Burnt Cabins in Huntingdon County. This reservoir would be used for recreation and fishing. It is expected to provide the annual opportunity for 178,000 recreation days initially and 203,000 recreation days ultimately, and the annual fishing opportunity for 32,600 trout fisherman-days at the reservoir, and 14,800 warm water fisherman-days downstream.

A 190 acre reservoir (8-8) for recreation and fishing is recommended on Sideling Hill Creek, 2 miles southeast of Wells Tannery. The structure would be located in Fulton County and would create the annual opportunity for 125,000 recreation days initially, 188,000 recreation days ultimately, and 18,800 trout fisherman-days at the reservoir.

A 420 acre reservoir (10-11) for recreation and fishing is recommended on Shaffer Creek about 2-1/2 miles northeast of Clearville in Bedford County. This project would provide the annual opportunity for 105,000 recreation days and the annual fishing opportunity for 40,300 trout fisherman-days at the reservoir.

A 360 acre multiple purpose reservoir (016-3) is recommended on Meadow Creek just north of Alfarata. This reservoir would be used for recreation and fishing and could also be used for water supply at Paintersville, if needed. The project would be located in Mifflin County and would provide the annual opportunity for 210,000 recreation days initially, 241,000 recreation days ultimately, and 14,200 warm water fisherman-days at the reservoir.

Ground Water for Municipal and Industrial Water Supply

The Coordinating Committee is recommending that ground water development be used to meet additional water supply needs at Altoona, Bellwood, and Roaring Spring. These projects would provide, during the early action period, an average of 7.4 million gallons per day (mgd) for Altoona, 0.6 mgd for Bellwood, and 1.6 mgd for Roaring Spring.

Management Measures

Management measures being recommended by the Coordinating Committee include land management, stream management to enhance recreation and fishing potential, flood plain management, water quality surveillance, and additional special studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 8,000 acres of land. This program would add to the existing land treatment and management practices on 326,000 acres of forest, crop, pasture, urban, and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 2,800 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams, and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Scenic	County
1. Standing Stone Creek from its source to McAlevy's Fort	Huntingdon
2. Raystown Branch, from Breezewood to Warriors Path Park	Bedford
3. Tuscarora Creek for its entire length	Juniata Huntingdon

4.	Clover Creek for its entire length	Blair
5.	Piney Creek for its entire length	Blair

B. Recreational		County
1.	Standing Stone Creek, McAlevy's Fort to mouth	Centre Huntingdon
2.	Aughwick Creek for its entire length	Huntingdon Fulton
3.	Spruce Creek for its entire length	Centre Huntingdon

C. Modified Recreational		County
1.	Juniata River from Mt. Union to its mouth	Huntingdon, Mifflin, Perry Juniata

D. Fishing

1. Bedford County

   a.) Beaver Creek, b.) Bobs Creek, c.) Cove Creek
   d.) Maple Run, e.) Shobers Run, f.) Yellow Creek

2. Blair County

   a.) Bald Eagle Creek, b.) Big Fill Run, c.) Bobs Creek,
   d.) Canoe Creek, e.) Clover Creek, f.) Piney Creek,
   g.) Poplar Run, h.) Smokey Run, i.) Tipton Run,
   j.) Vanscoyac Run

3. Centre County

   a.) South Bald Eagle Creek, b.) Big Fall Run

4. Fulton County

   a.) South Branch Little Aughwick Creek

5. Huntingdon County

   a.) Blacklog Creek, b.) Laurel Run, c.) Shaver Creek,
   d.) Standing Stone Creek, e.) East Branch Standing Stone Creek,
   f.) Saddlers Run

6. Juniata County

a.) Blacklog Creek, b.) Horse Valley Run, c.) East Licking Creek, d.) Lost Creek, e.) Tuscarora Creek, f.) Willow Run

7. Mifflin County

a.) Honey Creek, b.) Kishacoquillas Creek, c.) East Licking Creek, d.) West Licking Creek, e.) Treaster Valley Run

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to utilize their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood-proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following lists summarize this determination for the full 50-year planning period.

1. Intensive flood plain management program

a.) Bedford, b.) Little Juniata River, c.) Frankstown Branch, Williamsburg to mouth, d.) Juniata River, Frankstown Branch to Raystown Branch, e.) Lewistown (for low dam), f.) Juniata River, Aughwick Creek to Tuscarora Creek, g.) Juniata River, Tuscarora Creek to mouth, h.) Tuscarora Creek, i.) Upper Raystown Branch above Bedford, j.) Frankstown Branch, Beaverdam Branch to Hollidaysburg, k.) Roaring Springs, l.) Panther Creek, m.) Delaware Creek, n.) Kishacoquillas Creek at Lewistown, o.) Honey Creek, p.) Buck Run, q.) Jacobs Creek

2. Warning and evacuation program

a.) Raystown Branch, Bedford to Juniata River, b.) Mt. Union, c.) Juniata River, Raystown Branch to Aughwick Creek, d.) Mifflin, e.) Newport, f.) Aughwich Creek, g.) Frankstown Branch, Hollidaysburg to Williamsburg, h.) Little Buffalo Creek, i.) Raccoon Creek, j.) Cocolamus Creek, k.) Locust Run, l.) Doe Run,

m.) Lost Run, n.) Mifflin Creek, o.) Horning Creek, p.) Mill Creek, q.) Crooked Creek, r.) Standing Stone Creek, s.) Shaver Creek

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above, and using criteria outlined in Appendix K(3), stream reaches and damage centers having a priority need for flood plain management were identified. These locations require early detailed flood plain management studies to develop a fully integrated management program for use of flood-prone lands. The following early action study program is recommended for Sub-basin VI:

(1) Little Juniata River from Altoona to Tyrone.

(2) Juniata River at Lewistown (for low dam).

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Little Juniata below Bellwood and Tyrone.

(2) Beaverdam Branch below Hollidaysburg.

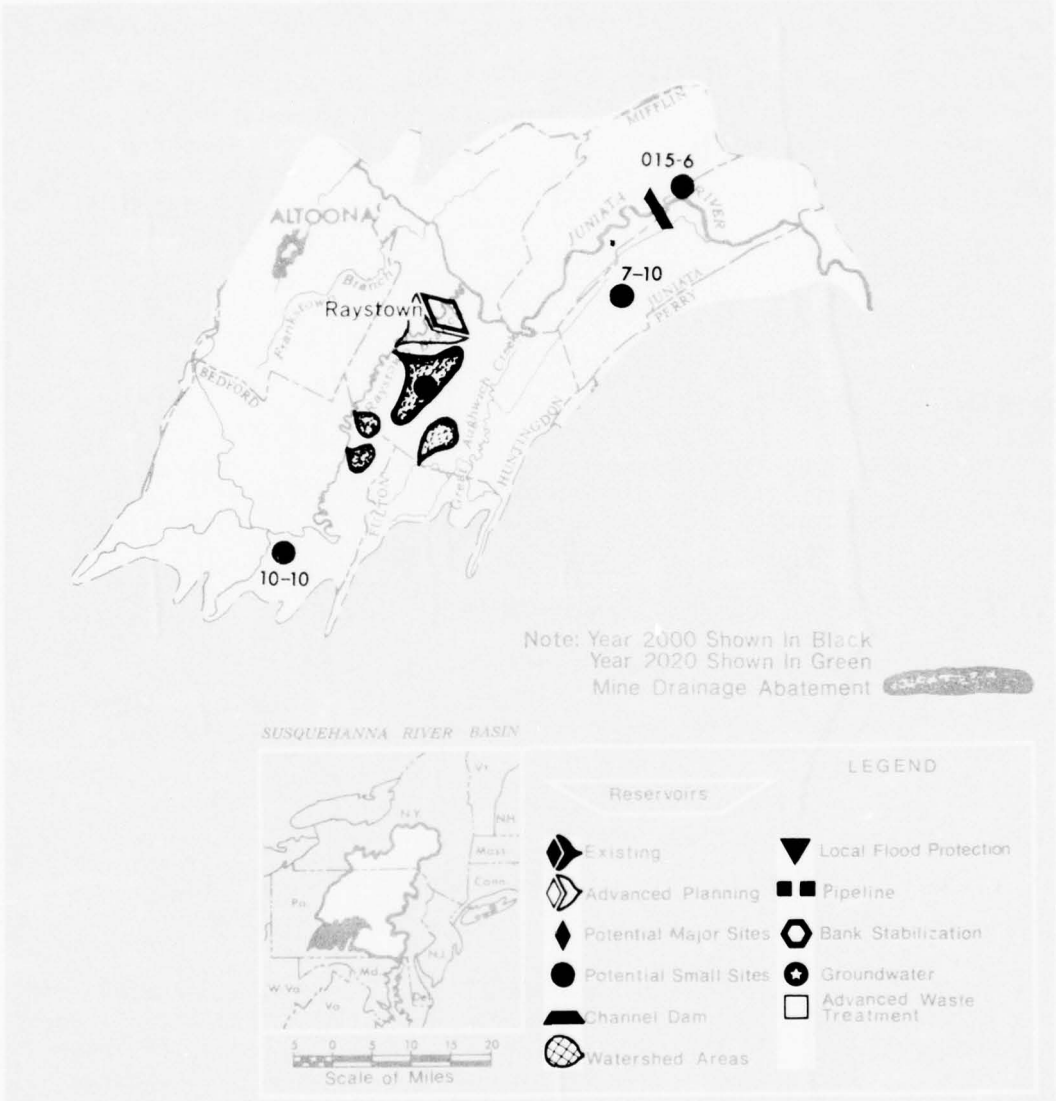
(3) Frankstown Branch below Roaring Spring and Williamsburg.

(4) Juniata River below Lewistown.

Details are given in Appendix K(3).

Additional Study

The Coordinating Committee recommends that a survey scope study be made of the potential for a regional sewerage system in the Altoona area. This study, which would include the service areas of Altoona, Bellwood, Duncansville, Hollidaysburg, and Tyrone, should recommend the optimum combination of sewerage system elements for the region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the appropriate authority to operate and maintain the system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.



SUB-BASIN VI: Framework Plan

Figure 35

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs occuring after 1980 includes some continuation of programs recommended for the early action period, as well as additional measures to meet the needs as they become evident. Figure 35 locates the specific features of the Framework Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at five service areas, the expansion of secondary waste treatment at ten service areas, and the construction of new or expanded collection facilities at 22 service areas. These projects are listed in Appendix K(2).

By the year 2020, advanced waste treatment will be required at the Altoona (NE) sewage service area in order to meet the water quality standards in the Little Juniata River. In addition to this project, existing advanced waste treatment plants, recommended in the early action period, will have to be expanded during the framework period as the needs become evident.

The Framework Plan includes coal mine drainage abatement measures on Great Trough Creek (2000), Longs Run (2020), Six Mile Run (2020), Shoups Run (2020), and Roaring Run (2020).

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. The Framework Plan includes one low channel dam in Sub-basin VI. This dam would be located on the Juniata River near Thompsontown. It would have a water surface area of 520 acres and provide for an ultimate visitation of about 1,956,000 annual recreation days.

Small Tributary Reservoirs. The Framework Plan includes four small tributary reservoirs. These projects are listed in Table 20.

TABLE 20
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN VI

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation-Days)
7-10 (2000)	Dougherty Run	.1 mi. SE Reeds Gap 2.9 mi. NW of Honey Grove	120	48
9-2 (2020)	Great Trough Creek	1.4 mi. SW of Cassville 2.1 mi. NE of Todd	438	182
10-10 (2020)	Clear Creek	1.1 mi. NW of Clear Ridge 2.5 mi. SW of Everett	290	87
015-6 (2020)	Cocolamus Creek	2.7 mi. SW of Seven Stars .3 mi. N of Millerstown	1,000	366

Management Measures

Land Management

The proposed land treatment and management program in Sub-basin VI between 1980 and 2020 is shown in Table 21.

TABLE 21
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	2,800	296,000
2000-2020	2,400	204,000

Stream Management

The Framework Plan calls for continuing the use of the recommended early action stream management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program and warning and evacuation program should be continued and flood plain management studies should be made at the following locations as soon as practicable after 1980: Bedford, Lewistown, Alexandria, Williamsburg, and Petersburg.

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

In this sub-basin, structural measures have been selected for pollution control, and to provide water based recreational opportunity, flood protection, and water supply. The primary alternatives to the selected measures are discussed below. Additional data on these alternatives are included in Appendix K(1).

Water Quality Management

Advanced waste treatment is recommended for Altoona, Tyrone, Roaring Spring and Williamsburg. Seven pipelines to divert these treated wastes to the Juniata below Huntingdon were considered, but were not feasible because of the relatively low assimilative capacity of the Juniata in drought years. Flow augmentation was also considered but was impractical because available water storage sites would be too costly, and because there is little storage potential upstream from these service areas.

Recreation and Fishing

In addition to 251 miles of streamside development, four reservoirs and one low channel dam are recommended specifically for recreation and fishing. Prime alternatives to the recommended reservoir sites are listed in Table 22.

TABLE 22
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Stream	Surf. Area (Acres)	Storage Vol. (1000 Ac-ft.)	Est Cost ($Thousand)
7-4A	George Creek	162	5.8	680
8-1	Sideling Hill Creek	150	2.0	276
10-2	Georges Creek	18	2.0	756
10-6	Swanee Branch Raystown Branch	215	5.0	1202
11-3	Canoe Creek	600	16.5	2700
013-2	Racoon Creek	413	12.9	1206
016-1	Jacks Creek	86	1.8	300

Conservation Storage

Three potential reservoir projects, Seven Stars (#126), Big Fill Run (#129), and Bells Gap Run (#131), were considered as water supply and water quality flow augmentation reservoirs.

Seven Stars Alternative

The Seven Stars project would be located on Spruce Creek, about 6 miles above the mouth near Seven Stars, Pennsylvania. This project would control 71 square miles and could supply State College with water if a pressure pipeline were constructed to transport the water from the reservoir to State College, in the Spring Creek watershed.

Considering watershed yield potential, the maximum hydrologic development of the Seven Stars project would be 55,000 acre feet of conservation storage. Relocations would be relatively minor, consisting of farms and woodland, some roads, and utilities.

During the plan formulation phase of the Study, the Seven Stars project looked promising based on national economic efficiency. The implementation of this project, however, would mean the inundation of a portion of a good fishing stream. In the interest of environmental quality, therefore, the Seven Stars project was not included in either the Early Action or Framework Plans.

Big Fill Run Alternative

This site is located on Big Fill Run, a tributary of South Bald Eagle Creek near Tyrone, Pennsylvania. It would control 12 square miles. At maximum hydrologic development this site would store 9,400 acre feet. The site could be used for water supply at Altoona, but ground water development appears to be a better long range solution.

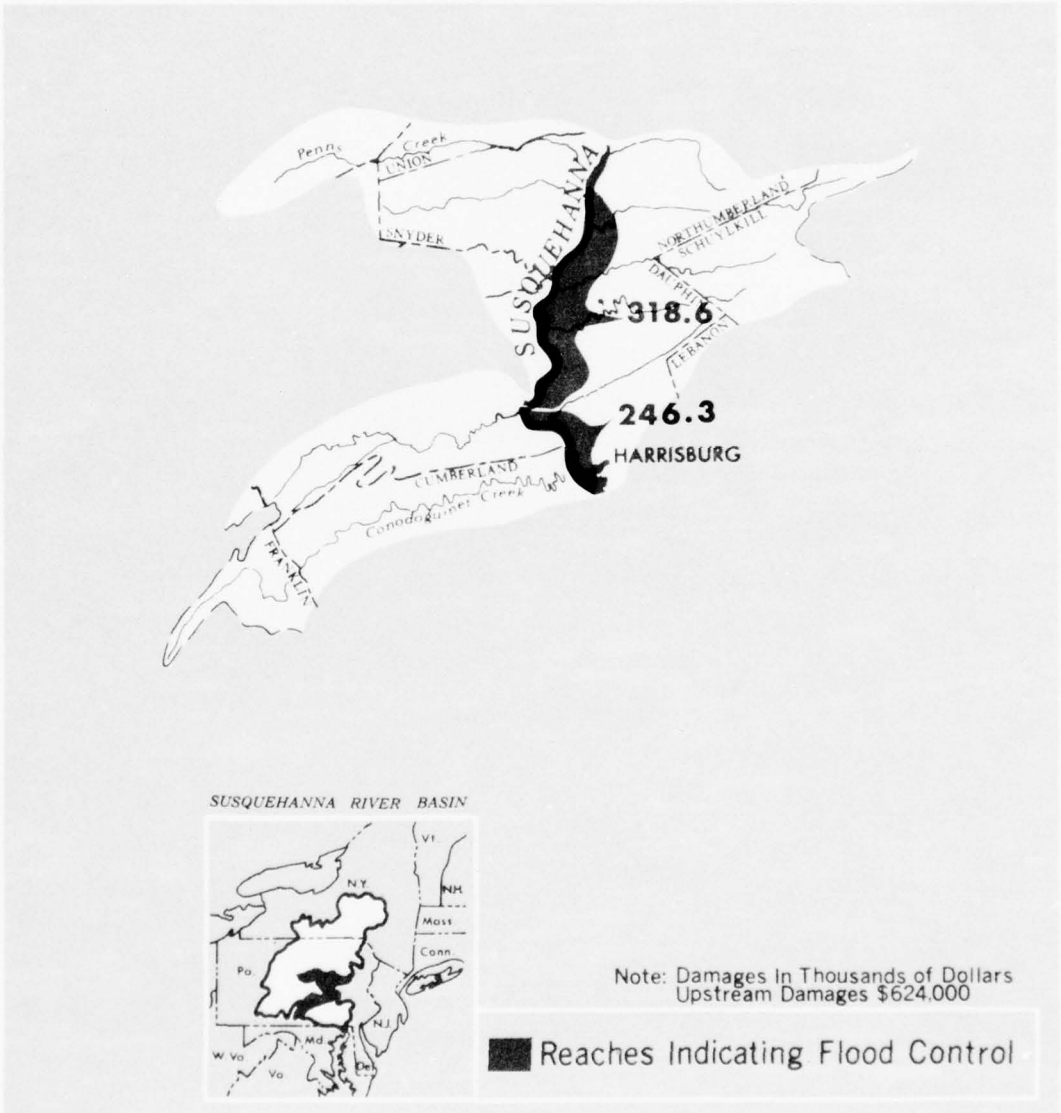
Bells Gap Run Alternative

This site is located on Bells Gap Run about 1 mile above the mouth near Bellwood, Pennsylvania. The drainage area is 18 square miles. The site could be useful for water supply for Altoona and Bellwood, but the alternative of ground water development is considered a better long range solution.

CHAPTER VII - THE PLAN AND ALTERNATIVES - SUB-BASIN VII (SUSQUEHANNA RIVER - SUNBURY TO HARRISBURG, PENNSYLVANIA)

A. EARLY ACTION WATER RESOURCES REQUIREMENTS

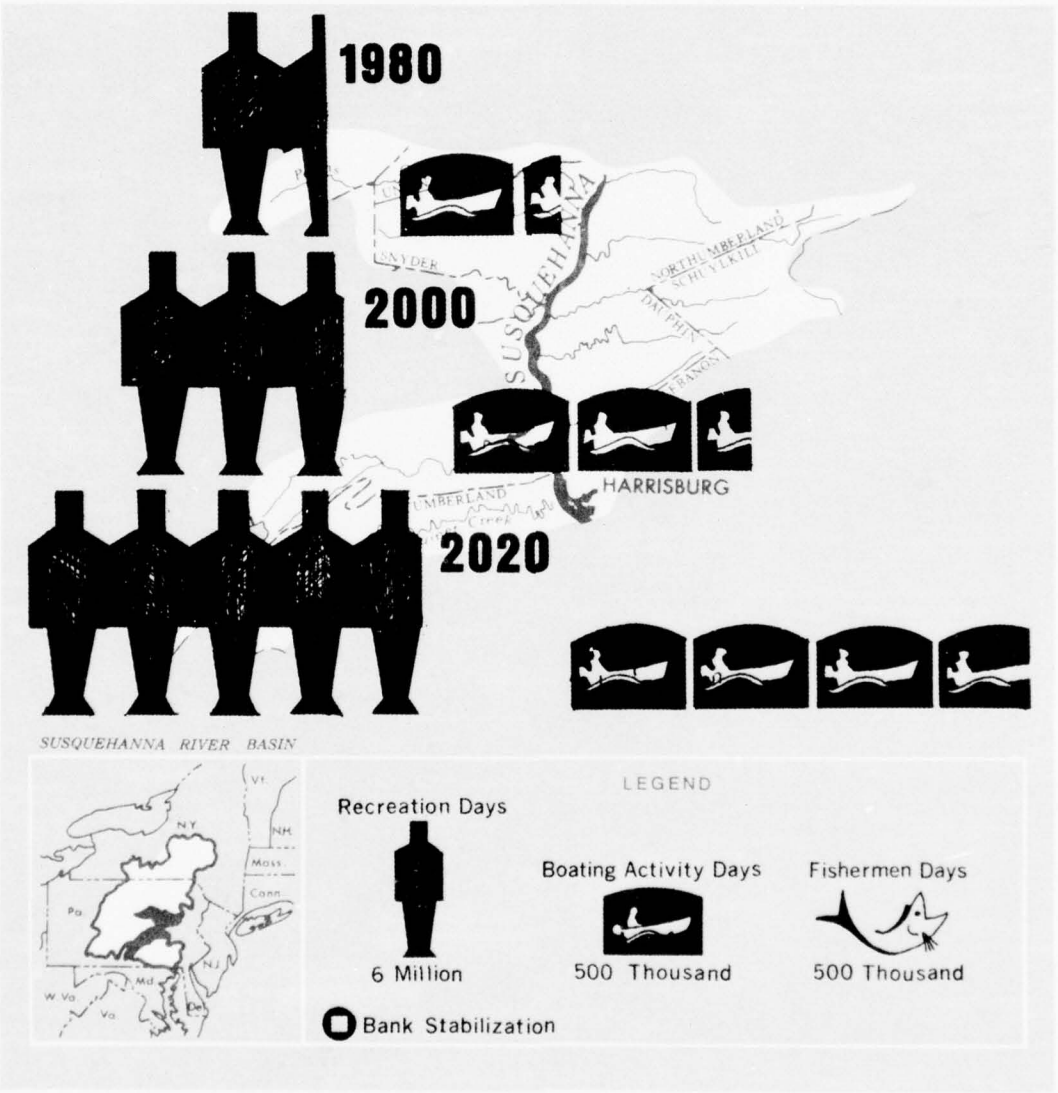
Sub-basin VII has an area of about 2,400 square miles and is located in the Commonwealth of Pennsylvania. This sub-basin includes the area drained by the Susquehanna River from Sunbury to Harrisburg, except for the Juniata River Basin (Sub-basin VI). The water and related land resources needs of Sub-basin VII in the early action period are shown in Figure 36. During the early action period to



SUB-BASIN VII: Needs 1980 Figure 36

1980, the demand for increased water-oriented recreational opportunity and water quality management will be the two problems most in need of additional investment.

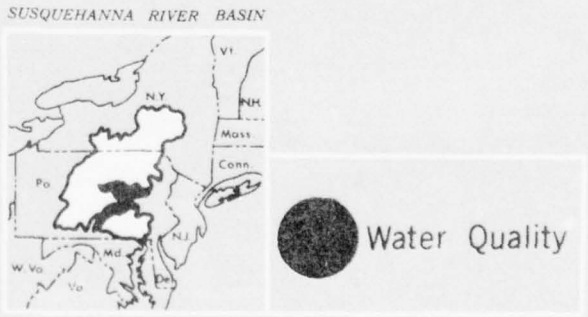
Figure 37 shows the recreational needs expected to occur in Sub-basin VII by 1980, 2000, and 2020 in three categories: 1) general recreation, 2) boating, and 3) fishing. There will be a demand for about 8.4 million seasonal water-oriented recreation days over and above the existing capacity by 1980. Boating needs in the early action period will require an additional 10,500 acres of water surface for unrestricted boating. In the early action period, it appears that



SUB-BASIN VII: Recreation Needs Figure 37

the resource capability for fishing will exceed the demand, creating a surplus of fishing opportunity. Some of the recreational needs in this sub-basin could be met by recreational development planned for Sub-basin VI, as discussed in Chapter VI of this supplement.

Assuming that adequate treatment of municipal and industrial wastes will have been provided during the early action period in accordance with the specific requirements of the Commonwealth of Pennsylvania, there will still be two locations in Sub-basin VII where water quality deficits will occur. These locations are Middle Spring Creek, below Shippensburg, and Conodoguinet Creek, below Carlisle. In addition, some of Sub-basin VII on the east side of the Susquehanna River is drained by streams which are polluted by coal mine drainage.

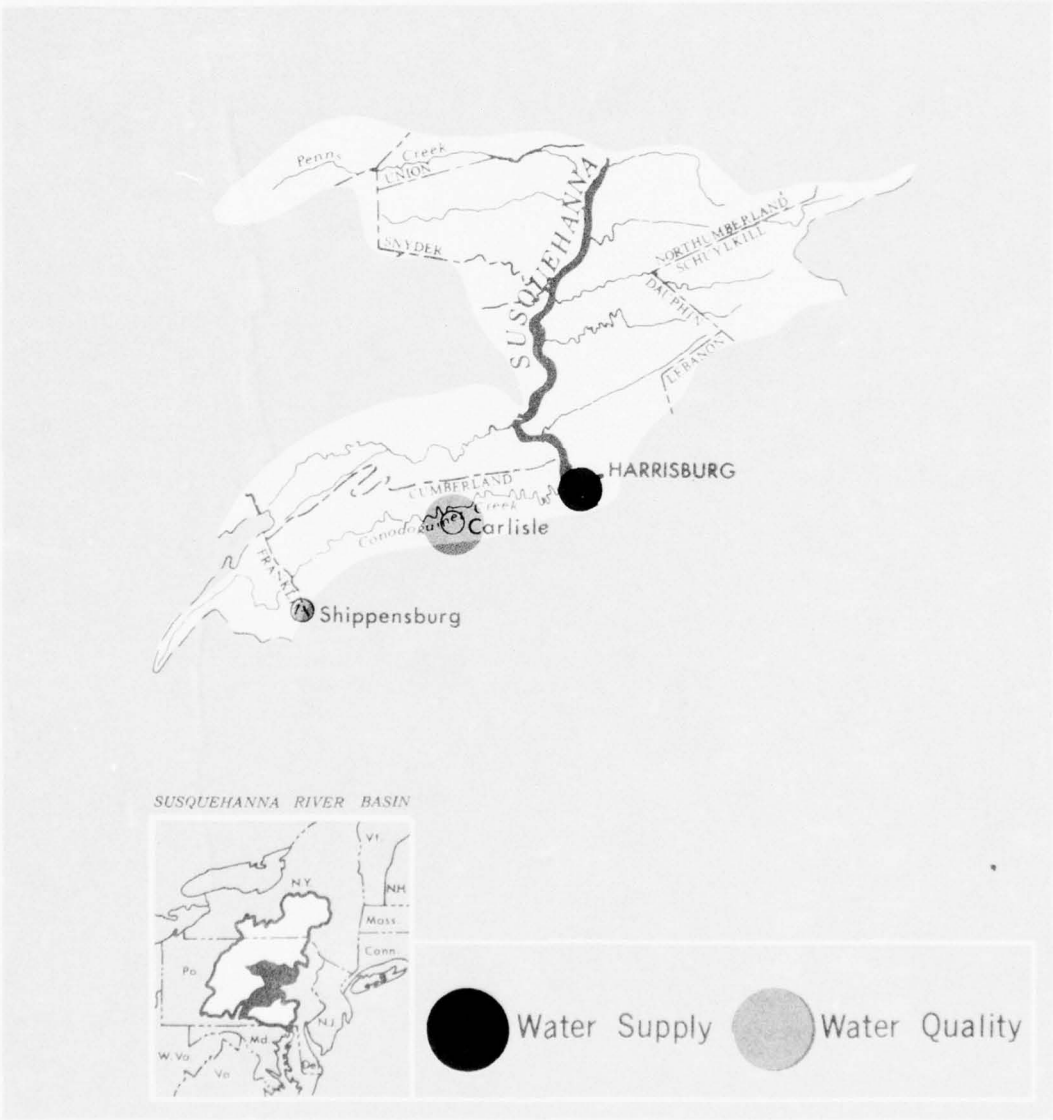


SUB-BASIN VII: Needs 2000

Figure 38

As shown in Figure 36, the Shippensburg* water service area will experience municipal and industrial water supply deficits during the early action period without further source development. There will also be a need for source development to meet the anticipated irrigation needs in the Penn Creek and Conodoguinet Creek watersheds.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and in addition would include critical areas needing treatment.



SUB-BASIN VII: Needs 2020 Figure 39

*Not shown in Figure 36, since deficit is less than 10 cfs.

Although the average annual flood damages along the Susquehanna River are considerable, there appears to be no non-disruptive structural solution to this problem. The average annual flood damages in upstream watersheds are fairly well spread throughout the sub-basin. One area of concentration of upstream flood damages is the lower end of Conodoguinet Creek just upstream from the confluence with the Susquehanna River.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 38 and 39.

B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin VII includes two advanced waste treatment plants; one multiple purpose reservoir; one coal mine drainage abatement project; one low channel dam; one small tributary reservoir for recreation, including fishing; one water supply pipeline; one upstream watershed project; an extensive program of land, stream, and flood plain management; a program of water quality surveillance; and a recommendation for additional studies. Figure 40 locates the specific features of the Early Action Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the construction of primary treatment facilities at eight service areas, the initiation of secondary treatment at three service areas, and the construction of new or expanded collection facilities at seven service areas.

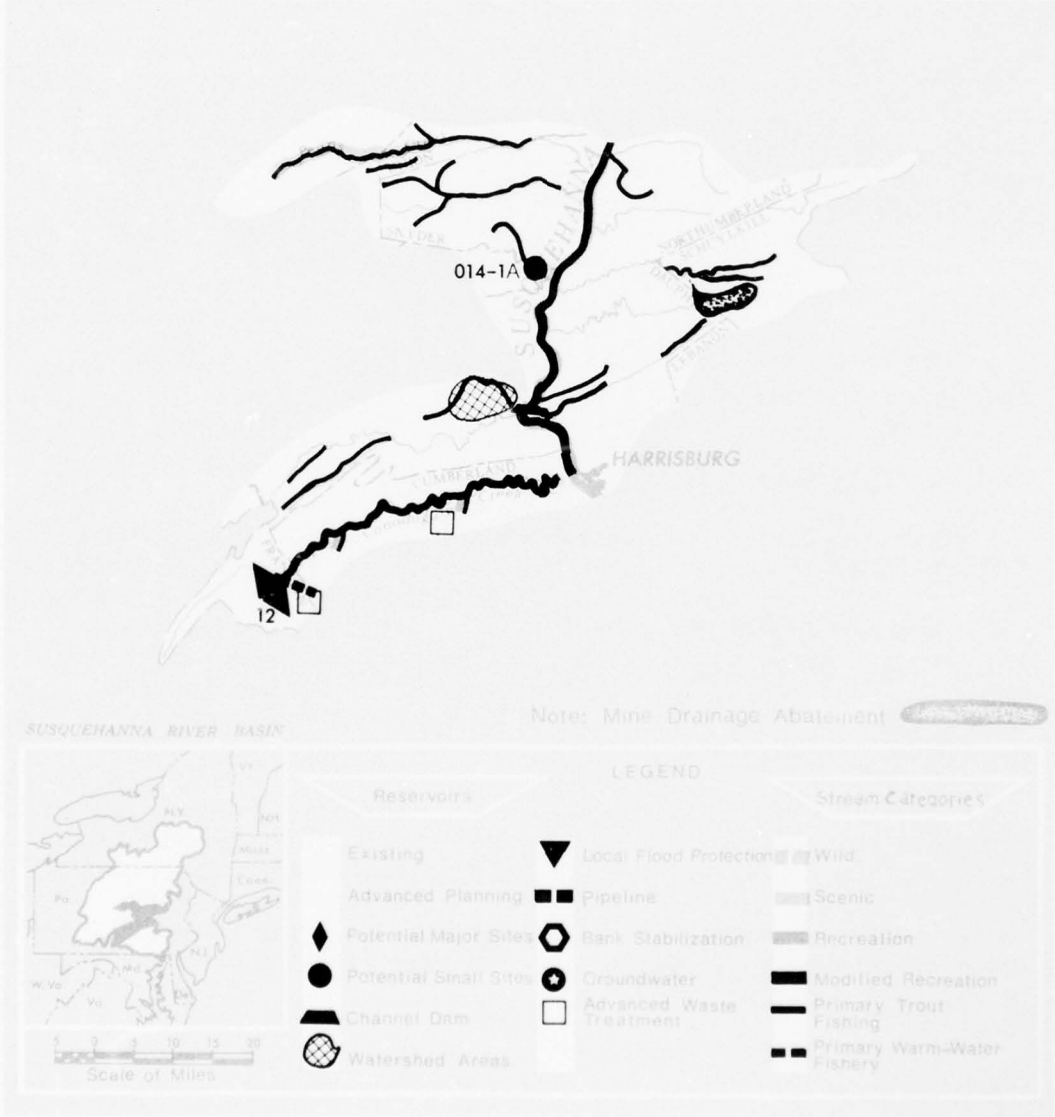
Assuming the implementation of the measures described in the preceding paragraph, water quality deficits will still occur in Middle Spring Creek, below Shippensburg; and Conodoguinet Creek, below Carlisle. In order to prevent these deficits, therefore, the Coordinating Committee is recommending that the sewage service areas of Shippensburg and Carlisle provide advanced waste treatment in the early action period.

The Coordinating Committee is also recommending coal mine drainage pollution abatement in the Mahantango Creek watershed.

The particular tributary on which the treatment is most needed is Pine Creek. This abatement project will be undertaken in portions of both Dauphin and Schuylkill Counties.

Major Multiple Purpose Reservoir

The Coordinating Committee is recommending the construction of the Shady Grove Reservoir as part of the Early Action Plan for Sub-basin VII. This project would be located on Conodoguinet Creek, 4 miles from Shippensburg, in Franklin County, Pennsylvania, and would include storage for recreation, fishing, and low flow augmentation.



SUB-BASIN VII: Early Action Recommended Plan Figure 40

The Shady Grove project would have a water surface area of 2,250 acres. Recreational facilities around the reservoir would accommodate picnicking, camping, swimming, and boating, and would provide the annual opportunity for 1,018,000 recreation days initially, and 2,047,000 recreation days ultimately. The project would also provide the annual fishing opportunity for 98,500 warm water fisherman-days at the reservoir and 72,700 warm water fisherman-days downstream.

Low flow releases from the Shady Grove project would increase the supplies of water available to the Carlisle and Harrisburg West Shore water service areas. (The Harrisburg West Shore water service area is located in Sub-basin VIII and will need the additional water during the framework period.) These releases would also compensate for the increasing irrigation withdrawals which are expected through the year 2020.

The Shady Grove Reservoir would contribute significantly to the economy of the Shippensburg area by (1) creating a more reliable source of water supply, (2) inducing recreational expenditures, and (3) rendering the area a more desirable place in which to live.

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. A low channel dam across the Susquehanna River at Duncannon in Dauphin and Perry Counties is recommended by the Coordinating Committee for recreation. This site would impound an area of about 2,200 acres and create a pool approximately 5 miles long. The recreational facilities at this project would ultimately include picnic areas, boat access areas, fishing areas, a beach, an athletic field and play area, a camping area, and a restored canal with a mule-drawn barge. About 10 percent of the ultimate recreational facilities are recommended to be installed in the early action period.

Small Tributary Reservoir. A 930-acre single purpose reservoir (014-1A) is recommended on West Mahantango Creek about 2 miles upstream from its mouth. This reservoir would provide the annual opportunity for 471,000 recreation days initially and 533,000 recreation days ultimately, and the annual fishing opportunity for 44,500 trout fisherman-days at the reservoir. The project would be located in portions of Juniata and Snyder Counties. It would satisfy a large portion of the demand for recreation originating in Sub-basin VII in the early action period from both sides of the Susquehanna River.

Pipeline for Municipal and Industrial Water Supply

The Coordinating Committee recommends that a pipeline be constructed between the proposed Shady Grove Reservoir and Shippensburg to transport Conodoguinet Creek water to meet the municipal and industrial water supply needs of the Shippensburg water service area. Initially, the pipeline would only need to

carry an average of 1 mgd to meet projected demand in the early action period, and eventually it would need to carry an average of 5 mgd to meet the projected 2020 demand.

Upstream Watershed Project

The Little Juniata Creek Watershed Project is recommended by the Coordinating Committee for implementation in the early action period. The project would consist of one multiple purpose flood control and recreation structure (013-5) with a permanent pool of 114 acres. It would be constructed on Trout Run just south of New Bloomfield in Perry County. It would provide flood control for rural areas along Trout Run and partial flood protection at Duncannon along Little Juniata Creek, and provide recreation and fishing opportunities. The estimated annual recreation opportunity is 38,000 recreation days initially and 88,000 recreation days ultimately, and the annual fishing opportunity is estimated as 10,500 trout fisherman-days at the reservoir.

Management Measures

Management measures being recommended by the Coordinating Committee include land treatment, stream management to enhance recreation and fishing potential, flood plain management, water quality surveillance, and additional studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 15,000 acres of land. This program would add to the existing land treatment and management practices on 233,000 acres of forest, crop, pasture, urban, and other land which the Coordinating Committee assumes will be continued. An accelerated critical area treatment program on 7,000 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for management so that their recreational potential can be realized in the future are listed below. The Coordinating Committee recommends that no impoundments be built on wild, scenic, and recreational rivers, and on primary trout streams and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Scenic	County
1. Penns Creek from Spring Mills to Glen Iron	Center, Union, Mifflin

B. Recreational	County
1. Letort Springs Run, entire length	Cumberland
2. Big Spring Creek, entire length	Cumberland

C. Modified Recreational	County
1. Conodoguinet Creek, Shady Grove damsite to mouth	Franklin Cumberland
2. Susquehanna River, Sunbury to Harrisburg	Dauphin, Perry, Cumberland, Northumberland, Juniata, Snyder

D. Primary Trout Fishing

1. Centre County
   a. Penns Creek, b. Elk Creek
2. Cumberland County
   a. Big Spring Creek, b. Letort Springs Run
3. Dauphin County
   a. Clark Creek, b. Powell Creek
4. Northumberland County
   a. Little Shamokin Creek
5. Perry County
   a. Travel Run, b. Little Juniata Creek, c. Shaeffer Run (Bull Run)
6. Schuylkill County
   a. Deep Creek, b. Pine Creek
7. Snyder County
   a. North Branch Mahantango Creek, b. Middle Creek, c. North Branch Middle Creek, d. West Branch Middle Creek, e. Swift Run
8. Union County
   a. Rapid Run

The Coordinating Committee is recommending that recreational facilities be placed on suitable land adjacent to these streams to ultiize their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a

determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood-proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The following lists summarize this determination for the full 50-year period.

1. Intensive flood plain management program

   a.) Selinsgrove, b.) Duncannon, c.) Conodoguinet Creek, d.) Sherman Creek from Shermandale to mouth, e.) Penns Creek, f.) Mahantango Creek in Klingerstown area, g.) Shamokin Creek, h.) Susquehanna River from Juniata River to Harrisburg

2. Warning and evacuation program

   a.) Susquehanna River, West Branch to Juniata River, b.) Mahanoy Creek, c.) Dalmatia Creek, d.) Hollowing Run, e.) North Branch Mahantango Creek, f.) West Branch Mahantango Creek

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources. However, from the "Intensive Management" list above, and using criteria outlined in Appendix K(3), one area having a priority need for flood plain management was identified. The Duncannon area requires an early detailed flood plain management study to develop a fully integrated management program for use of flood-prone lands, taking into consideration the proposed low channel dam.

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) Shamokin Creek below Shamokin*

(2) Conodoguinet Creek below Carlisle, Shippensburg, and Mechanicsburg

Details are given in Appendix K(3)

*In conjunction with an overall stream quality improvement program including secondary level waste treatment and mine drainage pollution abatement.

Additional Studies

The Coordinating Committee recommends that survey scope studies be made of the potential for regional sewerage systems in the following three regions: (1) Shamokin Creek, which includes the sewage service areas of Shamokin, Kulpmont, and Mt. Carmel, and several coal mine drainage problem areas; (2) Conodoguinet Creek, which includes Carlisle, Mechanicsburg, and Hamden Township; and (3) Harrisburg West Shore, which includes Fairview Township, Lower Allen Township, Upper Allen Township, Camp Hill, New Cumberland, Lemoyne, and Wormleysburg (the last region includes some areas which are in Sub-basin VIII). These

SUB-BASIN VII: Framework Plan Figure 41

studies should recommend the optimum combination of sewerage system elements for each region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the appropriate authority to operate and maintain each system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs occurring after 1980 includes some continuation of programs recommended for the early action period, as well as additional measures to meet the needs as they become evident. Figure 41 locates the specific features of the Framework Plan.

Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at seven service areas, the expansion of secondary waste treatment at three service areas, and the construction of new or expanded collection facilities at eight service areas. These projects are listed in Appendix K(2).

By the year 2000, advanced waste treatment will be required at the Mechanicsburg, Shamokin, and Shenandoah sewage service areas. In addition to these measures, existing advanced waste treatment plants, recommended in the early action period, will have to be expanded during the framework period as the needs become evident.

In this sub-basin three watersheds are scheduled to receive coal mine drainage pollution abatement measures in the framework period. These streams are Shamokin Creek (2000), Mahanoy Creek (2000), and Wiconisco Creek (2000).

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. A low dam on the Susquehanna River at Harrisburg (2020) would provide a surface area of 3,100 acres and provide annually 1,260,000 recreation days.

Small Tributary Reservoirs. Eight small tributary reservoirs are included in the Framework Plan and listed in Table 23.

TABLE 23
SMALL TRIBURARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN VII

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation (1,000 Recreation Days)
5-18 (2000)	Doubling Gap Cr.	2.5 mi. NW of Newville 3.8 mi. SW of Bloserville	480	318
32-5 (2000)	Deep Creek	3.5 mi. S of Mowry 4.4 mi. NE of Fountain	101	138
33-3 (2000)	Trib. Shamokin Creek	1.5 mi. W of Elysburg 1.7 mi. NE of Paxinos	80	117
04-2 (2000)	Trib. Little Wiconisco Creek	1.0 mi. S of Gratz 2.5 mi. NW of Wiconisco	58	62
13-5 (2020)	Pine Creek	1.0 mi. N of Woodward 7.0 mi. W of Laurelton State Village	202	78
32-9 (2020)	Mahantango Cr.	.5 mi. E of Klingerstown 1.0 mi. N of Erdman	510	246
04-3 (2020)	E. Branch Rattling Creek	1 mi. SE of Lykens	50	15
04-8 (2020)	Armstrong Cr.	1.5 mi. E of Halifax 3.1 mi. NE of Matamoros	605	520

Other Structural Measures

A small reservoir (13-2) east of Potters Mill on Laurel Run, a tributary to Penns Creek, is included in the Framework Plan to provide 1,300 acre feet of storage for irrigation by the year 2020.

Management Measures

Land Management

The proposed land management program in Sub-basin VII between 1980 and 2020 is shown in Table 24.

TABLE 24
LAND MANAGEMENT PROGRAM

Time	Critical Acres to be Treated	Total Acres to be Treated
1980-2000	7,000	176,000
2000-2020	6,000	97,000

Stream Management

The Framework Plan calls for the continued use of the recommended early action stream management areas for recreation and for increasing that use by adding the remaining 50 percent of the recreational facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program, and warning and evacuation program should be continued and flood plain management studies should be made at the following locations as soon as practicable after 1980: North Harrisburg (for low dam).

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

Structural measures have been selected for water quality management, water based recreation, and water supply. Primary alternatives to the selected measures are discussed below. Additional data on these alternatives are included in Appendix K(1).

Water Quality Management

Advanced waste treatment is recommended for Shippensburg, Carlisle, and, in the framework period, for Mechanicsburg. An alternative, for Carlisle and Mechanicsburg, would be the release of flow augmentation water from the Shady Grove project, which is being planned for water supply, irrigation, and recreation. While this is still a viable alternative, the Coordinating Committee concluded that the Shady Grove Reservoir could be operated to better effect with only three purposes to satisfy.

Interceptor sewer pipelines from Mechanicsburg and Shippensburg were considered as alternatives to advanced waste treatment, but were found to be less satisfactory, based on environmental quality as well as economic efficiency.

Recreation and Fishing

Some 184 miles of streamside development, two low channel dams, and nine reservoirs are included in the Early Action and Framework Plans for recreation and fishing. Prime alternatives to the recommended reservoirs are listed in Table 25.

TABLE 25
ALTERNATIVES TO RECOMMENDED
RECREATION AND FISHING RESERVOIRS

Site	Stream	Surf. Area. (Acres)	Storage Vol. (1000 Ac-ft)	Est. Cost ($Thousand)
5-21	Peebler Run	230	4.9	800
5-23	Clippingers Run	190	3.3	560
6-13	Shaeffer Run	120	4.0	780
32-1	Deep Creek	175	4.9	320
04-7	Powell Creek	615	22.0	4,600
04-9	Stony Creek	210	6.8	350

Conservation Storage

In the early action period the Shady Grove site is recommended for recreation and low flow augmentation in the Conogoduinet Valley. One other significant site, Mongul, is located in this valley, and two other sites, on Sherman Creek and Penn Creek, are located within Sub-basin VII. All of these potential projects could provide a recreational opportunity similar to that at the Shady Grove project. Details on these sites are given in the following paragraphs.

Mongul Alternative

The potential Mongul project would be located on Conodoguinet Creek, approximately 72 miles above the mouth and 2.5 miles above the Shady Grove site, in Franklin County, Pennsylvania. The project would control 81 square miles of drainage and would provide recreational opportunity in the same area as the Shady Grove project.

The Mongul project was not included in the Coordinating Committee Plan because it would not be as efficient as the Shady Grove project and it would be more detrimental to the existing agricultural land use.

Sherman Creek Alternative

The potential Sherman project would be located on Sherman Creek, approximately 1.2 miles above the mouth and 1 mile southwest of the town of Duncannon in Perry County, Pennsylvania. The project would control 220 square miles of drainage and would contribute toward meeting the water-related recreational needs of the communities along the Susquehanna River.

This project could provide recreational facilities for up to 4,452,000 visitors annually in the Harrisburg area. It would provide areas for swimming, fishing, and boating. By providing dependable flows, the project would also enhance the recreational use and sport fishery potential of the Susquehanna River.

The project at maximum permissible hydrologic development would have a top of dam elevation of 493 feet and maximum usable storage at elevation 477 feet. The usable storage would be 150,000 acre feet and the water surface area would be 4,050 acres.

The Sherman project was not selected for inclusion in the Coordinating Committee Plan because of its incompatibility with the regional development and environmental quality objectives. Even though the project would be easily justifiable, based on national economic efficiency, it would conflict with the economic well-being of the region. By preventing the agricultural use of the land the project would detrimentally affect the regional economy. This project would also be contrary to the environmental quality objective because it would conflict with the existing pastoral setting.

Penn Creek Alternative

The potential Kratzerville project would be located on Penn Creek, about 7.5 miles above the mouth and 3.5 miles northwest of Selinsgrove, Pennsylvania. It would control 368 square miles of drainage area. With a water surface elevation of 578 feet, this reservoir could store 290,000 acre feet with a pool of 6,900 acres. The project could be useful for flow augmentation and recreational development.

The Kratzerville project could be justified based on national or regional economic efficiency. It was not included in the Coordinating Committee Plan, however, because of its conflict with the objective of environmental quality. The project would be quite disruptive and does not have the support of the Commonwealth of Pennsylvania.

Water Supply

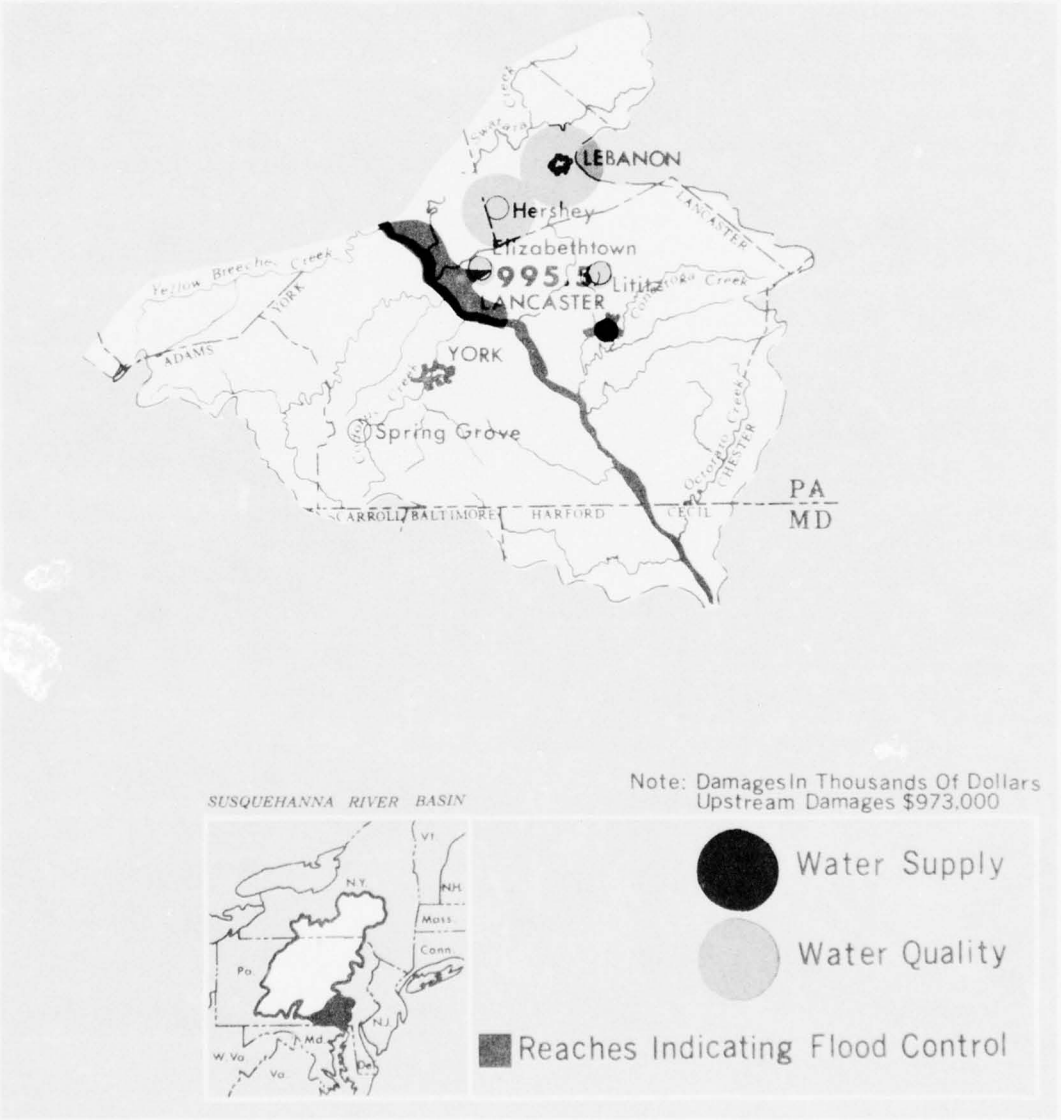
The Coordinating Committee Plan includes measures which would meet the water supply needs of the Shippensburg, Carlisle, and Harrisburg West Shore water service areas. Low flow augmentation from the recommended Shady Grove project would increase the surface water supply available to Carlisle and Harrisburg West Shore. A pipeline from the Shady Grove Reservoir would carry water to Shippensburg.

Prime alternatives to these recommended projects would be ground water development for Shippensburg and Carlisle, and reservoir storage in the Yellow Breeches Creek watershed for Harrisburg West Shore. The costs of these single purpose alternatives, however, would be more than the Shippensburg pipeline and the allocated water supply cost in the multiple purpose Shady Grove project.

CHAPTER VIII - THE PLAN AND ALTERNATIVES - SUB-BASIN VIII (SUSQUEHANNA RIVER - HARRISBURG TO CHESAPEAKE BAY)

A. WATER RESOURCES REQUIREMENTS

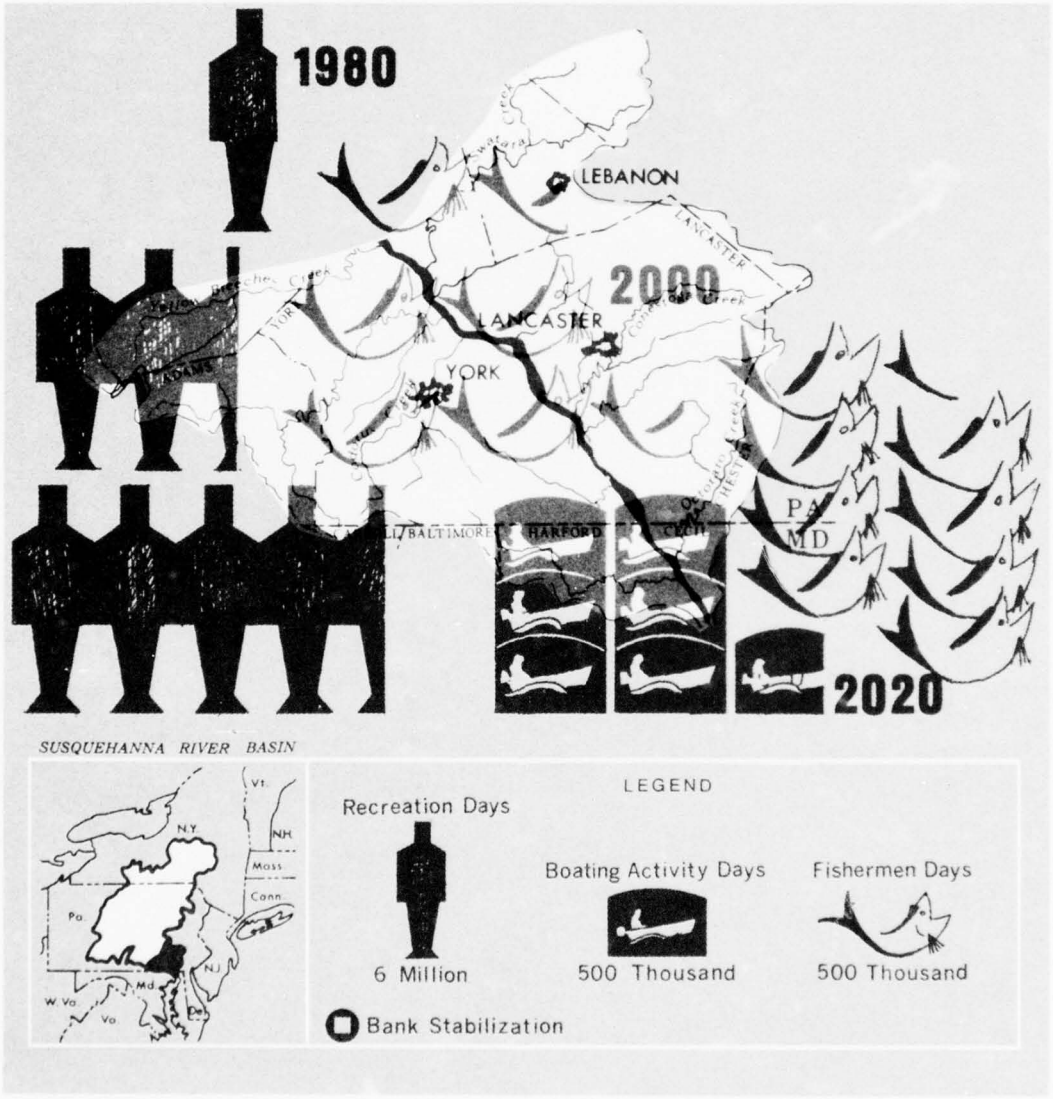
Sub-basin VII has an area of about 3,410 square miles and includes portions of the Commonwealth of Pennsylvania and the State of Maryland. This sub-basin includes the area drained by the Susquehanna River from Harrisburg to Chesapeake Bay. The water and related land resources needs for Sub-basin VIII in the early action period are shown in Figure 42. During the early action period to 1980, the demand for water-oriented



SUB BASIN VIII: Needs 1980 Figure 42

recreational opportunity and water quality management will be the two problems most in need of additional investment.

Figure 43 shows the recreational needs expected to occur in Sub-basin VIII by 1980, 2000, and 2020 in three categories: 1) general recreation, 2) boating, and 3) fishing. There will be a demand for about 5.8 million seasonal water-oriented recreation days over and above the existing capacity by 1980. Existing slack-water areas, including the private hydroelectric power developments along the lower Susquehanna River, appear adequate to provide enough boating opportunity to satisfy demands for both restricted and un-



SUB-BASIN VIII: Recreation Needs Figure 43

restricted boating throughout the early action period. The unsatisfied demand for fishing during the early action period is 724,000 fisherman-days. Some of the recreational needs in this sub-basin could be met by recreational development planned for Sub-basin VI, as discussed in Chapter VI of this supplement.

Assuming that adequate treatment of municipal and industrial waste water will have been provided during the early action period in accordance with the specific requirements of the Commonwealth of Pennsylvania and the State of Maryland, there will still be eight locations in Sub-basin VIII where water quality deficits will occur. These deficits will be in Mill Creek, below Dallastown; Conoy Creek, below Elizabethtown; Conewago Creek, below Hanover; Conestoga Creek, below Lancaster; Quittapahilla Creek, below Lebanon; Mill Creek, below New Holland; West Branch Codorus Creek, below Spring Grove, and Codorus Creek, below York. Swatara Creek, especially in its headwaters, is polluted by coal mine drainage.

As shown in Figure 42, the Elizabethtown,* Ephrata,* Lancaster,* Lititz,* Manheim,* Morgantown,* New Holland,* and York* water service areas will experience municipal and industrial water supply deficits during the early action period without further source development. There will also be a need for source development to meet the anticipated irrigation needs in the Octoraro Creek and Conewago Creek watershed.

The need for flood damage reduction is rather urgent in parts of Sub-basin VIII. On the Susquehanna River at Harrisburg, a repeat of the March 1936 flood would cause an estimated $12.5 million in damages. Average annual damages are estimated at $438,000. On Chickies Creek at Manheim a major flood occurred in 1925, a repeat of which would cause $1.3 million in damages. Average annual damages at Manheim are estimated at $157,000.

An accelerated land treatment and management program is needed to reduce erosion, sedimentation in the streams, and surface runoff during intense summer storms. The accelerated treatment would be upstream from the recommended reservoirs and watershed projects, and in addition would include critical areas needing treatment.

The additional water and related land resources needs between 1980 and 2020 are indicated in Figures 44 and 45.

B. RECOMMENDED EARLY ACTION PLAN

In response to all of the needs, the recommended Early Action Plan for Sub-basin VIII includes twelve new and four expanded advanced waste treatment plants; one coal mine drainage abatement project; eight small tributary reservoirs for recreation, including fishing; six ground water development projects for water supply; two pipelines for water supply; one local flood protection project; one upstream watershed project; ground water development for irrigation

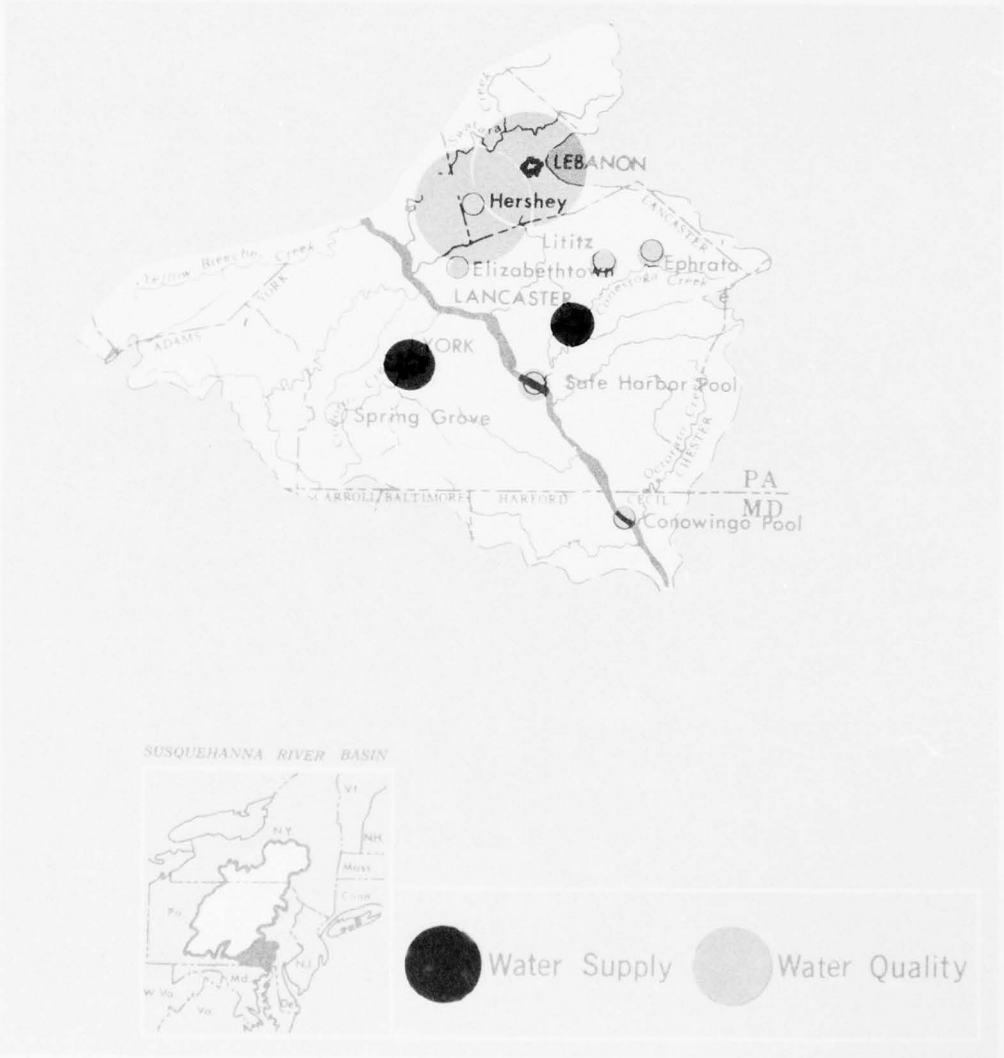
*Not shown in Figure 42, since the deficits are less than 10 cfs.

in two watersheds; an extensive program of land, stream, and flood plain management; a water quality surveillance program; and a recommendation for additional studies. Figure 46 locates specific features of the Early Action Plan.

Structural Measures

Water Quality Measures

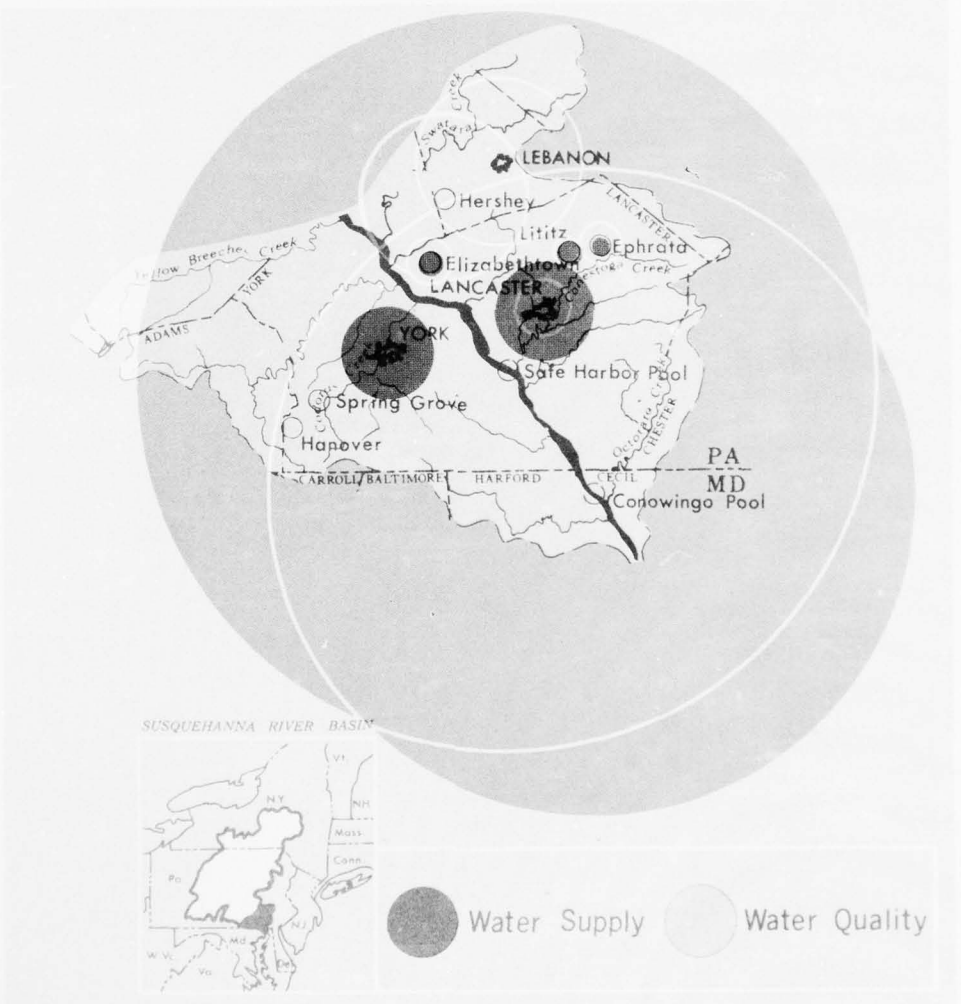
The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities



SUB-BASIN VIII: Needs 2000 Figure 44

to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treatment at six service areas, and the construction of new or expanded collection facilities at 30 service areas.

The Coordinating Committee recommends, as part of the Early Action Plan, that advanced waste treatment be provided at the Dallastown-Yoe, Red Lion, Elizabethtown, Hanover, Lancaster (South and River), Lebanon, New Holland, Fredericksburg, New Freedom-Shrewsbury, Spring Grove, and York sewage service areas, with expansion facilities provided at Annville, Lititz, Mount Holly Springs, and Penn Township.



SUB-BASIN VIII: Needs 2020 Figure 45

The Coordinating Committee is also recommending that the coal mine drainage pollution be abated in the upper reaches of Swatara Creek. This abatement project would include portions of Dauphin and Lebanon Counties.

Reservoirs for Recreation and Fish Habitat

The Coordinating Committee is recommending the construction of eight small tributary reservoirs for recreation and fish habitat during the early action period. These projects are described below.

SUB-BASIN VIII: Early Action Recommended Plan Figure 46

A 65-acre reservoir (1-1) is recommended on Island Branch Deer Creek at Route 136 in Harford County, Maryland, for recreation. The project would provide the annual opportunity for an estimated 75,000 recreation days initially and 113,000 recreation days ultimately.

A 188-acre reservoir (1-5A) is recommended on Deer Creek about one-third of a mile downstream from the Baltimore-Harford County line in Harford County, Maryland. The project would provide the annual opportunity for 336,000 recreation days initially, 374,000 recreation days ultimately, and the annual fishing opportunity for 7,500 warm water fisherman-days at the reservoir.

A 165-acre reservoir (1-6) is recommended on Stout Bottle Branch near Deer Creek Church for recreation in Harford County, Maryland. The project would provide the annual opportunity for an estimated 28,000 recreation days initially and 59,000 recreation days ultimately.

A 133-acre reservoir (4-2) is recommended on Stoney Run near Granthom for recreation and fishing in York County, Pennsylvania. This project would provide the annual opportunity for 50,000 recreation days initially, 88,000 recreation days ultimately, and the annual fishing opportunity for 4,500 warm water fisherman-days at the reservoir.

A 430-acre reservoir (4-11) is recommended on Mountain Creek upstream from Mount Holly Springs for recreation and fishing. It would be located in Cumberland County, Pennsylvania. This project would provide the annual opportunity for 739,000 recreation days and 38,700 warm water fisherman-days at the reservoir.

A 720-acre reservoir (30-2) is recommended on Cocalico Creek west of Adamstown in Lancaster County, Pennsylvania. The project would provide the annual opportunity for 150,000 recreation days initially, 337,000 recreation days ultimately, and 28,800 warm water fisherman-days. The area will require early shore-line revegetation to improve the quality of the recreational attraction.

A 415-acre reservoir (01-4) is recommended on Conowingo Creek at the State line for recreation and fishing in Cecil and Lancaster Counties. The project would provide the annual opportunity for an estimated 621,000 recreation days initially, 696,000 recreation days ultimately, and 16,200 warm water fisherman-days at the reservoir.

A 170-acre reservoir (02-7) is recommended on Cabin Creek near Martinsville for recreation and fishing in York County, Pennsylvania. The project would provide the annual opportunity for 53,000 recreation days initially, 78,000 recreation days ultimately, and the annual fishing opportunity for 6,100 warm water fisherman-days at the reservoir.

Ground Water and Pipelines for Municipal and Industrial Water Supply

Ground Water. The Coordinating Committee recommends that ground water be developed to meet the projected water supply needs of the Elizabethtown, Ephrata, Lititz, Manheim, Morgantown, and New Holland water service areas.

Pipelines. The Coordinating Committee is also recommending that two pipeline projects be constructed during the early action period. Both projects would take water from the Susquehanna River. One of the projects would satisfy the future municipal and industrial needs of the York and Hanover water service areas. The other project would transport water to the Lancaster water service area and could be constructed parallel to the existing water supply pipeline.

Local Flood Protection Projects

The Coordinating Committee recommends that a levee and flood wall be constructed to protect the Paxton Creek area of Harrisburg from flood damages caused by the Susquehanna River. This project would be in Dauphin County. The average annual flood damages of $377,900 in the Paxton Creek area would be reduced to $307,600 as a result of the construction of the project.

Upstream Watershed Projects

The Coordinating Committee is recommending an upstream watershed project for Chickies Creek. The project would consist of four single purpose flood prevention structures all located in Lancaster County, Pennsylvania. These structures would be located on Rife Run about 3 miles northwest of Manheim (03-3), on a tributary of Rife Run (03-9), on a tributary of Chickies Creek near Halfville (03-8), and on Chickies Creek (03-1) approximately 3-1/2 miles north of Manheim. The four structures could essentially eliminate flooding on Rife Run and Chickies Creek at Manheim, Pennsylvania.

Other Structural Measures

Irrigation. The Coordinating Committee is recommending that ground water be developed to meet irrigation needs on Octoraro Creek and West Conewago Creek. In these locations, the development of wells appears to be less costly than surface storage or pipelines.

Management Measures

Management measures being recommended by the Coordinating Committee include land treatment, stream management to enhance recreation and fishing potential, flood plain management, water quality surveillance, and additional studies.

Land Management

The Coordinating Committee is recommending the implementation of an accelerated land treatment and management program on 11,000 acres of land. This program would add to the existing land treatment and management practices on 586,000 acres of forest, crop, pasture, urban and other land which the Coordinting Committee assumes will be continued. An accelerated critical area treatment program on 4,000 acres of strip mined land is also recommended to reduce sedimentation and to improve the land aesthetically.

Stream Management

The streams recommended by the Coordinating Committee for streamside recreational management in the early action period are given below. The Coordinating Committee recommends that no impoundments be built on scenic and recreational rivers and on primary trout streams, and that only low channel dams be permitted on modified recreational rivers and primary warm water streams.

A. Scenic	County
1. Octoraro Creek from RT 272 to its mouth	Cecil, Chester Lancaster

B. Recreational	County
1. Chickies Creek from Manheim to its mouth	Lancaster
2. Swatara Creek from the Swatara Gap Dam to its mouth	Lebanon, Dauphin
3. Yellow Breeches Creek for its entire length	Cumberland, York
4. Deer Creek from the proposed site near the Baltimore-Harford County line to its mouth	Harford

C. Modified Recreational	County
1. Muddy Creek for its entire length	York
2. Conestoga Creek for its entire length	Lancaster, Berks
3. Pequea Creek for its entire length	Lancaster

D. Primary Trout Fishing

1. Lebanon County

   a. Snitz Creek

2. Lancaster County

a. Conowingo Creek, b. Donegal Creek, c. Fishing Creek, d. Middle Creek, e. Little Conestoga Creek, f. West Branch Octoraro Creek

3. Cumberland County

a. Old Town Run, b. Yellow Breeches Creek

4. York County

a. Beaver Run, b. East Branch Codorus Creek, c. Fishing Creek, d. North Branch Muddy Run, e. South Branch Muddy Run, f. Otter Creek

5. Cecil County

a. Basin Run

E. Primary Warm Water Fishing

1. Cecil County

a. Conowingo Creek, b. Octoraro Creek

2. Harford County

a. Broad Creek, b. Rock Run

The Coordinating Committee is recommending that recreation facilities be placed on suitable land adjacent to these streams to develop their recreational potential and to preserve their scenic values. The amount of recreational land and facilities proposed to be developed for each category is discussed in Appendix K(3).

Flood Plain Management

All flood plain areas in this sub-basin were reviewed to determine the relative intensity of flood plain management required. First, a determination was made that either: 1) an intensive flood plain management program was warranted, requiring zoning and building codes, and including flood proofing, ample warning, and temporary or permanent evacuation; or 2) a more limited program of warning and evacuation, with only occasional use of further management measures, would be adequate. The Coordinating Committee recommends the implementation of intensive flood plain management in the following areas:

(1) North Harrisburg, (2) New Cumberland, (3) Steelton, (4) Middletown, (5) Susquehanna River Harrisburg to Conewago Creek, (6) Marietta, (7) Susquehanna River, Conewago Creek to

Mouth, (8) Codorus Creek, (9) Conewago Creek, (10) Yellow Breeches Creek, (11) Conestoga Creek, (12) Swatara Creek, (13) Pequea, (14) Krautz Creek, (15) Muddy Creek, (16) Conoy Creek.

The Coordinating Committee does not intend to detail the specific kinds of management programs to be applied at a particular location. This will remain the responsibility of local governments using the technical assistance available from Federal, State, and private consulting sources.

Water Quality Surveillance

As a part of an overall water quality surveillance program, and to develop the capability to alert public officials of streams likely to be degraded under extreme low flow conditions, it is recommended that, as a minimum, the following locations be monitored:

(1) **Codorus Creek below Spring Grove, York, and Codorus Furnace**
(2) Quittapahilla Creek below Annville
(3) Swatara Creek below Hummelstown
(4) Conoy Creek below Elizabethtown
(5) Chickies Creek below Manheim
(6) Cocalico Creek below Ephrata
(7) Lititz Creek below Lititz
(8) Conestoga Creek below Lancaster
(9) South Branch Conewago below McSherrystown
(10) Susquehanna River at Safe Harbor and Conowingo

Details are given in Appendix K(3).

Additional Studies Needed for Proper Management

Chesapeake Bay Study. The Chesapeake Bay ecosystem and its maintenance as a productive and pleasing body of water, as well as a major recreation and navigation resource, are essential to the environmental well-being of the Middle Atlantic region. The Susquehanna flow is about half of the total fresh water flow into the entire Bay and nearly all of the inflow for the upper Bay (north of Baltimore). Significant changes in seasonal low and high flows may seriously endanger this sensitive dynamic system. The natural Susquehanna River flows should be sufficient to meet the consumptive demands projected through 1980 if the programmed and recommended reservoir storage is provided. Reasonable consumptive uses of the Susquehanna River could continue indefinitely, without serious detrimental effect on the Chesapeake Bay ecosystem, only if such withdrawals are made during the higher flow periods. However, net instream flow requirements and consumptive losses are expected to increase steadily into the late action period. These water losses, specifically thermal power consumption for cooling, out-of-basin diversions, and municipal and industrial water supply consumption taken together, could eventually consume all natural stream flow during the low flow months (August - October) during severe droughts. This could occur even though

diversions out of the basin do not presently exceed authorized levels. In any event, it appears likely that the Susquehanna River will become an increasingly important source of fresh water in Pennsylvania and Maryland.

An additional problem is the impact which will result when the Chesapeake and Delaware Canal is enlarged in 1972. Increased net outflow of primarily fresh water from the upper Bay through the Canal may require an increase in minimum dependable flows from the Susquehanna River into the upper Chesapeake Bay or other alternatives to safeguard the dynamics of the natural system.

The Coordinating Committee clearly recognizes that sophisticated water management and development geared to flow regulation requires sound management tools. These include numerical simulation of the Susquehanna stream flow, and physical and numerical (mathematical) models of Chesapeake Bay for fresh-saline water exchange predictions. The Committee considers the comprehensive Chesapeake Bay Study, particularly the hydraulic model of Chesapeake Bay, as essential to an understanding of the full relationship of the Susquehanna to Chesapeake Bay. The study can be expected to provide answers on how competing uses should be satisfied during the late action period.

Regional Sewerage Studies. The Coordinating Committee also recommends that survey scope studies be made of the potential for regional sewerage systems in the following three regions: (1) the Swatara Creek area, which includes Harrisburg, East Hummelstown, Swatara Township, and Hershey; (2) the Lancaster area, which includes Lancaster, Lititz, East Petersburg, Willow Street, and Millersville; and (3) the Codorus Creek watershed, including York, Red Lion, Dallastown, Spring Grove, Penn Township, and the Greater York Area. These studies should include the optimum combination of sewerage system elements for each region, the appropriate cost sharing between Federal and non-Federal interests, the construction agent, and the appropriate authority to operate and maintain each system. A more detailed discussion of regional sewerage studies is presented in Chapter IX of this supplement.

C. FRAMEWORK PLAN

The Framework Plan to 2020 to meet the needs occuring after 1980 includes some continuation of programs recommended for the early action period, as well as additional projects to meet the needs as they become evident. Figure 47 locates the specific features of the Framework Plan.

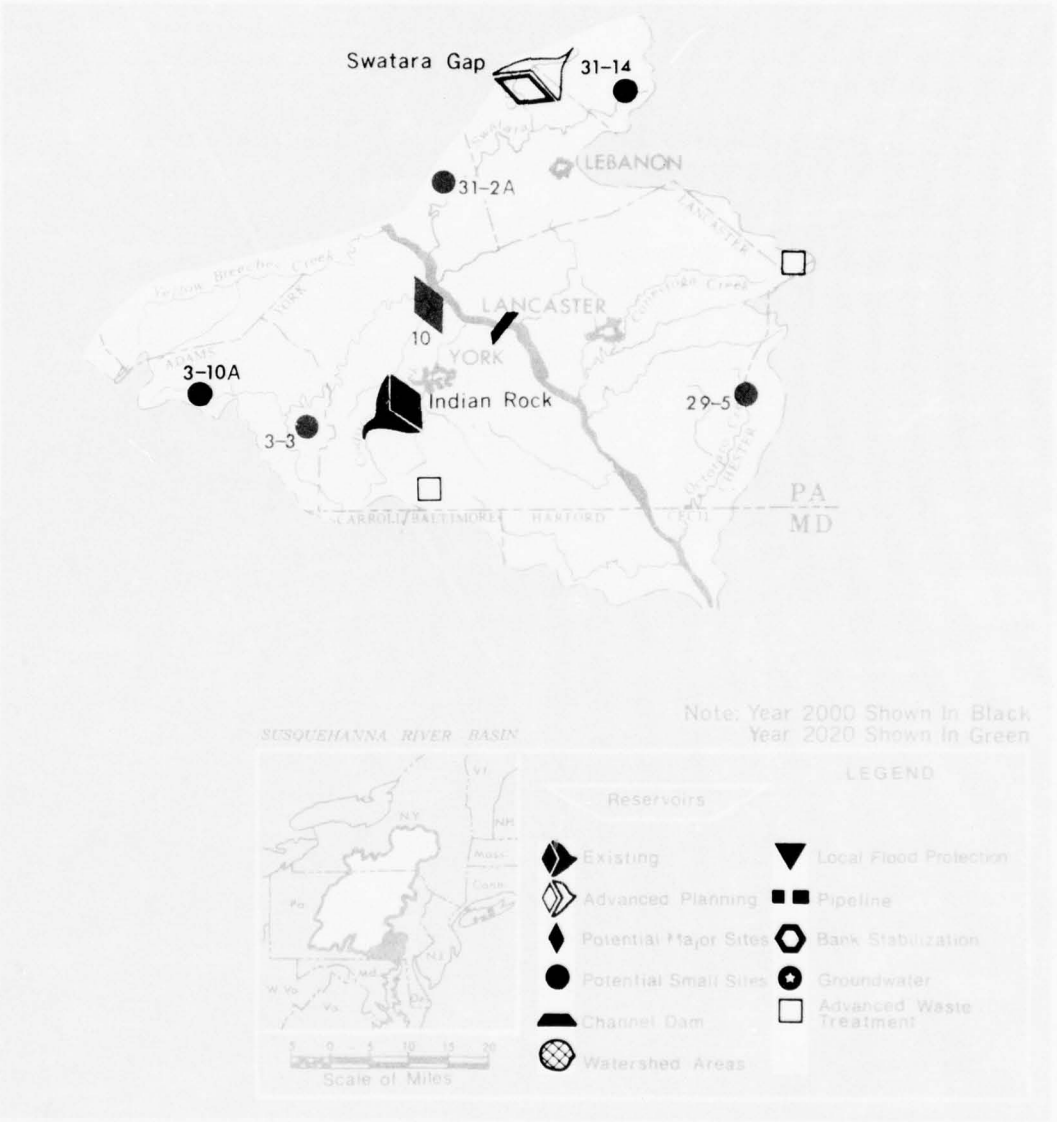
Structural Measures

Water Quality Measures

The Coordinating Committee assumes that all sewage service areas will provide the necessary treatment and collection facilities to comply with the specific waste water treatment requirements of the Commonwealth of Pennsylvania. This will necessitate the initiation of secondary treat-

ment at six service areas, the expansion of secondary waste treatment at five service areas, and the construction of new or expanded collection facilities at 29 service areas.

By the year 2020, new advanced waste treatment will be required at the Ephrata, Glen Rock, and Lancaster Suburban sewage service areas. In addition to these measures, existing advanced waste treatment plants, recommended in the Early Action Plan, will have to be expanded during the framework period as the needs become evident.



SUB-BASIN VIII: Framework Plan

Figure 47

Reservoirs for Recreation and Fish Habitat

Low Channel Dam. A low dam on the Susquehanna River at Marietta is included in the Framework Plan. This project would provide a surface area of 2,100 acres and provide 1.2 million recreation days annually.

Large Tributary Reservoir. A large tributary reservoir (site #10) is proposed on Conewago Creek in York County, Pennsylvania. This project would have a water surface area of 2,000 acres and provide the annual opportunity for 1,144,000 recreation days ultimately. The project could also serve to meet a part of the entire low flow requirements of the upper Chesapeake Bay during the late action period, with the potential for added storage if future studies indicate the need.

Small Tributary Reservoirs. Five small tributary reservoirs are included in the Framework Plan and listed in Table 26.

TABLE 26
SMALL TRIBUTARY RESERVOIRS IN
FRAMEWORK PLAN IN SUB-BASIN VIII

Project No. and Framework Plan Date	Stream	Location	Water Surface Area (Acres)	Ultimate Annual Visitation 1,000 (Recr. Days)
3-10A (2000)	Conewago Creek	1.6 mi. W of Table Rock 1.5 mi. SW of Biglerville	858	656
31-14 (2000)	Little Swatara Creek	2.0 mi. E of Bethel 1.4 mi. NW of Rehrersburg	300	656
3-3 (2020)	Paradise Creek	3.2 mi. W of Nashville 3.3 mi. SW of Thomasville	77	4,800 Fisherman-Days
29-5 (2020)	Knight Run	3.1 mi. W of Cochranville 2.1 mi. N of Homeville	235	295
31-2A (2020)	Manada Creek	0.6 mi. N of Sandy Beach 1.9 mi. N of Union Deposit	600	673

Other Management Measures

Land Management

The proposed land management programs in Sub-basin VIII between 1980 and 2020 are shown in Table 27.

TABLE 27
LAND MANAGEMENT PROGRAM

Time	Critical Acres To Be Treated	Total Acres to be Treated
1980-2000	4,000	385,000
2000-2020	3,000	151,000

Stream Management

The Framework Plan calls for the continued use of the recommended early action stream management areas for recreation, increasing that use by adding the remaining half of the recreation facilities between 1980 and 1990.

Flood Plain Management

The recommended early action intensive flood plain management program, and warning and evacuation program should be continued and flood plain management studies should be made on the Susquehanna River, between Harrisburg and Royalton, and at Marietta (for low dam).

D. ALTERNATIVES TO RECOMMENDED STRUCTURAL MEASURES

In this sub-basin structural measures have been selected for pollution control, and to provide water-based recreational opportunity and water supply. Primary alternatives to the selected measures are discussed below. Additional data on these alternatives are included in Appendix K(1).

Pollution Control

Advanced waste treatment is recommended for Lebanon, Elizabethtown, New Holland, Lancaster, Hanover, Spring Grove, York, Dallastown-Red Lion, Morgantown, and Columbia.

In all of these locations storage for water quality control by flow augmentation is impractical because of limited watershed yield capabilities, excessively expensive storage, or both.

Diversions of wastes, treated to the secondary level, through by-pass sewer lines were considered for all of these locations, but were found to be less desirable than advanced waste treatment. The possibility exists however, of combining the treatment facilities of the major communities in the Codorus Creek basin with a single waste treatment plant near York. This would require collection facilities to take all of the sewage to York,

where it would be treated to the tertiary level prior to discharge into Codorus Creek below York. The feasibility of such a project could be determined by a study such as the one recommended in Section B of this chapter.

Recreation and Fishing

Some 222 miles of streamside development and 14 reservoirs and one low channel dam are recommended for recreation and fishing. Prime alternatives to the recommended reservoirs are listed in Table 28.

TABLE 28
ALTERNATIVES TO RECOMMENDED RECREATION AND FISHING RESERVOIRS

Site	Stream	Surf. Area (Acres)	Storage Vol. (1,000 Ac-Ft)	Estimated Cost ($1,000)
1-2	Thomas Run	230	5.7	293
3-2	Trib. of N Br Bermudian Creek	190	3.5	424
3-5	Plum Run	240	4.9	667
3-6	Red Run	60	0.8	204
29-1	Basin Run	230	4.1	264
29-3	Valley Run	155	3.3	334
30-12	Hammer Creek	565	11.9	2,830
31-1	Beaver Creek	270	3.6	707
31-16	Elizabeth Run	410	5.8	1,750
01-3	Fishing Creek	100	1.8	231

Flow Control

In the early action period, no major reservoirs are recommended to be built. One large dam, the Conewago reservoir (10) is recommended for development during the framework period. Alternatives to this site would be Leaman Place (3), Frysville (4), and Reynolds Mill (8). Details on these alternatives are given below.

Leaman Place Alternative

This site is located on Pequea Creek about 29 miles above the mouth near the village of Leaman Place, Pennsylvania. The drainage area is 51 square miles. This dam could create a lake as large as 2,000 acres.

However, this site is in a prime agricultural area where land is very highly valued. It would be an extremely difficult project to implement at this time. The Coordinating Committee, in addition, has recommended that no large reservoirs be constructed in Lancaster County.

If the character of Lancaster County should change, this reservoir alternative could become feasible before 2020.

Frysville Alternative

This site is located on Muddy Creek, a tributary of Conestoga Creek about 2 miles upstream from the mouth and near the village of Frysville, Pennsylvania. The drainage area is 42 square miles. This dam could create a lake as large as 1,500 acres.

This site is also in a prime agricultural area. Although it lies in a strategic location near Lancaster, and could serve a water supply purpose, it would be extremely difficult to implement at this time. The Coordinating Committee has recommented cultural preservation in this part of Lancaster County. If the character of Lancaster County should change, this reservoir alternative could become feasible.

Reynolds Mill Alternative

This site is located on the south branch of Codorus Creek and is strategic to the York water supply intake. It would control 68 square miles, and could create a lake as large as 1,600 acres.

While the site is a viable short range alternative to York's water supply needs, it does not have the watershed yield potential to be an ultimate solution. Land costs would be considerable, and the project would be disruptive to the Glatfelters-Seven Valleys area. The water supply pipeline to the Susquehanna is a more realistic recommendation for the York area's long range needs.

Water Supply

Future water supply needs at Elizabethtown, Manheim, Lititz, Ephrata, New Holland, and Morgantown should be satisfied with ground water developments. Consideration was given to supplying these communities with an extensive county-wide pipeline from the Susquehanna. On the basis of available data, it appears that ground water development, as recommended, is the most economical and practical solution.

A pipeline is recommended to supply the Lancaster area from the Susquehanna River near Columbia. This line is, in fact, already existing and expanded capacity is all that is required. Alternatives to this would be ground water development in the Lancaster area or the construction of the Leaman Place and Frysville reservoirs. Neither of these alternatives can compete economically or from a practical implementation standpoint with the pipeline solution.

A pipeline from the Susquehanna is also recommended to serve the future needs of York and Hanover. This was determined to be the most practical long range solution, although development of the Reynolds Mill site and ground water resources were also considered.

CHAPTER IX

RECOMMENDATIONS FOR IMPLEMENTING THE EARLY ACTION PLAN

A. GENERAL

The Coordinating Committee recommends the implementation of all features of the Early Action Plan during the early action period. This will require a substantial capital investment by Federal, State, and local governments, and by private groups. The Committee, however, believes this investment will promote the orderly development of the water and related land resources of the Susquehanna River Basin in a manner which will serve the well-being of the general public.

Many of the recommended measures cannot be implemented by Federal agencies under existing public law and policy, nor could they be implemented by the State and local governments, given the constraints imposed by limited funds under which these governments have operated in the past. The Coordinating Committee, therefore, recommends changes in legislation and policy which will be needed for effective implementation. These recommendations are discussed in the Summary of the Main Report.

In this chapter, the implementation of the Early Action Plan is discussed by individual categories of structural and management measures.

B. STRUCTURAL MEASURES

Water Quality Management

The required measures for water quality management overwhelmingly constitute the largest single category of investment in the early action period. These investments include municipal and industrial waste collection and treatment measures, abatement of pollution caused by drainage from abandoned coal mines, and low flow augmentation. The implementation of low flow augmentation to assist in meeting the water quality standards is discussed under major multiple purpose dams and reservoirs.

Municipal and Industrial Waste Collection and Treatment

The Coordinating Committee assumes that all sewage service areas will provide the reasonable equivalent of secondary treatment by 1980, except for those discharging to acid streams not recommended for abatement of coal mine drainage pollution by 1980. This reflects the present interstate water quality standards and the water pollution control laws of the several Basin States. Implementation of waste collection and treatment measures would remain a responsibility of non-Federal authorities under existing laws and policy. Several Federal laws, however, authorize

the granting of Federal funds for planning and construction of waste water collection and treatment facilities. These grant programs are administered through several agencies, including the Departments of Interior, Agriculture, Housing and Urban Development, and Commerce.

The largest Federal program is administered by the Federal Water Quality Administration according to provisions of the Federal Water Pollution Control Act of 1966 and its subsequent amendments. Under this program municipalities are eligible to receive up to 55 percent of the costs of constructing treatment plants and interceptor sewers. Due to insufficient funds, however, a much smaller percentage has generally been made available.

The State of New York can provide up to 30 percent over the Federal share under the provisions of the New York Pure Waters Bond Act of 1965. The Commonwealth of Pennsylvania can provide up to 25 percent over the Federal share to sewage service areas in Pennsylvania.

The required investment in waste water treatment and collection facilities during the early action period is shown in Table 29. The data are presented by sub-basin and sewage service area.

TABLE 29
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ millions (July 1969 prices) Collection	Treatment	Total
I	Oneonta*	3	4.74	4.23	8.97
	Sidney*	-	5.14	-	5.14
	Hamilton*	-	2.56	-	2.56
	Norwich	3	2.90	1.73	4.63
	Cortland	3	15.08	10.96	26.04
	Binghamton*	3	58.50	12.70	71.20

*Under State orders to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

TABLE 29 (cont'd)
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ millions (July 1969 prices) Collection	Treatment	Total
	Endicott*	3	22.62	16.47	39.09
	Owego*	3	6.62	6.26	12.88
	Sayre-Waverly*	3	6.60	3.77	10.37
II	Westfield	3	0.12	0.34	0.46
	Hornell*	8	2.32	-	2.32
	Bath*	-	8.24	-	8.24
	Corning*	-	19.48	-	19.48
	Elmira*	-	44.54	-	44.54
	Elkland	-	0.58	-	0.58
	Mansfield	-	1.16	-	1.16
III	Towanda	3	3.25	1.04	4.29
	Vandling*	-	0.92	-	0.92
	Jermyn*	-	5.22	-	5.22
	Dickson City*	-	5.37	-	5.37
	Duryea*	-	9.28	-	9.28
	Freeland	2	0.70	0.52	1.22
	Clarks Summit	-	2.55	-	2.55
	Hazleton	7	9.74	-	9.74
	Wilkes-Barre*	3	31.90	11.44	43.34
	Berwick*	3	6.15	5.96	12.1
	Bloomsburg	3	4.86	2.56	7.42
	Danville*	3	1.74	1.96	3.70
	Scranton	7	18.00	-	18.00
	McAdoo	4	0.80	0.16	0.96

*Under State orders to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

TABLE 29 (cont'd)
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ millions (July 1969 prices) Collection	Treatment	Total
IV	Emporium	-	1.94	-	1.94
	Barnesboro-Spangler	2	-	1.14	1.14
	Patton	2	0.70	0.98	1.68
	Houtdale	3	-	0.97	0.97
	Curwensville-Westover	3	0.59	0.74	1.33
	Clearfield	3	-	0.94	0.94
	Philipsburg*	4	3.26	0.40	3.66
V	Renovo*	4	1.00	1.39	2.39
	State College & University Area*	8	20.18	-	20.18
	Bellefonte*	6	-	3.64	3.64
	Lock Haven	3	8.46	11.27	19.73
	Galeton*	3	0.14	0.86	1.00
	Wellsboro	6	-	3.01	3.01
	Jersey Shore*	3	0.26	1.25	1.51
	Williamsport (South)	3	2.50	13.21	15.71
	Hughesville	1	0.13	0.66	0.79
	Muncy	3	0.16	1.11	1.27
	Milton-Lewisburg*	3	0.87	4.06	4.93
	Northumberland*	3	-	0.49	0.49
	Montoursville	3	-	0.78	0.78
	Woolrich	-	0.05	-	0.05
VI	Tyrone*	6	2.44	5.73	8.17
	Roaring Spring	6	0.93	3.71	4.64
	Belleview	3	0.75	1.43	2.18
	Altoona (SW)	6	-	5.16	5.16
	Altoona (NE)	8	3.48	-	3.48
	Williamsburg	6	0.46	1.16	1.62

*Under State orders to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

TABLE 29 (cont'd)
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ millions (July 1969 prices) Collection	Treatment	Total
VI	Southern Blair County	-	3.94	-	3.94
	Alexandria*	1	0.46	1.21	1.67
	Huntingdon*	3	1.51	1.15	2.66
	Bedford*	3	1.51	0.80	2.31
	Millerstown	3	1.51	0.15	1.66
	Everett*	3	0.91	0.34	1.25
	Saxton*	7	0.75	-	0.75
	Orbisonia	3	0.75	1.26	2.01
	Bellwood	-	2.44	-	2.44
	Mt. Union*	3	1.66	0.45	2.11
	Belleville*	3	-	1.43	1.43
	Lewistown*	3	1.90	3.32	5.22
	Martinsburg	-	0.81	-	0.81
	Mifflintown*	3	0.30	0.30	0.60
	Port Royal*	3	0.60	0.60	1.20
	Holidaysburg	-	1.04	-	1.04
	Newport*	3	-	0.45	0.45
VII	Shenandoah*	4	-	1.33	1.33
	Mahanoy City	4	-	3.29	3.29
	Mt. Carmel*	4	-	1.09	1.09
	Ashland*	4	-	3.29	3.29
	Kulpmont*	4	-	0.53	0.53
	Shamokin*	4	-	3.94	3.94
	Tower City	4	1.16	0.41	1.57
	Middleburg	3	0.23	2.41	2.64
	Sunbury*	3	2.10	3.35	5.45
	Shippensburg	6	0.63	0.23	0.86
	Carlisle-North Middletown	6	12.22	5.19	17.41

*Under State order to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

TABLE 29 (cont'd)
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ million (July 1969 prices) Collection	Treatment	Total
VII	Mechanisburg	7	9.74	-	9.74
	Centralia*	4	-	0.10	0.10
	Selinsgrove	3	2.20	1.28	3.48
VIII	Mt. Holly Springs	3	4.64	2.59	7.23
	Dillsburg	7	0.25	-	0.25
	Hanover-McSherrystown	-	7.08	-	7.08
	Hanover	6	-	8.11	8.11
	Spring Grove*	6	1.86	12.95	14.81
	York*	6	44.08	27.47	71.55
	Red Lion*	6	1.97	1.39	3.36
	Pine Grove*	3	-	0.31	0.31
	Lebanon*	6	21.11	14.12	35.23
	Annville*	7	1.95	0.81	2.76
	Hershey	8	8.70	-	8.70
	Harrisburg East*	3	52.20	15.66	67.86
	Harrisburg West*	3	38.28	14.04	52.32
	Elizabethtown	5	4.64	5.95	10.59
	Ephrata	7	6.15	-	6.15
	Lititz	8	2.55	2.30	4.85
	Lancaster	-	33.64	-	33.64
	Lancaster* (South)	6	-	3.48	3.48
	New Holland*	6	4.18	17.05	21.23
	Columbia*	3	6.96	3.48	10.44
	Lancaster River Plant	6	40.14	26.60	66.74

*Under State orders to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

TABLE 29 (cont'd)
WASTE TREATMENT AND COLLECTION FACILITIES NEEDED
IN THE EARLY ACTION PERIOD

Sub-basin	Sewage Service Areas	Needed Treatment	Estimated Investment Requirement $ million (July 1969 prices) Collection	Treatment	Total
VIII	Dover	3	3.25	2.16	5.41
	Penn Township	6	1.39	3.00	4.39
	Glen Rock	-	0.81	-	0.81
	New Freedom-Shrewsbury	6	2.90	1.60	4.50
	Dallastown-Yoe	6	1.04	1.20	2.24
	Fredricksburg	6	1.74	1.50	3.24
	Palmyra	7	2.55	-	2.55
	Hummelstown	-	3.50	-	3.50
	Manheim	-	3.25	-	3.25
	Morgantown	-	1.40	-	1.40
	Oxford	-	2.78	-	2.78
	New Oxford	-	0.68	-	0.68
	York Haven	3	-	2.64	2.64
	TOTALS		704.02	350.40	1,054.52

*Under State orders to upgrade treatment efficiency

Notes: Needed treatment, in addition to extension of collection facilities:

1. septic tanks to secondary treatment
2. no treatment to secondary treatment
3. primary treatment to secondary
4. no treatment to primary
5. primary treatment to advanced
6. secondary treatment to advanced
7. continue secondary level treatment
8. continue high level treatment

Table 30 summarizes the potential cost sharing for the waste collection and treatment facilities required in the early action period. The Federal and non-Federal shares are based on grant financing of 50 percent of the treatment project construction costs by the Federal Water Quality Administration, as well as 50-50 cost sharing of the construction costs of waste collection systems as authorized under Section 702 of Public Law 89-117, the Housing and Urban Development Act of 1965, by the Department of Housing and Urban Development (HUD). The Coordinating Committee recognizes that this recommendation for sharing of costs calls for a sharp increase over the next decade in the level of funding by HUD. This increase, however, is necessary to carry out a timely and effective program of construction of collection facilities, upon which the recommendations for adequate waste treatment depend.

TABLE 30
EARLY ACTION FUNDING BASIN-WIDE FOR WASTE
COLLECTION AND TREATMENT FACILITIES

Fund Source	Collection $ millions	Treatment $ millions	Total $ millions
Federal			
Department of Housing and Urban Development	352	-	352
Federal Water Quality Administration	-	175	175
Non-Federal	352	175	527
Totals	704	350	1,054

Notes: Assuming 50% Federal financing on all facilities.
All costs rounded from Table 29 totals.

The Committee recommends implementation of waste treatment measures on the basis of broad regional collection and treatment, wherever feasible from engineering, economic, and environmental viewpoints. First, feasibility (survey-scope) studies must be conducted on broad regional bases to determine the most efficient and effective regional combinations of collection, treatment, and operation.

A survey-scope study of the potential for regional sewerage systems should produce the following recommendations:

(1) The combination (system) of interceptor sewers, treatment plants, and operating conditions that would yield the optimum return on the investment. The full range of water and related land resource impacts must be considered, including such local factors as the relationship of urban storm runoff to water quality.

(2) The appropriate share of the costs for construction (including lands, easements, and rights-of-way), operation and maintenance, and major replacements of the system, each apportioned among the local or regional authority or the State(s) involved, and the Federal government.

(3) The appropriate agency responsible for constructing the integral elements of the system.

(4) The appropriate authority to operate and maintain the system, presumably from revenues collected from those served.

The feasibility of waste treatment regionalization for any particular region can only be determined through specific study. The results of a reconnaissance "case study" of Codorus Creek, in York County, Pennsylvania, indicate that a survey-scope study, considering all tangible and intangible effects of waste treatment regionalization on the water resource system, would be warranted to verify the potential for a regional sewerage plan for the Codorus Valley (see Supplement A).

Such a survey would require close coordination and agreement among the Federal and State agencies concerned with water resources and public health, as well as with the local planning and sewer authorities. The full range of beneficial and detrimental effects on the water and related land resources should be evaluated requiring penetration beyond the immediate economics of regional sewerage systems.

The Coordinating Committee recommends that surveys of the type outlined above be undertaken at an early date for the regions listed in Table 31. The relative priority for study is also noted. The estimated cost of all of the regional survey studies, based on preliminary information, is $3 million. The agency assigned any or all of the surveys should have the organizational resources to carry out the effort in coordination with the affected Federal, State, and local interests involved and to incorporate the impact on other phases of water resource management. Several of the service areas already have joint treatment

projects proposed or under construction; others are considering some consolidation of facilities and have initiated limited studies that would be included as part of the regional surveys.

TABLE 31

RECOMMENDED REGIONAL SEWERAGE STUDIES
FOR EARLY ACTION

Region	Sub-basin	Service Areas Included	Priority
Binghamton Area	I	Binghamton, Port Dickinson, Vestal, Endicott, Johnson City, and Endwell	A
Elmira Area	II	Chemung County, Elmira, Horseheads, Big Flats, and Corning	A
Lackawanna Valley*	III	Carbondale, Jermyn, Dickson City, Scranton, Dunmore, Clarks Summit, Old Forge, and Duryea	A
Williamsport Area	V	Williamsport, South Williamsport, and Montoursville	B
Spring Creek Area	V	Greater State College area and Bellefonte	B
Milton-Lewisburg Area	V	Milton and Lewisburg	B
Altoona Area	VI	Altoona, Bellwood, Hollidaysburg, Duncansville, and Tyrone	B
Shamokin Creek	VII	Shamokin, Kulpmont, Mt. Carmel, and coal mine drainage problem areas	B
Conodoguinet Creek	VII	Greater Carlisle, Mechanicsburg, Hamden Township	A
Harrisburg West Shore	VII, VIII	Fairview Township, Lower Allen Township, Upper Allen Township, Camp Hill, New Cumberland, Lemoyne, and Wormleysburg	A
Swatara Creek	VIII	Harrisburg East, Hummelstown, Swatara Township, and Hershey	B

TABLE 31 (Continued)

RECOMMENDED REGIONAL SEWERAGE STUDIES
FOR EARLY ACTION

Region	Sub-basin	Service Areas Included	Priority
Codorus Creek	VIII	Greater York Area, Red Lion, Dallastown, York, and Spring Grove	A
Lancaster Area	VIII	Lancaster, Lititz, East Petersburg, Willow Street, and Millersville	B

* Regional authorities have been established for the upper and lower valley areas.

Coal Mine Drainage Pollution Abatement

Currently, coal mine drainage abatement activities in the Basin are the responsibility of two Pennsylvania agencies. Regulation of the quality of water discharged from active bituminous deep mines and active anthracite deep and strip mines is administered by the Department of Health as an enforcement function. Regulation of the discharges from active bituminous strip mines and from all abandoned mines is administered by the Department of Mines and Mineral Industries, which also has responsibility for investing $150 million statewide for coal mine drainage abatement as part of a conservation bond issue passed in 1967 (Project 500). In the Coordinating Committee's view, based only on the information collected to date, implementation should continue to be the Commonwealth's responsibility, but financial assistance should be provided from the Federal government. Because of the widespread and interstate impact of the coal mine drainage pollution problem, subsequent detailed studies should require joint participation by the Federal, State, and local governments.

The Federal government has already assisted in three ways:

(1) In the 1930's, as a part of the Works Progress Administration (WPA) program, the Federal government sealed many abandoned mines to enhance water quality and to create jobs. This program was not successful due either to the ineffectiveness of the preventive measures or to the lack of maintenance of such measures. It did, however, help to develop knowledge on the feasibility of preventive measures.

(2) The Federal Water Quality Administration (FWQA) is helping to fund research and demonstration projects on tributaries of Catawissa Creek, Moshannon Creek, Bennett Branch Sinnemahoning Creek, and Beech Creek.

(3) The Susquehanna Study itself has defined the problem as a whole, and in some detail by watersheds. These data include estimates of the

number and magnitude of acid discharges, and order-of-magnitude costs to achieve a uniform level of acid reduction.

The Federal government is already committed to continue assistance as follows:

(1) FWQA will continue to fund research projects in the area of coal mine drainage pollution abatement.

(2) FWQA will administer the coal mine drainage demonstration program authorized under the Water Quality Improvement Act of 1970, most likely as an extension of its research and development program.

(3) The Appalachian Regional Commission (ARC), in cooperation with the Secretary of the Interior, can use funds under Section 302 of the Appalachian Act to assist States in planning comprehensive environmental improvement programs in watersheds when coal mine drainage is the principal problem.

(4) Under a Senate Public Works Committee resolution of April 14, 1964, the Baltimore District of the Corps of Engineers plans to undertake more detailed planning and engineering studies of coal mine drainage projects identified by the Susquehanna River Basin Study. Where such studies may have already been completed by the Commonwealth of Pennsylvania, or others, they could become, after review, a part of the basis for an interim report. The Corps of Engineers' studies will provide a survey-scope basis for abatement construction decisions, and will more specifically define the basis and extent of Federal involvement, including the extent of construction responsibility and sharing of costs, as an essential step in the overall improvement of the water and related land resources of the Susquehanna River Basin.

The Coordinating Committee's recommendations are:

(1) Adequate Federal funding should be programmed for the Corps of Engineers to complete the necessary detailed survey-scope engineering studies of the coal mine drainage problem as soon as practicable under the existing authority.

(2) Preconstruction studies by all Federal agencies should be closely coordinated with any comprehensive environmental programs of the Commonwealth of Pennsylvania and the Appalachian Regional Commission.

(3) Construction responsibility and construction cost sharing for watersheds requiring abatement measures should be specifically stated in the individual authorization reports.

(4) The local agency sponsor should agree to operate and maintain all mine drainage pollution abatement works of improvement after construction. The local sponsor may or may not be a State agency.

Table 32 lists estimated costs for abatement of pollution from coal mine drainage on the watershed projects recommended in the Early Action Plan. These estimates are based on generalized procedures combining preventive and treatment measures (see Appendix F).

The cost-sharing recommendations are shown in Table 33. The 80 percent Federal and 20 percent State funding for construction investment indicated was suggested by the Commonwealth of Pennsylvania as the necessary amount to be able to undertake all of the early action projects over the next 10 years.

Solution of the abandoned coal mine pollution problem appears to be more national than local in responsibility, since Pennsylvania coal has provided a great deal of the Nation's fuel energy for over 150 years. The environmental blight would have been lessened greatly if the cost of removing the scars and restoring the land had been added to the price of coal over the years. In addition, the interstate impact of coal mine drainage pollution is measured by reduced quality (undesirable minerals in solution) during low flow periods at least as far downstream as the Baltimore City water supply intake near the mouth of the Susquehanna River.

TABLE 32
ESTIMATED COST OF EARLY ACTION COAL MINE DRAINAGE ABATEMENT

Watershed	First Cost ($Millions)	Annual Cost ($Millions)	O&M Cost ($Millions)
Tioga River	7.85	0.78	0.35
Lackawanna River	16.20	2.44	1.41
Wyoming Valley	13.85	2.30	1.32
Sinnemahoning Creek	6.36	0.83	0.46
Upper West Branch	21.39	2.25	1.02
Chest Creek	3.24	0.41	0.22
Clearfield Creek	12.80	1.75	1.01
Beech Creek	4.59	0.58	0.31
Loyalsock Creek	0.50	0.12	0.09
Babb Creek	1.93	0.28	0.17
Beaverdam Branch	6.07	0.58	0.23
Mahantango Creek	2.70	0.34	0.18
Swatara Creek	5.43	0.79	0.46
Totals	102.91	13.45	7.23

Note: All costs estimated at July 1969 price levels

TABLE 33
ENGINEERING STUDIES COSTS AND
RECOMMENDATIONS FOR COST SHARING OF EARLY ACTION
COAL MINE DRAINAGE ABATEMENT

Watershed	Engineering Studies Cost ($Millions)		Cost-Sharing of Construction Investment ($Millions)	
	Investigative Survey	Detailed Plans	Federal	State
Tioga River	0.02 1/	0.43	5.92	1.48
Lackawanna River 1/	0.10	0.50 3/	12.48	3.12
Wyoming Valley 1/	0.10	0.95 3/	10.24	2.56
Sinnemahoning Creek	0.10	0.86 3/	4.32	1.08
Upper West Branch	0.11	1.18 3/	16.01	4.09
Chest Creek	0.04	0.30 3/	2.32	0.58
Clearfield Creek	0.10	0.90 3/	9.44	2.36
Beech Creek 2/	-	-	3.67	0.92
Loyalsock Creek	0.01	0.19	0.24	0.06
Babb Creek	0.01	0.30	1.30	0.32
Beaverdam Branch	0.03	0.40	4.51	1.13
Mahantango Creek	0.02	0.28	1.92	0.48
Swatara Creek	0.05 1/	0.50	3.91	0.97
Totals	0.69	6.79	76.28	19.15

1/ Already or partially completed.
2/ Underway by Pennsylvania Department of Mines and Mineral Industries.
3/ Funding would probably be over and above authorized Corps of Engineers' Study.

Major Multiple Purpose Dams and Reservoirs

The Coordinating Committee recommends that six major multiple purpose dam and reservoir projects be implemented by the Corps of Engineers. The Federal interest in these types of projects has been expressed in the Flood Control Act of 1936 for flood control, for water supply in the Water Supply Act of 1958, for water quality in the Federal Water Pollution Control Act amendment in 1961, and for recreation in the Federal Water Project Recreation Act of 1965. Each reservoir project responsive to these laws requires authorization and funding by the Congress before it may be constructed by the Corps of Engineers. The Coordinating Committee recommendation for cost allocation and apportionment for all major reservoir projects is summarized in Table 34. Project descriptions and detailed information on costs, benefits, cost allocations, and apportionment are contained in Appendix K(2).

TABLE 34
COST ALLOCATION AND APPORTIONMENT
MAJOR MULTIPLE PURPOSE RESERVOIRS
($ MILLIONS)

	Construction Cost Allocation							Apportionment	
Project	Flood Control	Water Supply	Water Quality	Irri-gation	Rec. Fish & WL	Regional Expan-sion	Total Con. Cost	Fed. Share	Non-Fed. Share
New York:									
Charlotte Creek Complex	10.4	0.2	7.8	0.6	13.7	14.2	46.9	44.7	2.2
Fabius	2.2	-	7.7	-	4.8	2.9	17.6	17.3	0.3
S. Plymouth	4.0	0.1	-	-	6.9	16.1	27.1	26.2	0.9
Mud Creek	2.2	2.0	1.8	-	6.8	10.2	23.0	19.7	3.3
Fivemile Creek	7.5	3.8	2.4	-	3.0	16.2	31.8	27.5	4.3
Pennsylvania:									
Shady Grove	-	9.4	6.9	1.7	9.0	-	27.0	14.6	12.4
Totals							173.4	150.0	23.4

Charlotte Creek Complex

The multiple purpose dam component of the Charlotte Creek Complex would be at the same location as the authorized Davenport Center Reservoir (121). The Coordinating Committee recommends this development as the central feature of a multiple purpose water resource development complex on Charlotte Creek. The other key feature is an upstream recreation sub-impoundment (T-2) for recreation, fishing and waterfowl use. Because the complex has been designed to enhance economic growth in this area, the Coordinating Committee is recommending that the State of New York request authority and funds to acquire the land for these two project features, and that the Corps of Engineers request funds to begin preconstruction planning during fiscal year 1972, and to begin construction as early as practicable thereafter, beginning with the multiple purpose reservoir.

The Coordinating Committee also requests New York State, at an appropriate time during the early action period, to construct the sub-impoundment recreation site as part of the State contribution to sharing of costs under an arrangement similar to that specified by the Federal Water Project Recreation Act of 1965. Both projects should be planned and designed as a coordinated recreational complex under the Recreation Act provisions. Special State legislation will be needed to authorize the State to construct the upstream reservoir.

The multiple purpose project would contain storage to satisfy consumptive irrigation withdrawal demands between the reservoir site and Binghamton, to maintain adequate flow for municipal and industrial water supply at Binghamton, and to assist in maintaining satisfactory water quality downstream from Binghamton. A new institutional arrangement may have to be established by the State with the users to reimburse the Federal government for the allocated agricultural water storage cost.

South Plymouth Project

The recommended dam and reservoir project on Canasawacta Creek is located at the authorized South Plymouth site (114). It is anticipated that additional authorization by the Congress will be needed for implementation as a Federal project. The Coordinating Committee recommends that the Corps of Engineers seek early authority to implement this project as an exception to present policy. The economic justification for this project relies on an anticipated beneficial impact on income to the immediate region; the user (primary) benefits are not in excess of the project costs.

The regional income expected is a combination of two factors: (1) the recreational expenditure would create more jobs in the service sector, and (2) the existence of the project should make this area, especially Norwich, a more desirable location for business investment.

The Coordinating Committee is recommending that preconstruction planning, following the additional authorization required for this project, begin by fiscal year 1975. An alternative means of implementation would be construction by the State of New York with Federal financial assistance to the extent permitted by Federal law and policy.

Fabius Project

The multiple purpose dam and reservoir (49-28) on the West Branch Tioughnioga Creek is an economically justified project under present Federal policies. The Fabius project would have to be authorized and funded by the Congress prior to preconstruction planning.

The Coordinating Committee recommends that the multiple purpose Fabius reservoir be constructed by the Corps of Engineers as a project for flood control, water quality management, and recreation, as well as for regional development. The Committee recommends that the Corps request funds for an authorization report for this project for fiscal year 1972, and begin preconstruction planning as soon thereafter as the project is authorized. The authorization report would be the basis for an agreement on sharing of project costs.

Mud Creek Project

The multiple purpose dam and reservoir on Mud Creek (96) is economically justified under present Federal policies. The Coordinating Committee recommends that the Corps of Engineers request funds to prepare an authorization report on this project in fiscal year 1972 and begin preconstruction planning as soon after authorization as possible.

Fivemile Creek Project

The multiple purpose dam and reservoir on Fivemile Creek (97)

appears to be economically justified based on combined user benefits and predicted impact on regional income. The conventional national income (primary) benefits for flood control, water supply, and water quality management are not in excess of the estimated project costs. In addition, the incremental cost of flood control storage appears to exceed the primary flood damage reduction benefits. On the basis of its regional merits and local importance, and strong State support, the Coordinating Committee recommends that the Corps of Engineers request funds to prepare an authorization report for this project by fiscal year 1973 and begin preconstruction planning as soon after authorization as possible. An alternative means of implementation would be construction by the State of New York with Federal financial assistance to the extent permitted by Federal law and policy at that time. The authorization report would be the basis for specific cost sharing recommendations.

Shady Grove Project

A multiple purpose dam and reservoir project on Conodoguinet Creek at the Shady Grove reservoir (12) is recommended for regional water supply, irrigation, and recreation. The project does not have an "established" Federal purpose such as flood control or navigation. The Coordinating Committee, however, believes that this project, due to its regional impact on water supply, should be federally constructed, and recommends that the Corps of Engineers prepare a report seeking Congressional authorization for this project by fiscal year 1973. Preconstruction planning should begin as soon as possible after authorization. A new local institutional arrangement may be required to reimburse the Federal government for the irrigation portion of the low flow releases, unless the amount could be considered part of the water supply apportionment.

Reservoirs for Recreation and Fishing Habitat

Low Channel Dams

Four low channel dams have been included in the Early Action Plan based on information provided by the Pennsylvania Department of Forests and Waters. The Coordinating Committee recommends that these four recreational projects be implemented by the Commonwealth of Pennsylvania as soon as practicable over the next 10 years, and that these projects be financed with 50-50 matching funds available from either the Land and Water Conservation Fund (PL 88-578) or the Open Space Land Program (PL 87-70) administered by HUD. Under the Land and Water Conservation Fund program a comprehensive statewide outdoor recreation plan is required. Projects submitted for funding should be consistent with the statewide plan.

The Coordinating Committee recognizes that the Commonwealth of

Pennsylvania may be financially unable, even if half of the total cost is paid by the two Federal programs cited, to implement the four projects shown in Table 35.

TABLE 35
COSTS FOR LOW CHANNEL DAMS
IN THE EARLY ACTION PERIOD

Sub-basin	Location	Total Dam and Land Costs* ($ Millions)
III	Berwick	1,900,000
V	Williamsport	4,700,000
VI	Lewistown	800,000
VII	Duncannon	4,000,000
TOTAL		11,400,000

*Facilities for full recreational development deferred to late action.

Small Tributary Reservoirs

The small tributary reservoirs for recreation and fish habitat would be implemented by a local sponsor (State, county or other political subdivision). Financial and technical assistance from the U. S. Department of Agriculture (USDA) is available under PL 83-566, as amended, the Watershed Protection and Flood Prevention Act. Under provisions of this act the Secretary of Agriculture can enter into agreement with the sponsor to share up to 50 percent of the structural cost, recreational land costs, and cost of needed facilities for recreation and fish and wildlife development. In order to qualify for assistance the structure should be part of a PL 566 watershed project. If the USDA is to provide financial and technical assistance on single purpose recreation and fish and wildlife development projects, a change in existing policy must be made.

Table 36 lists the tributary reservoirs for recreation and fishing by sub-basin, together with a potential sponsor or implementing agent, and the estimated total first cost of the structure, including land rights, and the needed facilities. As local governments prepare their detailed recreation plans, the recommended tributary reservoirs may be reproportioned or moved. Table 37 summarizes by States the number of sites and their total first cost.

TABLE 36
RECOMMENDED EARLY ACTION TRIBUTARY
RESERVOIRS FOR RECREATION AND FISH HABITAT

Sub-Basin	Project	Potential Implementing Agent	First Cost
I	49-22	New York State or Cortland County	$ 607,000
	50-8	New York State or Chenango County	489,000
	51-15	New York State or Otsego County	2,504,000
	53-6	New York State or Otsego County	337,000
	027-6	New York State or Broome County	1,334,000
	030-9A	New York State or Broome County	354,000
	NY 30-3	New York State or Chenango County	1,097,000
	NY 31-2	New York State or Tioga County	1,626,000
	NY 31-4	New York State or Tioga County	316,000
	NY 48-4	New York State or Tompkins County	934,000
	NY 50-3	New York State or Chenango County	942,000
	NY 50-4	New York State of Chenango County	1,320,000
	NY 52-1	New York State or Otsego County	541,000
II	44-4	New York State or Steuben County	1,191,000
	44-7	New York State or Steuben County	328,000
	012-1	Bradford County	615,000
	012-8	Bradford County	330,000
	033-1	New York State or Chemung County	1,425,000
	035-1	New York State or Steuben County	246,000
	NY 33-3	New York State or Chemung County	958,000
	NY 44-1	New York State or Steuben County	1,075,000
III	34-3	Columbia County	1,329,000
	36-13B	Commonwealth of Pennsylvania - Columbia County	4,701,000
	37-20	Lackawanna & Susquehanna Counties	3,897,000
	38-10	Susquehanna County	468,000
	41-7	Bradford County	3,175,000
	07-7	Luzerne County	1,547,000
	08-4	Luzerne County	2,488,000
	08-9	Luzerne County	1,433,000
	010-15	Wyoming County	1,058,000
	011-5	Bradford County	650,000
	Andy's Pond	Luzerne County	254,000
	PA 499	Columbia County	71,000
IV	19-1	Cambria County	3,577,000
	20-7	Clearfield County	1,624,000
	20-11	Clearfield County	1,345,000
	025-1	Clearfield County	1,748,000
	025-2	Clearfield County	2,525,000
V	16-1	Clinton County	594,000
	21-5	Lycoming County	761,000
	21-8	Lycoming County	5,430,000

TABLE 36 (Cont'd)

Sub-Basin	Project	Potential Implementing Agent	First Cost
	22-1	Pennsylvania Department of Forests and Waters	$4,845,000
	22-4	Lycoming County	1,448,000
	24-5	Tioga County	968,000
	020-8	Union County	1,120,000
	022-1	Lycoming County	1,434,000
	PA 603	Tioga County	281,000
	PA 604	Tioga County	293,000
VI	8-4	Huntingdon County	1,585,000
	8-8	Fulton County	1,260,000
	10-11	Bedford County	2,080,000
	016-3	Mifflin County	1,707,000
VII	014-1A	Pa. Dept. of Forests and Waters or Juniata & Snyder Counties	3,791,000
VIII	1-1	Harford County, Maryland	797,000
	1-5A	Harford County, Maryland	1,463,000
	1-6	Harford County, Maryland	797,000
	4-2	York County	727,000
	4-11	Pa. Dept. of Forests and Waters	4,566,000
	30-2	Lancaster	4,136,000
	01-4	Pa. Dept. of Forests and Waters & Md. Dept. of Forests & Parks	3,942,000
	02-7	York County	725,000
	TOTAL		$96,211,000

TABLE 37
TRIBUTARY RESERVOIR SUMMARY

State Location	Number of Sites	Total Cost $1,000
New York	19	17,624
Pennsylvania	38*	72,557
Maryland	4*	6,030
Total	61	96,211

* The dam for site 01-4 would be in Maryland; most of the reservoir would be in Pennsylvania. The cost is split 50-50 between these States.

Ground Water and Pipelines for Municipal and Industrial Water Supply

Ground Water

The recommended wellfields would be implemented locally for

municipal and industrial water supply. Federal assistance (up to 50 percent of development costs) is available under the Housing and Urban Development Act of 1965, PL 89-117, administered by the Department of Housing and Urban Development. The costs of the ground water wellfields recommended are shown in Table 38.

Pipelines

The recommended water supply pipelines from the Susquehanna River for the Scranton, Lancaster, and York-Hanover systems would be implemented by the local water authority. Federal funding (up to 50 percent of development costs) is available under PL 89-117 administered by the Department of Housing and Urban Development. The costs of the recommended pipelines are given in Table 39.

TABLE 38
COST OF RECOMMENDED WELLFIELDS

Sub-Basin	Location	First Cost
I	Cortland	$ 1,360,000
II	Hornell	60,000
III	Hazleton	1,000,000
IV	Barnesboro-Spangler-Patton	140,000
IV	Emporium	580,000
V	State College	2,020,000
VI	Bellwood	220,000
VI	Altoona	3,370,000
VI	Roaring Spring	440,000
VIII	Elizabethtown	510,000
VIII	Morgantown	80,000
VIII	New Holland	750,000
VIII	Ephrata	810,000
VIII	Lititz	760,000
VIII	Manheim	850,000
Total		$12,950,000

TABLE 39
COST OF RECOMMENDED PIPELINES

Sub-Basin	Project	First Cost
III	Scranton	$ 8,530,000
VII	Shippensburg	1,080,000
VIII	Lancaster	9,300,000
VIII	York-Hanover	11,590,000
Total		$30,500,000

Local Flood Protection Projects

The Coordinating Committee recommends that all but one of the local flood protection projects in the Early Action Plan be constructed by the Corps of Engineers under the general authority contained in the Flood Control Act of 1936, as amended. The Coordinating Committee recommends that the Corps seek specific authorization as soon as possible for the projects at Marathon, New York, and at Bloomsburg, Harrisburg, Lock Haven, and Westfield, Pennsylvania. The existing local protection system in the Wyoming Valley of Pennsylvania should be restored to its original elevations to compensate for subsidence which has occurred since construction. This subsidence has been due to collapse of underground anthracite mines.

The Committee also supports completion of construction of the phased Philipsburg local flood protection project by the Commonwealth of Pennsylvania.

The project at Bloomsburg relies on the expected increase in regional income for economic justification, as discussed in Chapter III and detailed in Appendix K(2). The Committee believes the anticipated increase in regional income and well-being warrants the required investment. Table 40 illustrates the approximate cost sharing for each project based on existing Federal policy. Final cost sharing arrangements will be contained in the authorization report for each specific project.

TABLE 40
COST SHARING OF LOCAL
FLOOD PROTECTION PROJECTS

Sub-Basin	Project	First Cost		
		Federal	Non-Federal	Total
I	Marathon	$ 1,632,000	$ 57,000	$ 1,689,000
II	Westfield	903,000	26,000	929,000
III	Bloomsburg*	7,900,000	242,000	8,142,000
III	Wyoming Valley Levee System	1,260,000	33,000	1,293,000
IV	Philipsburg	-	1,000,000	1,000,000
V	Lock Haven	11,174,000	500,000	11,674,000
VIII	Harrisburg	4,851,000	11,000	4,862,000
Total		$27,720,000	$1,869,000	$29,589,000

* Economically justified from regional development viewpoint.

Upstream Watershed Projects

The nine upstream watershed projects in the Early Action Plan

are recommended by the Coordinating Committee to be implemented under the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended. This act requires that the projects be sponsored by political subdivisions. Financial technical assistance is provided by the U.S. Department of Agriculture. The act provides that the Federal Government may pay for all engineering and construction costs related to flood control. For irrigation, drainage, and fish and wildlife development, the Federal Government may pay for all engineeering costs, and up to 50 percent of the construction costs. The Federal Government will also share up to 50 percent of the cost for recreation land and facilities.

Table 41 illustrates a possible sponsor and the approximate cost sharing for each of the projects recommended. Final cost sharing and administrative arrangements would be contained in the specific work plans for each watershed.

TABLE 41
POTENTIAL SPONSOR AND COST SHARING FOR
EARLY ACTION UPSTREAM WATERSHED PROJECTS

Sub-Basin	Project	Potential Sponsor	First Cost		
			Federal	Non-Federal	Total
I	Trout Brook	New York State Cortland County	$1,191,000	$ 975,000	$ 2,166,000
I	Upper Otselic River	New York State Madison County	329,000	37,000	366,000
II	Upper Tioga River	Tioga County	4,415,000	1,336,000	5,751,000
III	Dundaff Creek	Lackawanna & Susq. Co.	618,000	84,000	702,000
III	Crooked Run	Columbia Co.	161,000	62,000	223,000
III	Roaring Creek	Columbia Co.	1,190,000	794,000	1,984,000
V	Little Loyal-sock Creek	Sullivan Co.	364,000	205,000	569,000
VII	Little Juniata Creek	Perry Co.	345,000	249,000	594,000
VIII	Chickies	Lancaster Co.	1,017,000	500,000	1,517,000
	Total		$9,630,000	$4,242,000	$13,872,000

Other Structural Measures

Water Supply

The water supply reservoir on Little Laurel Run for Philipsburg, Pennsylvania, should be implemented locally. It is estimated to cost $2,278,000. Up to fifty percent of the construction costs could be paid under PL 89-117 administered by the Department of Housing and Urban Development.

Irrigation

The three recommended wellfields for irrigation would be implemented locally by the users. Federal financial and technical assistance is available under PL 87-703, Agriculture Conservation Program, as amended, which is administered by the U.S. Department of Agriculture. The financial assistance is usually 50 percent of the project cost but may be as much as 80 percent. There is precedent, particularly in the western and mid-western portions of the United States, for groups of farmers to collectively finance these irrigation projects. The costs for irrigation ground water wellfields are listed in Table 42.

TABLE 42
COSTS OF IRRIGATION WELLFIELDS

Sub-Basin	Project	Total Cost
II	Upper Cohocton River	$ 273,000
VIII	West Conewago Creek	2,637,000
VIII	Octoraro Creek	2,020,000
		$4,930,000

Streambank Stabilization

Streambank stabilization is an appropriate item for Federal participation in selected individual cases where the nature of the benefits can be shown to be widespread. Recognizing the potential multiple benefits that could accrue to the general public from protection of badly eroding streambanks, some projects appear to be justifiable in light of full recognition of all related tangible and intangible benefits. Some tangible benefits could be realized by preventing the loss of land and land-use values, by protecting against structural damages, by reducing the water supply treatment costs downstream, and by reducing the cost for clearing sediment-obstructed stream channels. Other benefits include preservation of present environmental values, enhancement of the potential uses of streambanks and adjacent lands, and enhancement of the recreational use of streams.

The Soil Conservation Service and Agricultural Stabilization and Conservation Service of the USDA provide technical assistance and Federal cost-sharing for streambank stabilization in rural areas. Also, Federal assistance for emergency bank protection is authorized by the 1946 Flood Control Act. Beyond these activities, the extent of the Federal interest in such work is defined only by precedent established in previously authorized projects. However, the existing authority for Federal participation in beach erosion projects (Section 103 of the River and Harbor Act of 1962, as amended) could logically be extended to cover streambank erosion with similar cost-sharing provisions, based on specific studies of a problem area.

The Coordinating Committee recommends that streambank stabilization at the locations listed in Table 43 be accomplished by the States with Federal matching funds (up to 50 percent) under PL 566 or under subsequent River and Harbor Act, as dictated by the extent of the specific problem surveyed. The cost for the recommended bank stabilization is also included in Table 43.

TABLE 43
IMPLEMENTING AGENT AND COSTS OF RECOMMENDED
STREAMBANK STABILIZATION PROJECTS

Sub-Basin	Project	First Cost
I	Wappasening Creek	$ 1,220,000
II	Purdy Creek (Hartsville)	22,000
II	NewtonCreek (Horseheads)	44,000
II	Coal Run	22,000
II	Cowanesque River	2,800,000
II	Bentley Creek	554,000
III	Wysox Creek	553,000
III	Towanda Creek	620,000
III	Wyalusing Creek	553,000
III	E. Br. Tunkhannock Cr.	930,000
III	S. Br. Tunkhannock Cr.	740,000
III	Fishing Creek	885,000
V	Muncy Creek	1,160,000
V	Little Muncy Creek	89,000
Total		$10,192,000

C. MANAGEMENT MEASURES

Land Management

The Coordinating Committee's recommendations for conservation land treatment in the early action period fall into two programs: (1) acceleration of land treatment and management programs upstream from recommended reservoirs and within upstream watershed project areas, and (2) land treatment on critical sediment-producing areas. In addition, it is assumed that the on-going land treatment program in the Basin will be carried out as planned.

Present Program

The number of acres in the on-going land treatment program is shown in the fourth column of Table 44. These measures will be implemented by individual land owners. On request, technical assistance will be provided to soil and water conservation district cooperators

TABLE 44
INITIAL LAND TREATMENT TIMETABLE
(Thousands of Acres)

Sub-basin	Total Area	Area Needing Treatment as of 1964 [1]	Early Action Program [2]			Late Action Program		Area remaining to be treated [4]
			On-Going Program	Accelerated Program [3]	Total Area	to 2000	to 2020	
I	3,156	1,986	609	27	636	412	246	692
II	1,648	942	341	31	372	217	111	242
III	2,341	1,236	329	25	354	254	159	470
IV	1,878	1,007	164	2	166	175	146	519
V	2,569	1,792	327	12	339	328	251	874
VI	2,167	1,524	326	8	334	296	204	690
VII	1,370	777	233	15	248	176	97	256
VIII	2,278	1,393	586	11	597	385	151	160
TOTAL	17,407	10,657	2,915	131	3,046	2,243	1,365	4,003

1/ Does not include treatment needs on urban land. Urban land totals 737,000 acres. Some of this urban land undoubtedly will need treatment but specific acreage data is not available. Refer to Appendix J for detailed breadkown of treatment needs by land use and type of problem.

2/ Treatment Timetable is based on present needs and programs plus a limited amount of acceleration of land treatment in project areas (see Table 2, Appendix J). Future changes in land use or programs will affect this timetable.

3/ Does not include acceleration on critical areas (Table 3, Appendix J) because these figures were not available on a sub-basin basis. Also, these figures may not agree exactly with Table 7 in Appendix J because of rouding to the nearest thousand.

4/ This acreage is primarily forest land.

by the Soil Conservation Service and the State forestry organizations in cooperation with the U.S. Forest Service, as authorized by the Soil Conservation Act of 1935 (PL 46). Federal cost-sharing is available under the Agriculture Conservation Program Act (PL 87-703), in amounts up to 80 percent of the cost, which would be $70 million. These are not part of the plan costs.

All of the land area in the Basin is within established soil and water conservation districts. These districts operate under State law and are supervised by State commissions or committees. The districts, usually county-wide entities, are responsible for the overall soil and water conservation programs, as set forth in the States' soil and water conservation laws. These districts solicit the help of all conservation agencies, organizations, and individuals in providing assistance to rural and urban landowners for soil surveys, soil and water conservation planning, urban erosion and sediment control, resource planning, watershed protection and flood prevention, and for application or practices and measures needed to protect and improve communities and the soil, water, forest, and wildlife resources.

Accelerated Program

The proposed accelerated land treatment and management program is shown in Table 45. This accelerated program would be carried out in the same manner as the on-going program described above. Since the on-going program depends on the voluntary cooperation of individual landowners, an educational effort specifically geared to those needing early action is required to alert these owners of their opportunities and responsibilities. As landowner requests for technical and financial assistance increase, additional funds for technical assistance and cost sharing should be made available to reduce runoff, erosion, and sediment production upstream from recommended reservoirs. This program will cost nearly $3.2 million.

Critical Areas Program

This program is summarized in Table 46. The land treatment and revegetation of surface-mined areas need to be implemented as part of the mine drainage pollution abatement measures discussed under Water Quality Management Measures. The land treatment on "Other Surface Mined Areas" would be implemented to protect these critically eroding areas. Additional funds will be needed to carry out the critical area treatment program. This program will cost nearly $4.2 million.

Stream Management

The Coordinating Committee recommends that management of the streamside areas to realize their recreational potential be imple-

TABLE 45

PROPOSED ACCELERATION OF LAND TREATMENT WITHIN PROJECT AREAS - EARLY ACTION PROGRAM[1/]

Sub-basin	Total Area within Projects	Total Project Land Treatment Needs	Accelerated Land Treatment Program (Costs - thousands of dollars) Amount of Proposed Acceleration	Installation	Technical Service	Total
I	236,000	124,000	27,000	416,000	212,000	628,000
II	216,000	132,000	31,000	563,000	253,000	816,000
III	147,000	96,000	25,000	399,000	199,000	598,000
IV	20,000	13,000	2,000	43,000	23,000	66,000
V	71,000	47,000	12,000	151,000	121,000	272,000
VI	37,000	24,000	8,000	87,000	54,000	141,000
VII	103,000	66,000	15,000	208,000	117,000	325,000
VIII	110,000	57,000	11,000	214,000	100,000	314,000
TOTAL	940,000	559,000	131,000	2,081,000	1,079,000	3,160,000

[1/] Project areas are defined as the area behind structural measures or upstream watershed projects.

TABLE 46

PROPOSED LAND TREATMENT ON CRITICAL AREAS - EARLY ACTION PROGRAM

Type of Critical Area	Total Acres to be Treated	Amount to be treated with Acceleration (acres)	Cost of Acceleration (thousands of dollars) Installation	Technical	Total
Strip Mine Spoil	111,300[1/]	38,910	1.520	510	2,030
Coal Mine Refuse	11,700	4,090	1,610	190	1,800
Other Surface Mined Areas	16,600	5,800	240	80	320
TOTAL	139,600[1/]	48,800[2/]	3,370	780	4,150

1/ Does not include 31,570 acres of culm piles and surface mined areas which are not feasible to treat with vegetative means, or which will go into other uses, such as roads, shopping centers, etc.

2/ Forest Service portion = 39,100 acres and $2,130,000
SCS portion = 9,700 acres and $2,020,000

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t possible, at the local level. With the exception
Creek from Ansonia to Blackwell, which is included
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e taken at an early date to protect the selected
ment that would adversely affect their recreational
The Coordinating Committee encourages local gov-
ning, purchase, or other development controls, to
le use of streamside locations for recreation,
servation of scenic values. The spirit of this
urge the responsible local authorities to give
streamside land use in their jurisdictions, so
planned development occurs through both public
investments and efforts. However, local zoning
ir enforcement) are necessary to manage these
or the enhancement of their recreational and

available under the Land and Water Conservation
88-578) to State, county, and local governments
ition, or development of selected streamside areas
recreational use, as well as under the Open Spaces
s included in Title VII of the Housing and Urban
961, as amended. Under the Land and Water Con-
am, a comprehensive statewide outdoor recreation
rojects undertaken by the State, consistent with
are eligible for up to 50 percent matching funds.
cost of streamside recreation land and facilities
action period is summarized in Table 47. Appendix
onal information on annual costs and benefits.

nt

g Committee has not estimated the costs for the
flood plain management, except for the supporting
nt studies, listed in Table 48. The flood
sures would have to be implemented locally, although
rs could fully fund and carry out the flood plain
. The Coordinating Committee recognizes that
n management will cost many times more than the
nation studies and subsequent technical assistance
s of Engineers, and the flood warning network of
eau (see Appendix K(3)).

TABLE 47
FIRST COST OF STREAMSIDE RECREATION LAND
AND FACILITIES IN EARLY ACTION PLAN

Sub-basin No.	Total Land and Facilities Cost ($1000)
I	4,130.95
II	290.05
III	1,659.25
IV	1,462.35
V	1,186.85
VI	2,729.95
VII	15,894.85
VIII	479.20
Total	27,833.45

TABLE 48
COSTS OF RECOMMENDED FLOOD PLAIN
MANAGEMENT STUDIES

Sub-basin	Project	Estimated Cost
I	Great Bend to Binghamton	$58,000
I	Chenango Bridge to Binghamton	37,000
I	Endicott-Johnson City-Vestal	41,000
I	Marathon*	32,000
II	Corning to Elmira	55,000
III	Bloomsburg	34,000
III	West Pittston to Plymouth	50,000
III	Scranton	38,000
III	Berwick (for low dam)	11,000
V	Lock Haven*	30,000
V	Jersey Shore to Moutoursville	57,000
V	Muncy	33,000
V	Milton	30,000
V	Lewisburg	32,000
V	Mill Hall to Lock Haven	36,000
VI	Altoona to Tyrone	49,000
VI	Lewistown (for low dam)	10,000
VII	Duncannon (for low dam)	4,000
VII	Harrisburg (Paxton Creek)*	39,000
Total		$668,000

* To assist in effective implementation and management of recommended local flood protection project.