Interstate Commission on the Delaware River Basin

The Delaware River Basin Physical Facts

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The Delaware River Basin

PHYSICAL FACTS

A GRAPHIC COMPENDIUM
CONTAINING MAPS and CHARTS

THE INTERSTATE COMMISSION
ON THE DELAWARE RIVER BASIN
PHILADELPHIA PENNSYLVANIA

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BROAD STREET STATION BUILDING
PHILADELPHIA, PENNSYLVANIA

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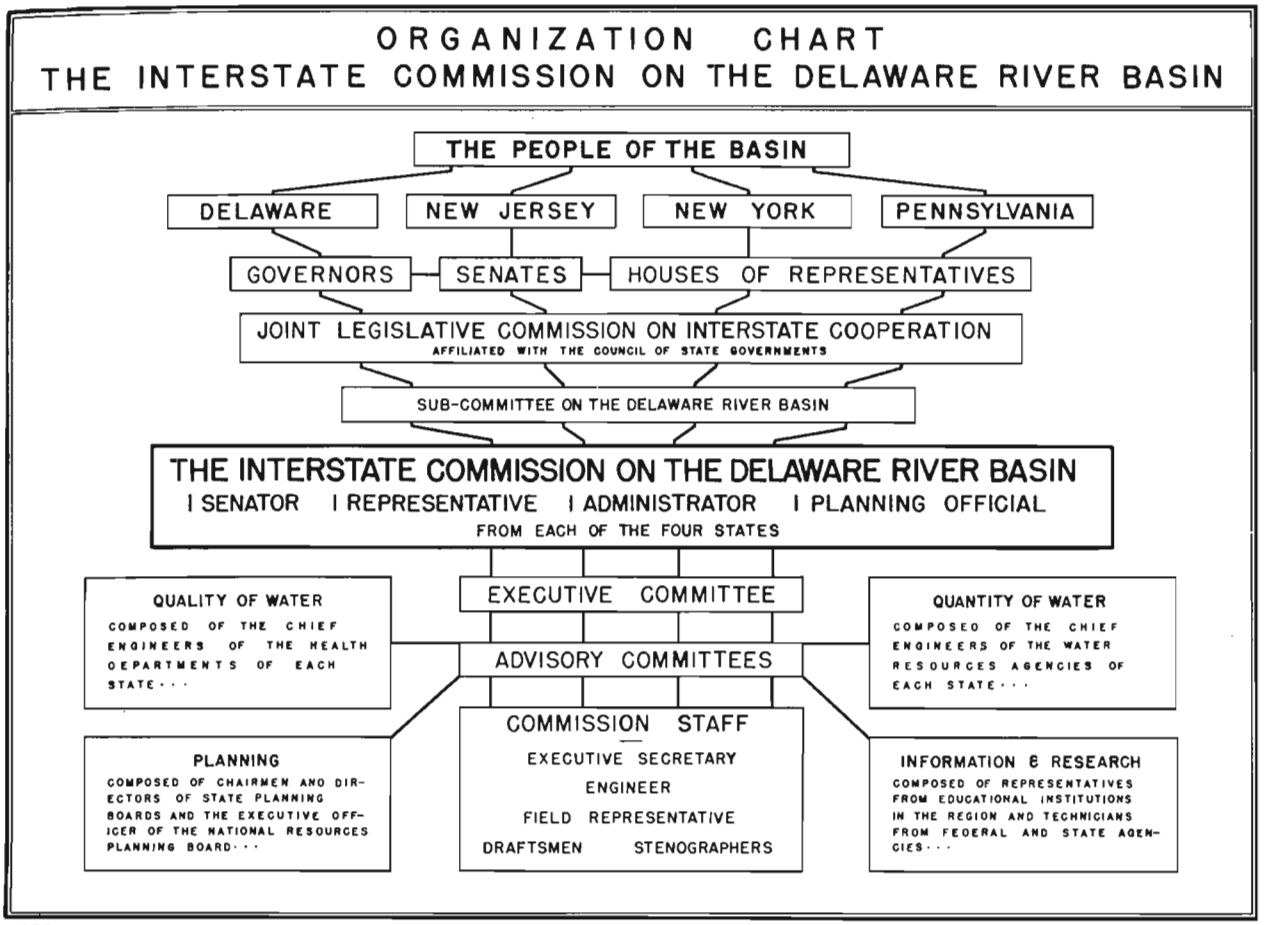

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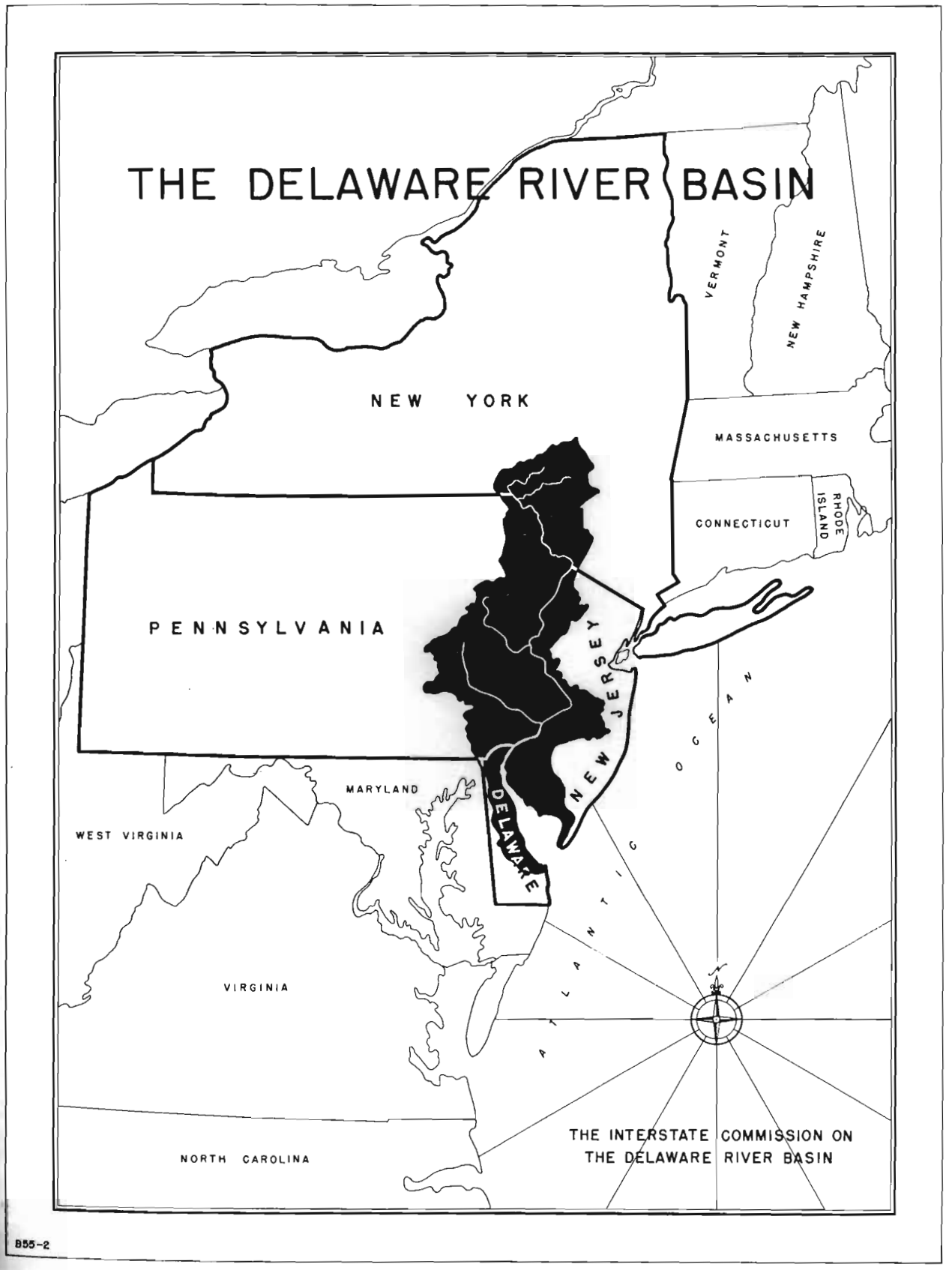
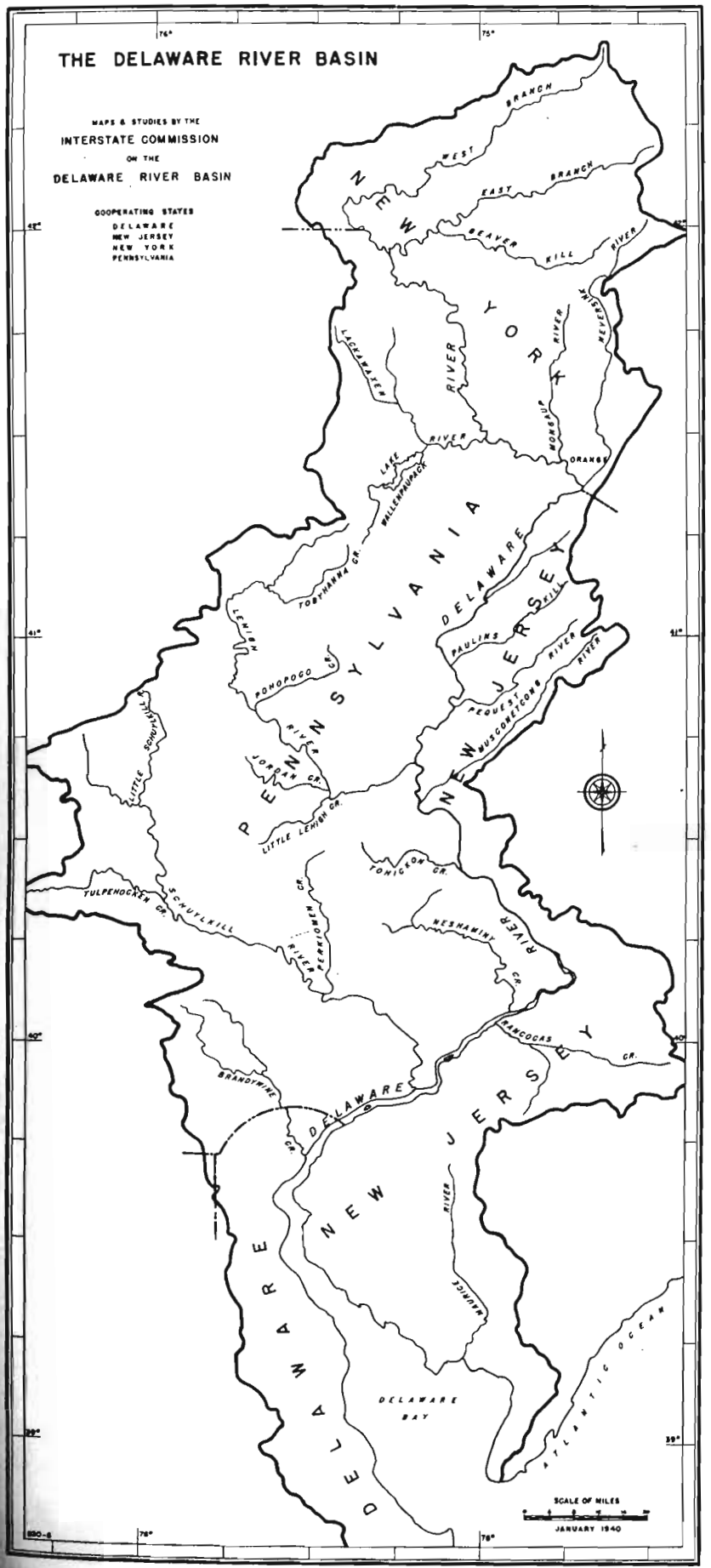
ORGANIZATION CHART

The Interstate Commission on the Delaware River Basin is a joint governmental agency of the States of Delaware, New Jersey, New York, and Pennsylvania. As the above organization chart indicates, Incodel derives its authority from Joint Legislative Commissions on Interstate Cooperation which have been established by law in the States of Delaware, New Jersey, New York, and Pennsylvania.

As a counterpart of the Cooperation Commission, Incodel seeks to supplement state administration of related land and water resources problems in the interstate Delaware River Basin by supplying the individual states with machinery for cooperating with one another, as well as with federal agencies.

Some of the physical facts with which the state governments are concerned in approaching a solution to major problems of land and water use and control in this drainage area are graphically illustrated on the following pages: supplementary maps and charts will be issued from time to time for insertion.





The Delaware River Basin

Rising on the western slopes of the Catskill Mountains in the State of New York, the Delaware River flows in a southwesterly direction as the East and West Branches to the "Wedding of the Waters" at Hancock, New York. From Hancock, the river flows southward 326 miles to the sea as a boundary water, first dividing New York and Pennsylvania, then New Jersey and Pennsylvania, finally New Jersey and Delaware.

The drainage basin which the Delaware system serves in the four states has an area of 12,757 square miles, distributed as follows:

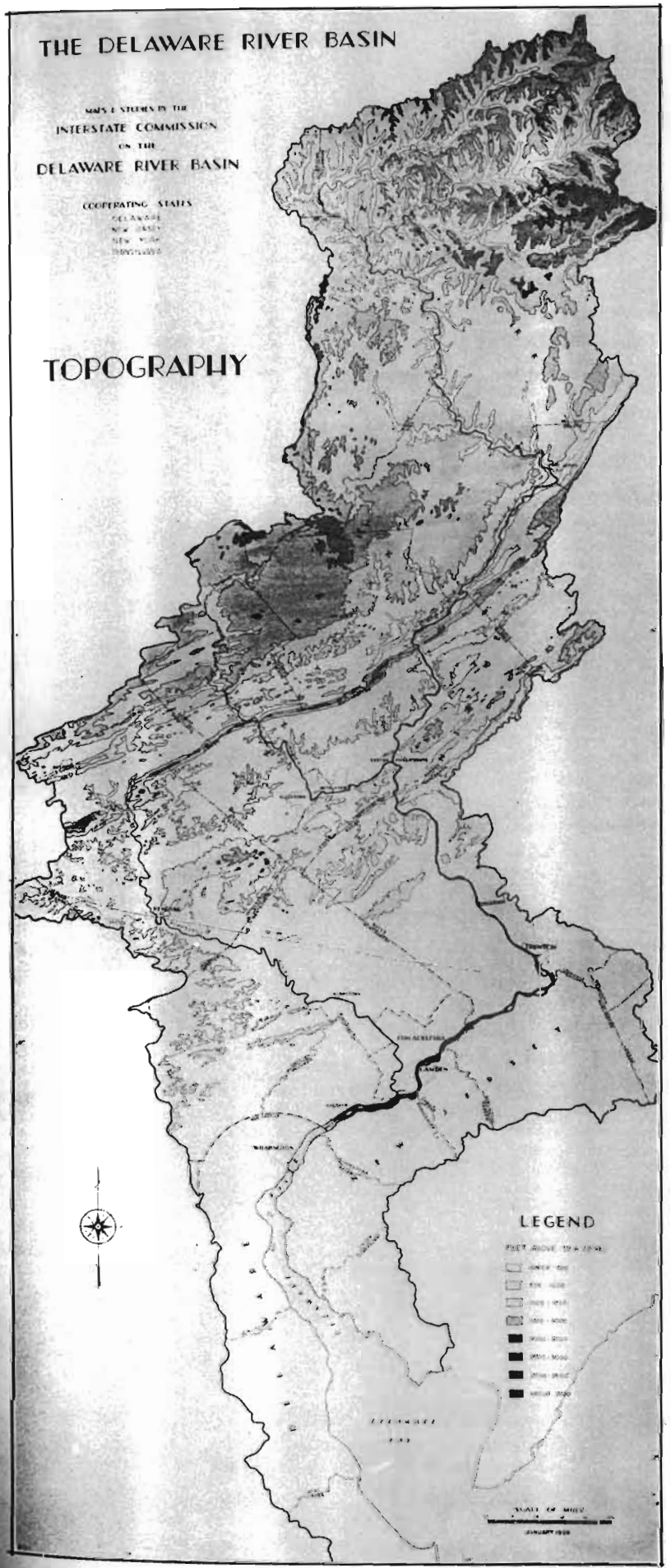
State	Drainage Basin Area	
	Square Miles	Per Cent
Pennsylvania	6,422	50.3
New Jersey	2,969	23.3
New York	2,362	18.5
Delaware	1,004	7.9
TOTAL	12,757	100.0

In New York the more important tributaries are the West Branch, the East Branch and its largest tributary the Beaver Kill, the Neversink River, and the Mongaup River.

In Pennsylvania, the two largest tributaries of the Delaware River are the Lehigh and the Schuylkill Rivers.

In New Jersey, the Paulkins Kill, the Pequest River and the Musconetcong River are important tributaries by reason of being potential sources of public water supply for metropolitan areas in that state. In the Maurice River section of the Bay are located 50,000 acres of oyster beds, producing four million bushels of oysters annually.

In Delaware, the northern part of the state is drained by the Brandywine Creek and the Christiana River, with their tributaries.



Physical Geography

TOPOGRAPHY

The Delaware River Basin lies within five of the principal physiographic provinces of the eastern United States.

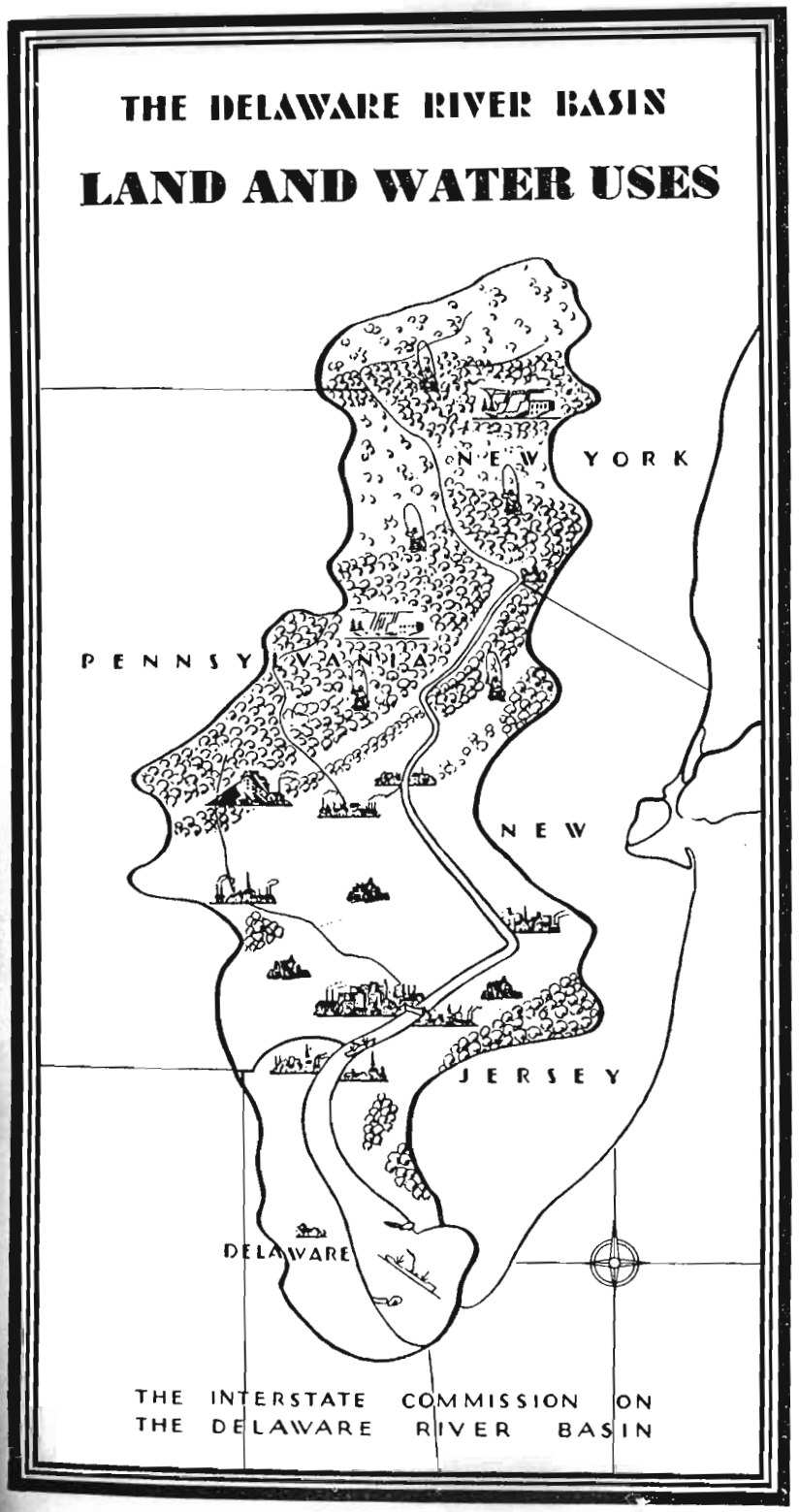
Above Port Jervis, the Basin falls within the Interior Plateau, represented on the northeast by the Catskill Mountains and on the southwest by the Pocono Plateau. The valleys of this region were filled with heavy deposits of debris during the glacial period and subsequent erosion has removed only a portion of these deposits: the region is rugged and mountainous, abounding in lakes and ponds.

The Appalachian Folds, characterized by a series of high parallel mountain ridges separated by relatively narrow valleys, occurs in that section of the Basin which is tributary to the river between Port Jervis and Delaware Water Gap. The general direction of these ridges and valleys is northeast-southwest, the main courses of the river piercing the ridges in canyon-like gaps. At the Delaware Water Gap, the river cuts through the Kittatinny Mountain Ridge.

Between the Water Gap and Easton, the Delaware River drains a region referred to as the Taconic Deformation Belt, which is characterized by rolling hills underlain by limestone and slates.

The Atlantic Highlands occur in the section of the Basin between Easton and Trenton. The channel of the river in this region first pierces irregular ridges and hills of ancient granite, then cuts a deep valley between high cliffs of red sandstone, and at Lambertville crosses a range of hills of trap rock, reaching the "Fall Line," the boundary between the ancient granites and gneisses, at Trenton.

Between Belvidere, the southern terminal of the glacial boundary, and Trenton, solid rock is exposed in the bed of the stream in many places, and probably would be found at shallow depths at all points. The Atlantic Coastal Plain, characterized by flat topography, occupies most of the section of the Basin below Trenton.



Land and Water Uses

The Delaware River and its tributaries flow through land characterized by a wide diversification of uses.

In the Upper Delaware Basin, above Trenton, lies an area more than three-fifths forested, with a population of only three-quarters of a million people. In the Lower Delaware Basin, from Trenton to the sea, there is massed over three-fourths of the total population of the watershed, densely urbanized and highly industrialized.

The Upper Delaware Basin, including the main stream, its tributaries, and a large number of natural lakes, is an area of great scenic beauty and charm. Recreation is its major industry, now and for the future. Well developed and widely diversified manufacturing industries in the Lower Delaware Basin, advantageously located in reference to transportation and distribution centers, reach their heaviest point of concentration in the Philadelphia-Camden metropolitan area and continue downstream to the Bay. In the latter area, commercial fisheries and oyster beds are predominant interests.

From its source in the Catskills of New York to its outlet to the Atlantic through Delaware Bay, the river and its tributary watershed lend themselves to an endless variety of uses and interests.

Political Subdivisions

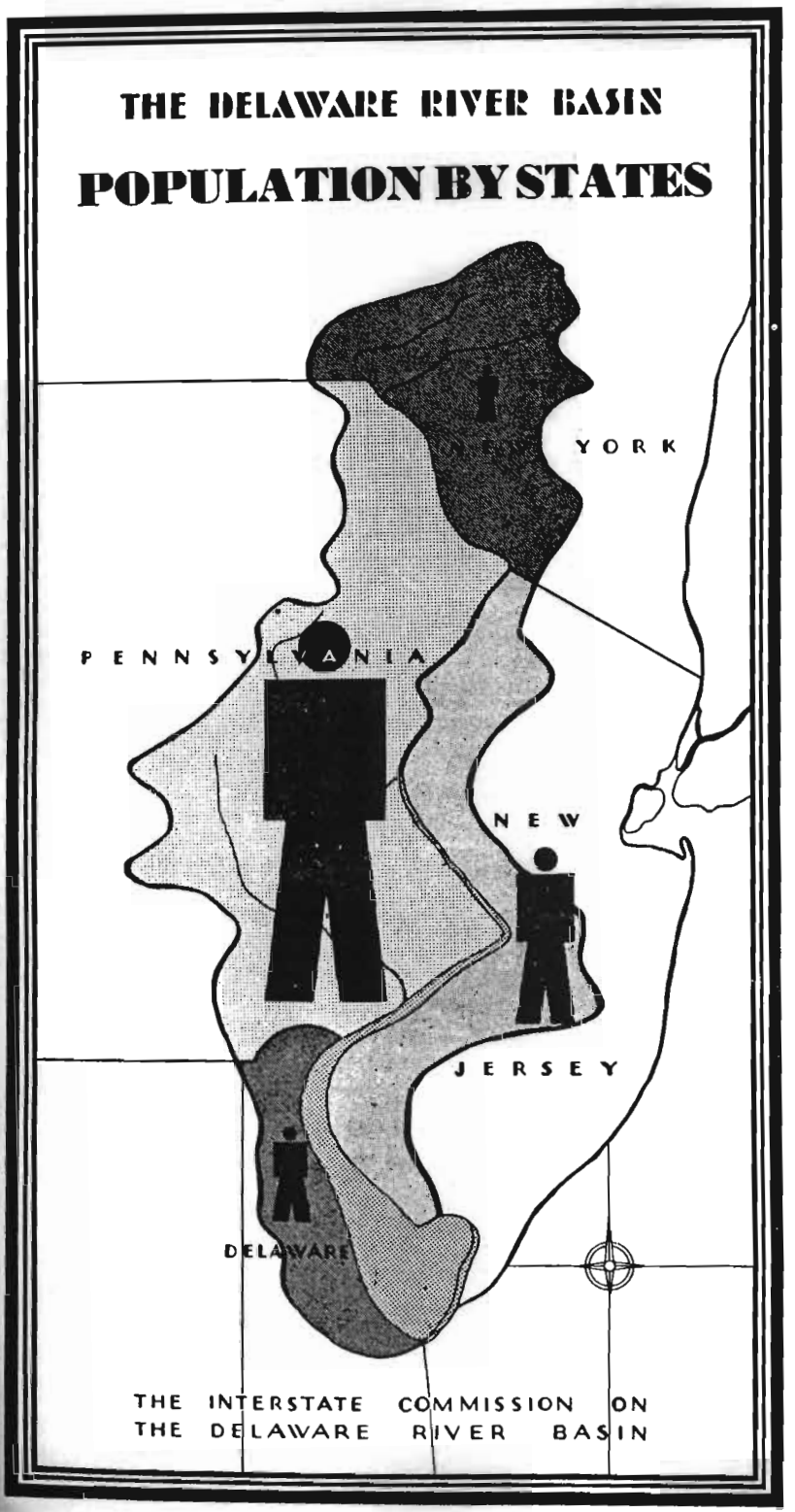
Within the 13,000 square miles of area in the four states which comprise the Delaware River Basin—a region which is only about two automobile hours wide and seven, long—are 838 separately incorporated political subdivisions. These consist of 38 counties, 24 cities, 299 boroughs, towns or villages, and 477 townships or towns.

In Pennsylvania, the primary divisions of the counties are townships, cities and boroughs. In New Jersey, an additional unit, the town, of which there are four, has been grouped with boroughs. In New York, towns correspond to townships in New Jersey and Pennsylvania; villages correspond to boroughs.

The division of political jurisdictions by states is as follows:

	Counties	Cities	Boroughs Towns Villages	Townships
Delaware	3	3	31	0
New Jersey	13	11	70	126
New York	6	1	15	39
Pennsylvania	16	9	183	312
TOTAL	38	24	299	477

The greatest concentration of political subdivisions occurs in Camden County, New Jersey, which has one city and 27 boroughs within an area of 53 square miles, and in Delaware County, Pennsylvania, in which there is one city and 25 boroughs having an average area of only .92 square miles.



Population by States

In 1930, the total population of the Delaware River Basin, from federal census figures, was 4,598,000. The distribution of this population, by states, as shown graphically on the attached illustration, is as follows:

Population of Delaware River Basin 1930	
Delaware	189,000
New Jersey	770,000
New York	75,000
Pennsylvania	3,564,000
TOTAL	4,598,000

Population by Political Subdivisions

The distribution and the concentration of population in the Basin, as of 1930, is illustrated graphically on the accompanying map entitled "Population By Political Subdivisions." This drawing distinguishes between centers of population, represented by cities, boroughs, villages, and other incorporated municipalities, and the usually less densely populated township, or town, subdivision.

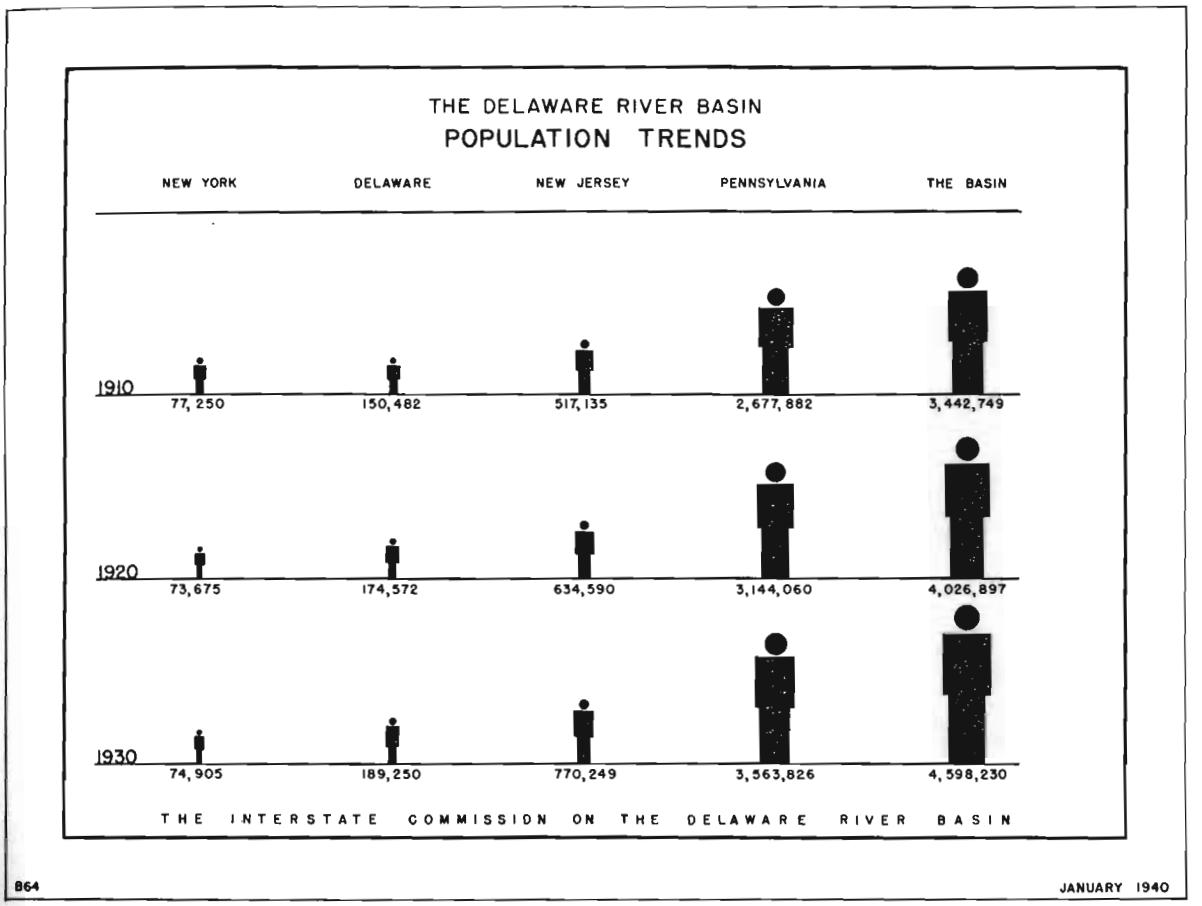
Circles, proportionate in size to the relative population of respective municipalities, urban and rural, have been used to illustrate urban centers, whereas a system of cross-hatch symbols pictures the population of township units.

The influence of metropolitan areas such as Philadelphia, Camden, Wilmington, and Trenton in attracting heavily concentrated densities of population to their surrounding areas is clearly brought out by this study.

Similarly, the location of large natural waterways such as the Lehigh and Schuylkill Rivers, the location of lines of transportation, the occurrence of mineral resources, and the relative productivity of soils are other powerful factors of influence in shaping the population pattern.

Approximately three-fourths of the inhabitants of the Delaware River Basin reside in urban communities, having a population greater than 2,500. There are 128 such municipalities in the Basin, which are classified according to population groupings in the following manner:

Population Groups	Number of Municipalities	Total Population
Over 1,000,000	1	1,950,961
100,000 to 150,000	4	459,824
50,000 to 100,000	3	209,619
25,000 to 50,000	3	88,721
10,000 to 25,000	16	227,706
5,000 to 10,000	36	253,247
2,500 to 5,000	65	242,122
TOTAL	128	3,432,200



Population Trends

The total population of the Delaware River Basin increased from 3,442,749 to 4,598,230, or 34 per cent from 1910 to 1930. The respective rate of increase according to states was: New Jersey, 46 per cent; Pennsylvania, 33 per cent; and Delaware, 26 per cent. In New York a decrease of 3 per cent occurred during the twenty year period.

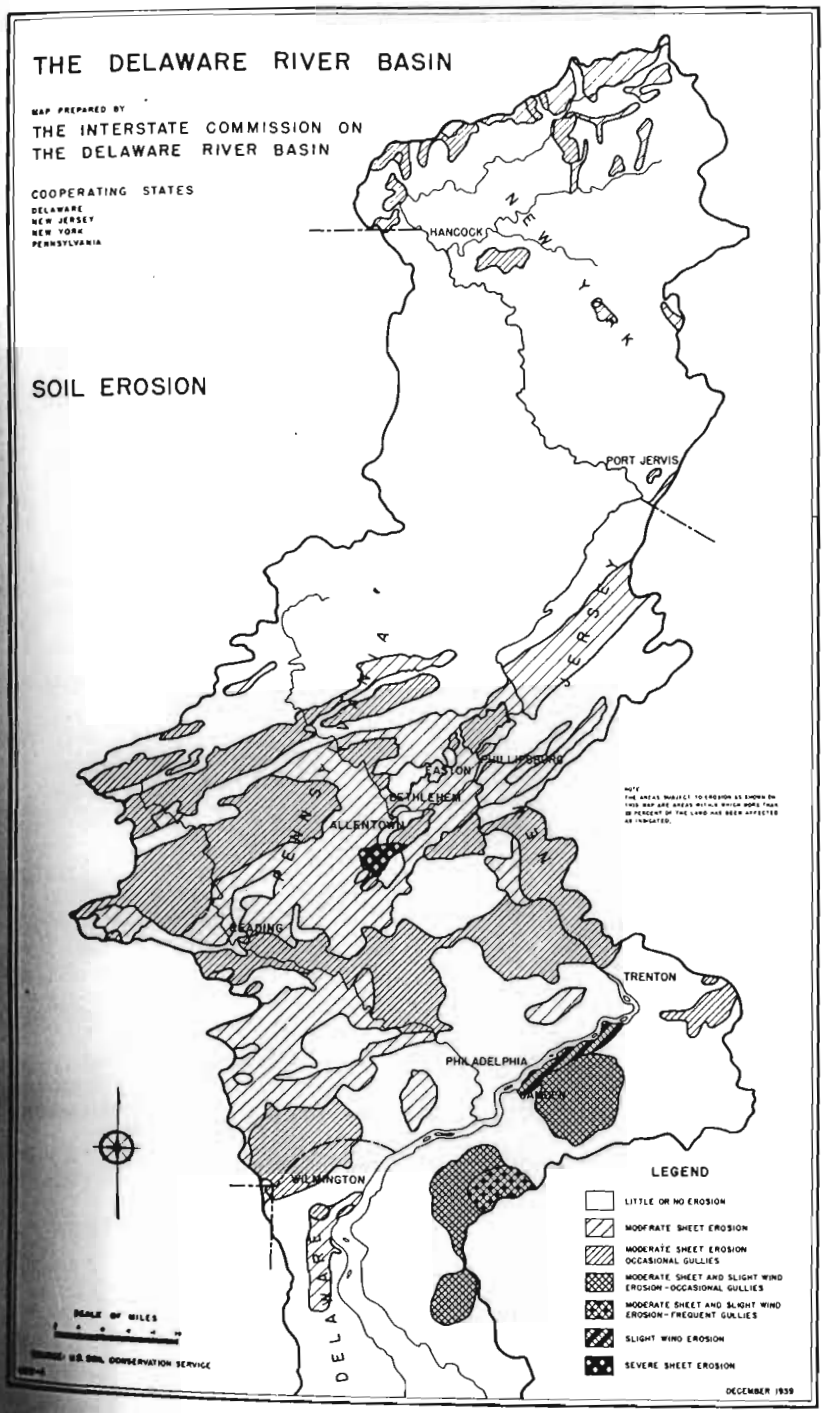
Existing Use of Land

Approximately 4,200 square miles of the total 13,000 square miles of land area in the Delaware River Basin is in forest or wild land, most of which is located in the upper part of the Basin, above Delaware Water Gap. About 8,200 square miles is in open land, principally used for agriculture; about 200 square miles is in tidal marsh. Only 400 square miles, less than 3 per cent of the entire land area of the Basin is devoted to urban and industrial use.

The proportion of each state section of the Basin, classified according to existing use of land, is shown in the following summary:

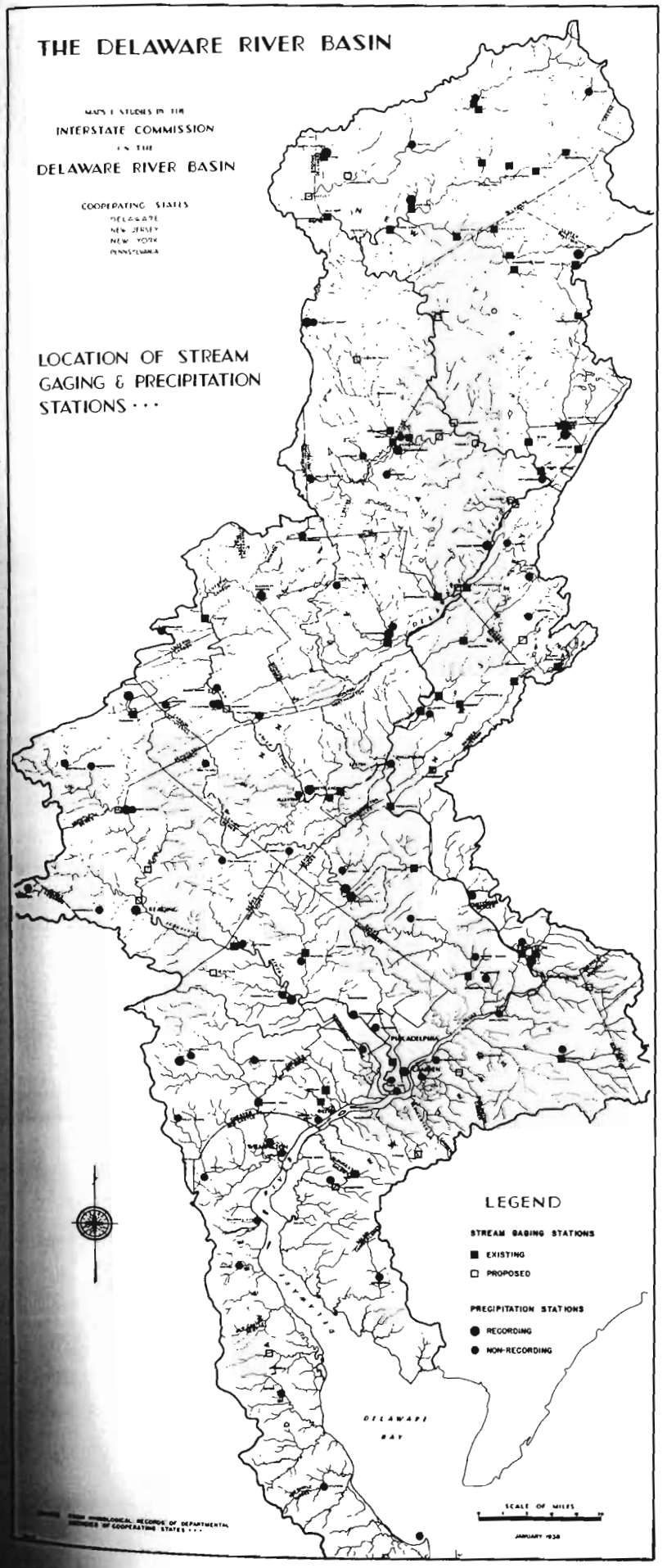
Per Cent of Land Area Devoted To Various Existing Uses

	Forest	Open	Marsh	Urban
Delaware	15	73	10	2
New Jersey	25	69	2	4
New York	60	39	0	1
Pennsylvania	30	66	0	4
TOTAL	32	62	3	3



Soil Erosion

Soil erosion, "the removal or wearing away of the land surface by active agencies, usually running water or wind", affects approximately 40 per cent of the land surface of the Delaware River Basin. Most of this occurs in the open land sections which have been cleared and cultivated. It is particularly noticeable in the Lehigh and Schuylkill valleys in Pennsylvania and in southern New Jersey. The heavily forested and mountainous Pocono and Catskill areas are practically free of erosion.



Location of Precipitation and Stream Gaging Stations

Precipitation and stream flow records are of basic value in formulating a comprehensive program of development and conservation of water resources.

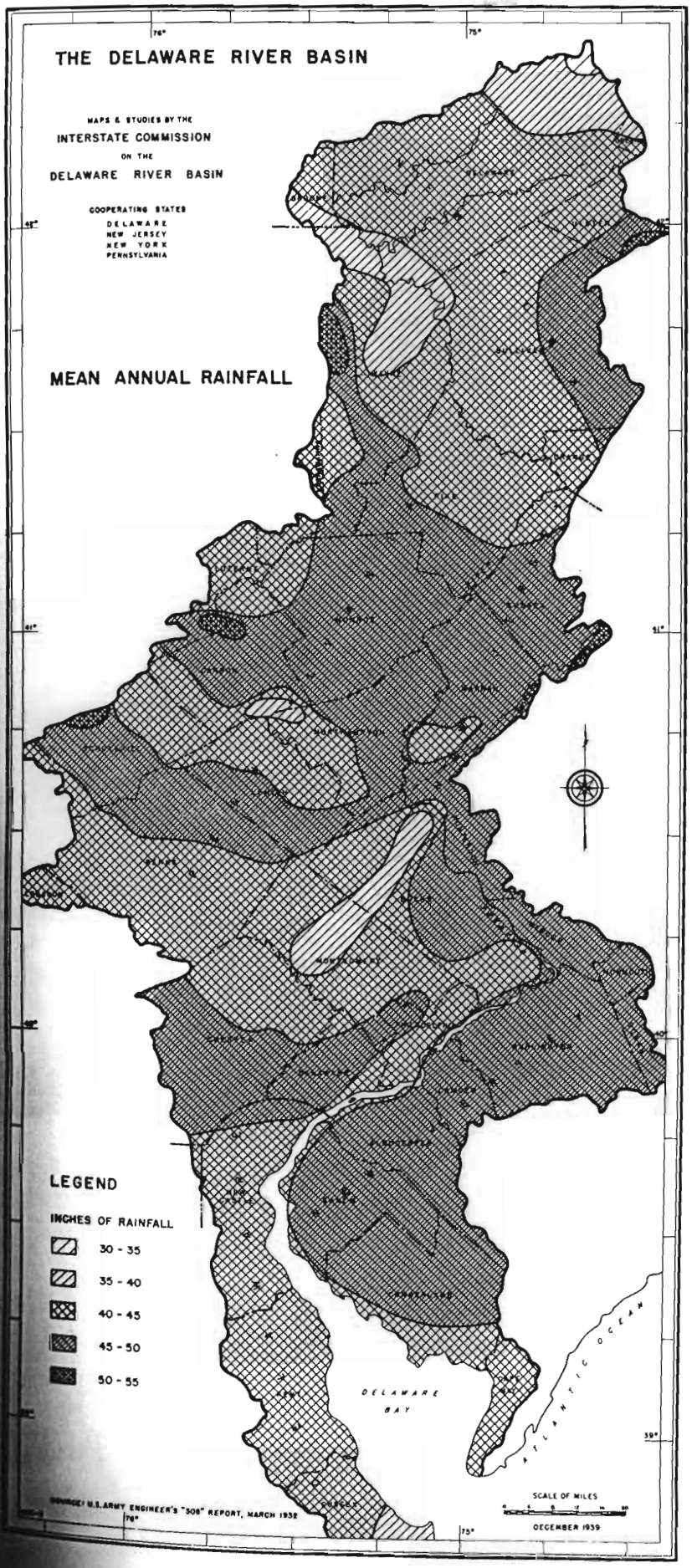
Precipitation Stations

At the present time 87 stations are being maintained in the Basin to measure rainfall, of which 19 are of the automatic type which record both variations in intensity of rainfall as well as total precipitation. The United States Weather Bureau maintains and operates most of these stations, including the automatic facilities at Philadelphia, Trenton, and Reading. The Pennsylvania Department of Forests and Waters operates 12 automatic stations; the United States Geological Survey and the Pennsylvania Power and Light Company maintain one station each.

In addition to the rainfall stations shown on this map, there are 6 recording and 13 non-recording stations which have recently been established in the southern part of the basin by the United States Soil Conservation Service. It is understood that these stations have been set up for special research investigations.

Stream Gaging Stations

Stream flow investigations have been carried on in the Basin by the United States Geological Survey, in cooperation with the states' water resources agencies, for the past 35 years. As a result, run-off data recorded at stream gaging stations, in most cases for long periods, now are available for many of the more important streams. At the present time there are 50 stations in operation. The location of the gaging stations, both rainfall and stream flow, are indicated on the accompanying map. Separate studies, showing additional rainfall and run-off data also are available.



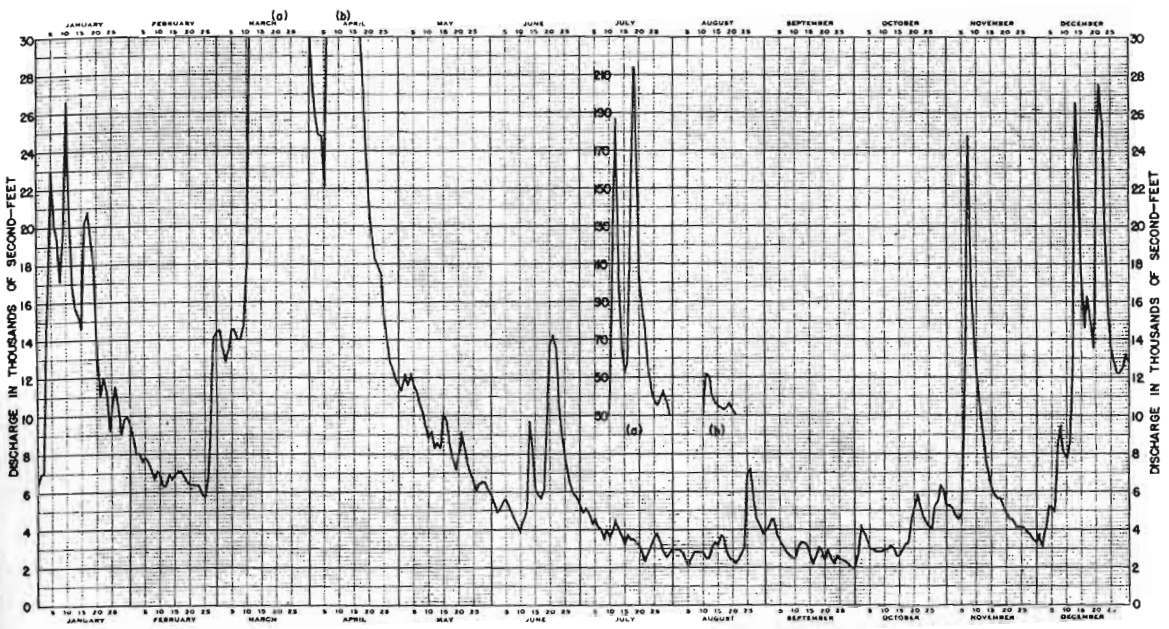
Mean Annual Rainfall

This illustration, derived from records in the Army Engineers so-called "308" Report on the Delaware River graphically shows the distribution of average annual rainfall in the Delaware River watershed. The general average ranges from 40 to 50 inches in most of the Basin; only one per cent of the area is subject to more than 50 inches of rain and about six per cent to less than 40 inches.

According to the report referred to above, the distribution of rainfall throughout the year is remarkably uniform: more than a century of record for Philadelphia shows that the rate for August, the month of maximum precipitation, is only 126 per cent of the average for the year while the rate for the month of least rainfall is approximately 90 per cent of the mean annual.

STREAM & STATION LOCATION	DRAINAGE AREA (Square Miles)	AVERAGE RUN-OFF (M.G.D. per Sq. Mi.)	PERIOD OF RECORD (Oct. 1 to Sept. 30)
19. Delaware—Port Jervis	3076	1.170	1904 to 1939
3. Delaware—Belvidere	4542	1.142	1922 to 1937
4. Delaware—Riegelsville	6344	1.123	1906 to 1939
5. Delaware—Trenton	6796	1.109	1913 to 1939
NEW YORK TRIBUTARIES			
16. Beaver Kill—Cooks Falls	241	1.527	1914 to 1938
17. Beaver Kill—Craigie Clair	82	*	*
20. E. Br. Delaware—Fishs Eddy	783	1.410	1913 to 1938
21. E. Br. Delaware—Harvard	443	1.360	1934 to 1937
22. E. Br. Delaware—Marbaretville	163	*	1937
23. W. Br. Delaware—Delhi	142	*	1937
24. W. Br. Delaware—Hale Eddy	593	1.183	1913 to 1938
25. Little Beaver Kill—Livingston Manor	20	1.554	1924 to 1937
26. Little Delaware River—Delhi	50	*	1937
27. Mill Brook—Arena	25	*	1937
28. Mongaup—Rio	209	*	*
29. Neversink—Godeffroy	302	1.482	1937 to 1939
30. Neversink—Halls Mills	68	*	1937
31. Neversink—Oakland Valley	222	1.301	1928 to 1937
32. Neversink—Woodburne	113	*	1937
33. Terry Clove Kill—Pepacton	14.1	*	1937
34. Tremper Kill—Shavertown	33	*	1937
35. Willowemoc Creek—Livingston Manor	63	*	1937
NEW JERSEY TRIBUTARIES			
1. Assunpink—Trenton	89	0.974	1923 to 1937
2. Beaver Brook—Belvidere	36	0.876	1922 to 1937
6. Flat Brook—Flatbrookville	65	1.051	1923 to 1937
8. Maurice River—Norma	113	1.091	1932 to 1933 1934 to 1937
7. Manantico Creek—Millville	22.3	1.124	1931 to 1937
9. Musconetcong River—Bloomsbury	143	0.975	1921 to 1937
10. Musconetcong River—Hackettstown	70	1.027	1921 to 1937
11. " River—Outlet of Lake Hopatcong	25.6	1.031	1928 to 1937
12. Oldmans Creek—Woodstown	19.3	0.850	1931 to 1937
13. Paulins Kill—Blairstown	126	0.920	1921 to 1937
14. Pequest River—Pequest	108	0.886	1921 to 1939
15. Rancocas Creek—North Branch Pemberton	111	0.873	1921 to 1937
PENNSYLVANIA TRIBUTARIES			
36. Brandywine Creek—Chadds Ford	287	0.854	1911 to 1938
37. Bushkill Creek—Shoemakers	117	1.307	1908 to 1916 1920 to 1938
38. Chester Creek—Chester	61.1	1.222	1931 to 1938
39. Lackawaxen River—Hawley	290	*	1938
40. Lackawaxen River—West Hawley	206	1.107	1924 to 1938
41. Lehigh River—Bethlehem	1280	1.121	1928 to 1938
42. Lehigh River—Tannery	322	1.353	1914 to 1915 1919 to 1926 1927 to 1938
43. Little Schuylkill River—Tamaqua	42.9	1.398	1916 to 1917 1919 to 1938
44. McMichaels Creek—Stroudsburg	64.4	1.228	1911 to 1918 1920 to 1938
45. Neshaminy Creek—Langhorne	210	0.695	1934 to 1938
46. Perkiomen Creek—Graters Ford	279	0.950	1914 to 1916 1926 to 1938
47. Ridley Creek—Moylan	31.9	0.881	1931 to 1938
48. Schuylkill River—Philadelphia	1893	0.888	1903 to 1912 1931 to 1938
49. Schuylkill River—Pottstown	1147	1.032	1927 to 1938
50. Tohickon Creek—Pipersville	97.4	1.003	1935 to 1938
51. Wallenpaupack Creek—Wilsonville	228	1.065	1913 to 1922 1925 to 1938

*Average rate of run-off not determined for these locations as gaging stations have been in operation since only 1937 or 1938.



DELAWARE RIVER AT TRENTON, N.J. FOR YEAR 1936

Hydrographs

Complete sets of hydrographic charts showing the daily stream flow at specified points on the Delaware River and its tributaries were developed in 1929 and 1930 in connection with the prosecution of the Delaware Diversion Case before the Supreme Court of the United States. The Interstate Commission on the Delaware River Basin has brought these records up-to-date and now currently maintains complete sets, for the following locations and periods of record:

Location	Period Beginning
1. East Branch of the Delaware River at Hancock and Fish Eddy.	1902
2. West Branch of the Delaware River at Hancock and Hale Eddy.	1902
3. Delaware River at Port Jervis.	1904
4. Delaware River at Belvidere.	1923
5. Delaware River at Riegelsville.	1906
6. Delaware River at Trenton.	1913

A reproduction of a sample sheet, for the year 1936, from the set of hydrographs for the Delaware River at Trenton is shown above.

Status of Water Supply by Political Subdivisions

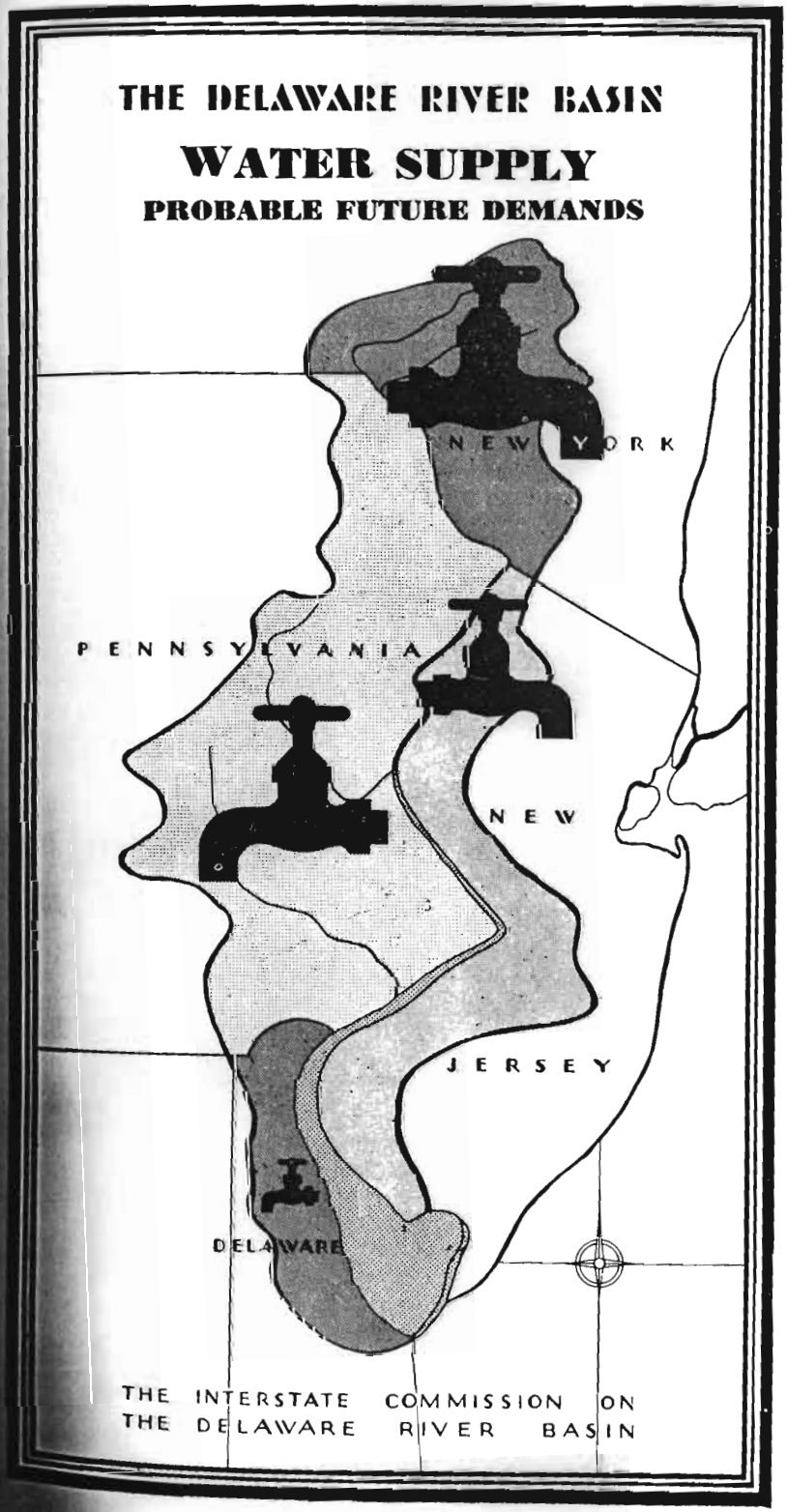
Approximately 180 water supply systems furnish water for consumption by the four million persons living in incorporated cities, towns, boroughs, and villages in the Basin. Ninety-nine of the systems are publicly owned, 78 are privately owned, and 4 are operated under dual public-private ownership.

Fifty-one communities in the Basin receive their water from surface sources, 96 from underground supplies, and 34 are served by both surface and underground waters.

With the exception of the Camden area, most of the large municipalities obtain their water from surface supplies.

The classification of sources of water supply, and type of ownership, is shown, by states, in the following summary:

	Source of Supply Under-			Type of Ownership		
	Surface	Ground	Both	Public	Private	Both
Delaware	1	11	—	10	2	—
New Jersey	9	39	8	40	15	1
New York	10	1	3	9	5	—
Pennsylvania	31	45	23	40	56	3
TOTAL	51	96	34	99	78	4



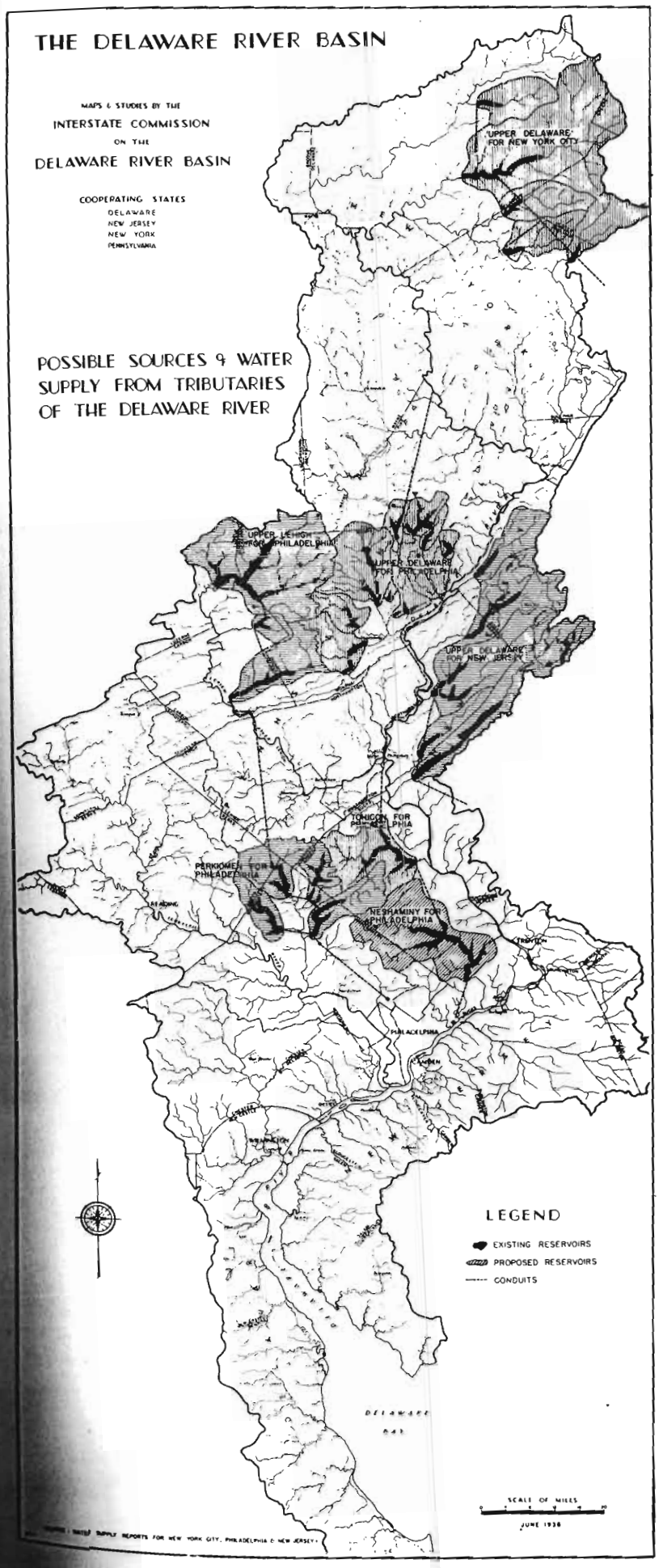
Water Supply
Probable Future Demands

Two billion gallons of water daily may be required from the Delaware River and its tributaries, by 1980, to meet the anticipated domestic demands of the people of New York, New Jersey, and Pennsylvania. This estimated quantity assumes that Pennsylvania will require 672 million gallons of water daily for the Philadelphia metropolitan area; that the needs of New York City will account for the diversion of 1,040 million gallons daily; and that northeastern New Jersey municipalities will require 573 million gallons daily.

New York City is now constructing a reservoir-aqueduct water supply project in the Upper Basin which will divert 440 million gallons of water daily from tributaries of the Delaware in New York State.

New Jersey's 50 per cent population increase from 1910 to 1930, coupled with increasing industrialization, indicates increased demands for additional water, particularly in the northeastern part of the state.

Philadelphia's water supply, taken from the Delaware and Schuylkill Rivers, has long been criticized: whether the city decides to protect its present sources by completing its comprehensive plan of sewage collection and treatment, or whether it will be in a position to seek a new source of supply from upland areas, in either event, demands on the Delaware will be increased.



Possible Sources of Water Supply from Delaware River Tributaries

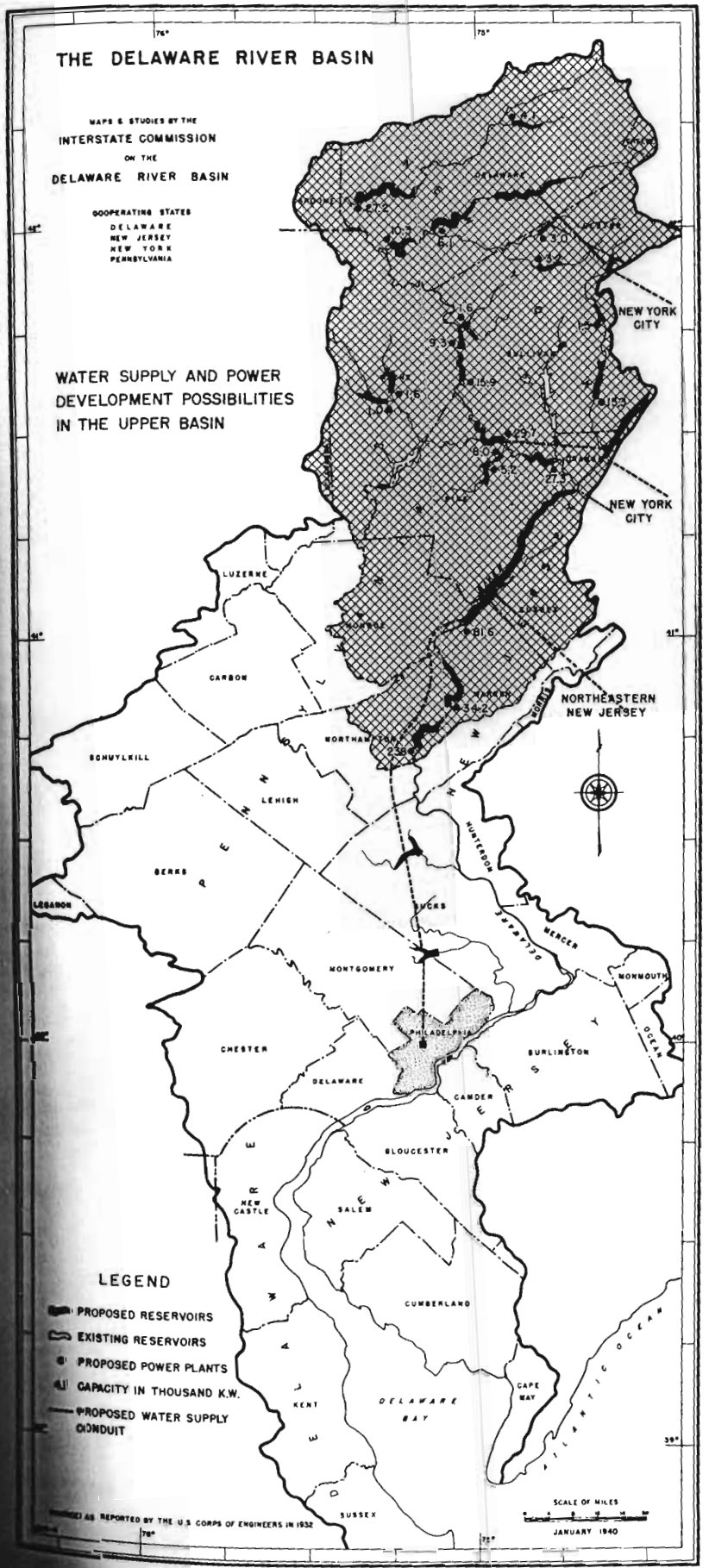
Most of the important proposals which have been advanced from time to time recommending the development of tributaries of the Delaware River for metropolitan water supply projects are indicated on the accompanying map.

For the past twenty years, the metropolitan regions of New York City, northeastern New Jersey and Philadelphia, containing about one-eighth of the total population of the United States, have been almost constantly confronted with water supply problems. The rapidity of growth of these highly urbanized centers has caused existing sources of water supply to become inadequate in quantity or unsuitable in quality.

Since 1920, these water supply problems have been subjected to study by a variety of official boards and commissions. During this period, New Jersey has considered at least eight different plans of future water supply involving the use of water from the Delaware River Basin, the most recent being the proposal of Governor Moore to utilize the Delaware and Raritan Canal properties and rights-of-way for a metropolitan water supply.

In Pennsylvania, the proposals for new and additional water supplies for Philadelphia and the surrounding metropolitan area, include studies by at least twelve agencies, involving many alternate plans, all including the utilization of the water resources of the Delaware River Basin.

In New York, New York City having completed a major water supply development in the early twenties soon sought additional water from the upper portion of the Delaware River Basin for the city's mounting requirements.

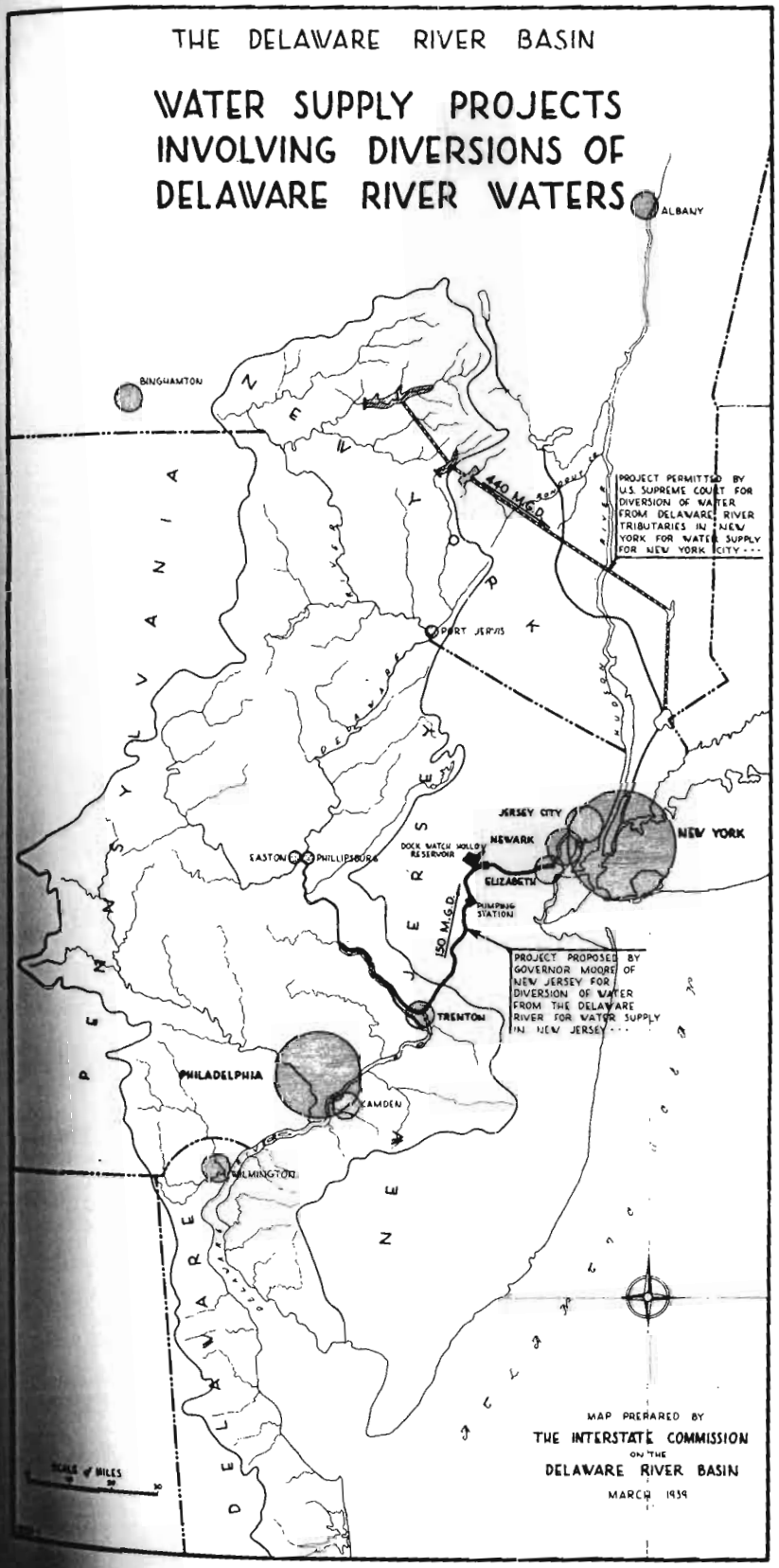


Water Supply and Power Development Possibilities in the Upper Basin

Shortly after the United States Supreme Court decree in the Delaware River Case, in March, 1932, the United States Army Engineers released a report on the Delaware River. While the original scope of this study, by law, was intended to be limited to navigation, hydro-electric power, flood control, and irrigation it was found that the Delaware investigation could not be complete or conclusive without consideration of water supply.

In order to meet the estimated future water requirements of the three metropolitan areas—New York City, Philadelphia, and northeastern New Jersey—and at the same time provide for the development of hydro-electric power, a project, designated Combination Project No. 2, was advanced under the section of the report entitled Coordination of Interests. This project involves the development of the 26 proposed power and storage sites, shown on this map, and was estimated to cost $390,000,000., including a capitalized credit from the sale of power amounting to $72,000,000.

In addition to meeting water supply requirements and providing for the production of power, the project also could be operated to maintain a regulated low water flow of 0.50 cubic feet per second per square mile of drainage area at Port Jervis and Trenton.

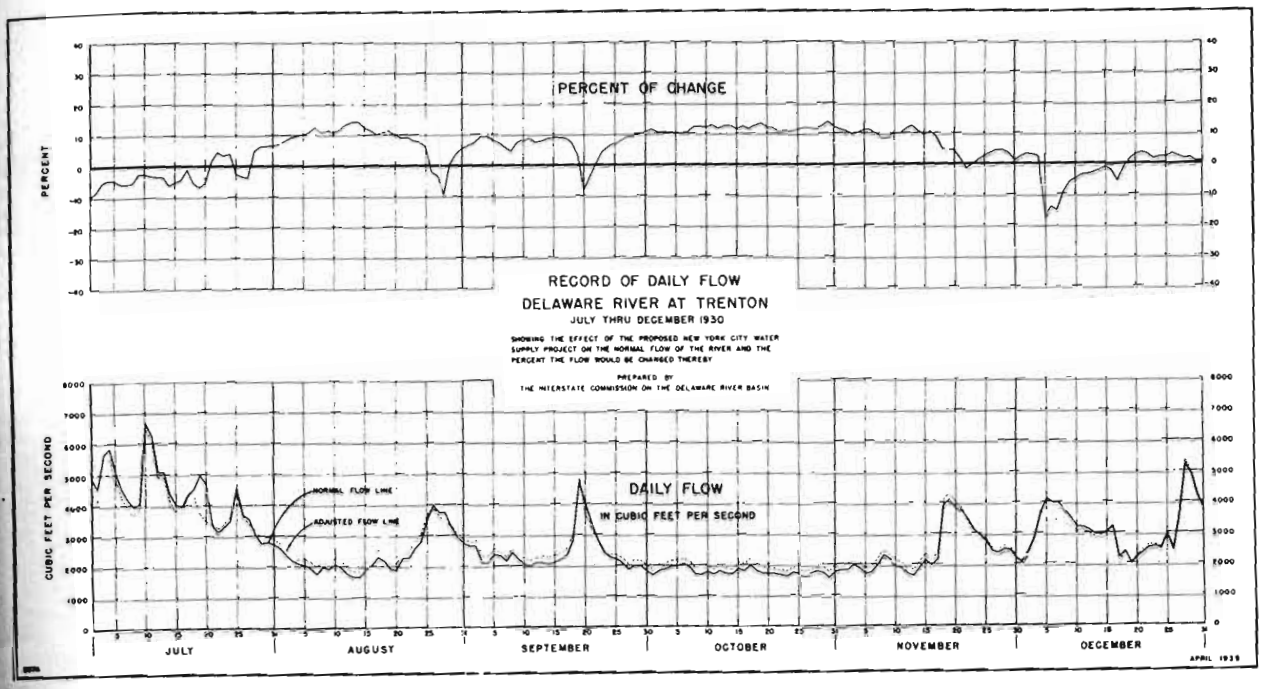


Water Supply Projects Involving Diversions of Delaware River Waters

The outcome of the Delaware Diversion Case was a denial of New Jersey's prayer that the State and City of New York be enjoined from diverting any water whatever from the Delaware River Basin. The Court, however, limited the permissible diversion to the equivalent of 440 million gallons of water daily and established conditions under which the diversion could be made including a rule for the release of compensating water for the augmentation of dry weather flows.

This map, titled, "Water Supply Projects Involving Diversions of Delaware River Waters", shows the location of the projects on the Neversink River and on the East Branch of the Delaware River from which the authorized diversion of 440 million gallons of water per day for New York City will be made. This project is now under construction and is scheduled to be in operation by 1945.

In addition, there is also shown a water supply proposal recently advanced in New Jersey for the diversion of 150 million gallons of water daily from the Delaware River at Bull's Island (20 miles above Trenton) to supply requirements in the northeastern New Jersey metropolitan area.



Effect of the Application of the U. S. Supreme Court Rule to Flows of the Delaware River at Trenton

July through December, 1930

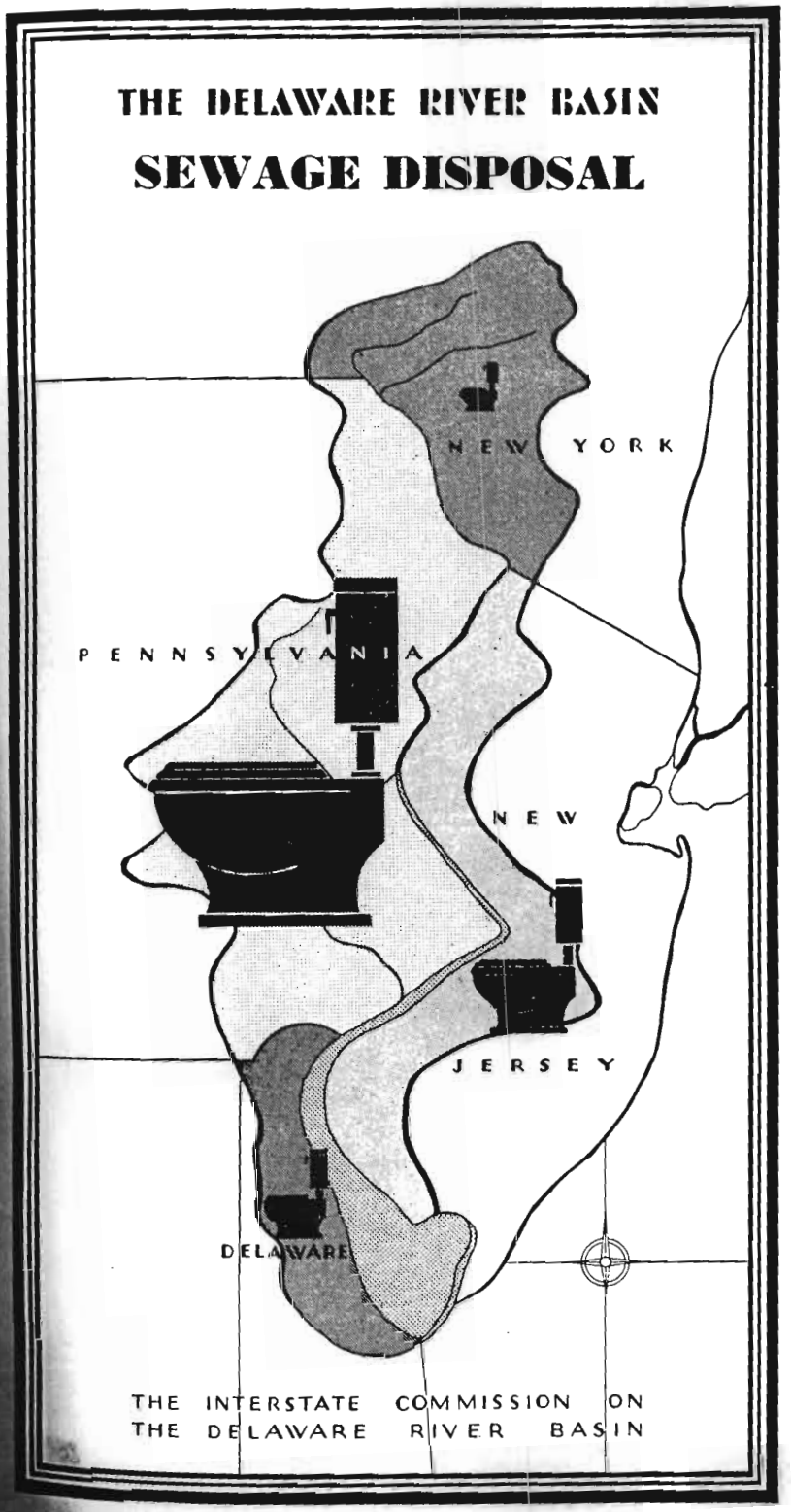
> "At any time the stage of the Delaware River falls below .50 c.s.m. at Port Jervis, New York or Trenton, New Jersey, or both (.50 c.s.m. being equivalent to a flow of 1535 c.f.s. at Trenton), water shall be released from one or more of the impounding reservoirs of New York City in sufficient volume to restore the flow at Port Jervis and Trenton, to .50 c.s.m., provided, however, that there is not required to be released at any time in excess of 30 per cent of the diversion area yield. . ."

Thus was the approaching diversion of 440 million gallons of water daily from the upper tributaries of the Delaware for New York City conditioned by the United States Supreme Court. The above rule was founded on the principle of requiring the release of compensating water during periods of low flow in order to remove the damage which the Court, through the Master, was of the opinion would otherwise be imposed upon the stream, particularly to recreational interests and oyster fisheries.

The above diagram illustrates the results of the application of this rule (as it is most commonly interpreted) to the flow conditions which existed at Trenton during the latter part of 1930, one of the most severe periods on record.

On the lower section of the chart, the actual flow of the river at Trenton is represented by the full line curve. Areas above the full line indicate quantities of compensating water which would have been released by New York, had this diversion project been in operation, and added to the actual flow of the stream. Areas below the full line show the decrease in actual flow by the operation of the New York diversion.

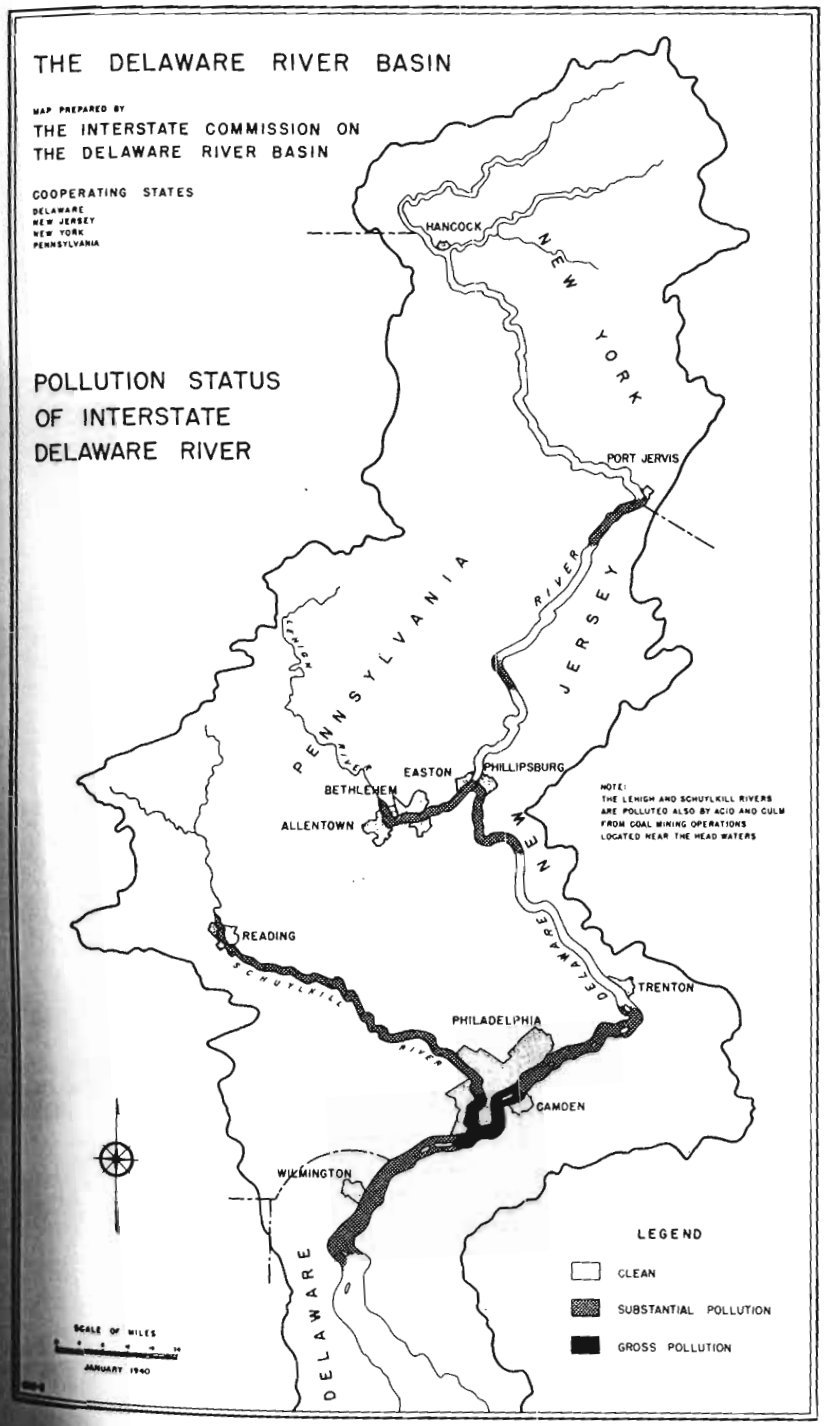
The upper half of the chart shows the percentage of increase effected by releases and diversions. A similar study is available for the flows in the river at Port Jervis.



Sewage Disposal

Since the time of the earliest settlement, the Delaware River and its tributaries have been the natural depository for wastes of all kinds. By diluting processes, the river can absorb large volumes of organic and trade wastes. But the gathering of hundreds of industries and the settling of millions of people in the Delaware Valley eventually produced too large and varied a load for the river to assimilate. Its volume of flow has remained almost unchanged, while the amount of domestic sewage discharged into the stream, treated and untreated, can be comparatively pictured by the accompanying illustration.

The total volume of domestic sewage which is discharged into the Delaware system of streams is estimated to amount to a half-billion gallons daily. Of this amount, Pennsylvania contributes more than 75 per cent; New Jersey, about 20 per cent; Delaware and New York combined, the remaining 5 per cent.



Pollution Status of The Interstate Delaware River

This map, based upon the results of sanitary surveys conducted in 1929 and 1937, shows the relative degrees of quality, or cleanliness, of the waters of the interstate Delaware River from their headwaters in the Catskills down to the Bay.

Above Easton-Phillipsburg, and the confluence of the Lehigh, the quality of the water, due to the relatively sparse population of the watershed and the consequent small number of sewered communities and industrial establishments producing wastes, is relatively clean. The zone of pollution below Port Jervis, created by the discharge of untreated sewage and industrial wastes from that municipality, soon will be eliminated.

Proceeding downstream the flow of the Lehigh River, coupled with the discharge of inadequately treated sewage and wastes from Easton and Phillipsburg, creates the second major zone of pollution in the Delaware. Due to the assimilating powers of the river, this is gradually absorbed and the stream again becomes relatively clean down to Trenton.

The tidal section of the river, below Trenton, comprises a large zone ranging from substantial pollution in its upper and lower limits to "one of the most grossly polluted areas in the United States" at Philadelphia and Camden. In this section of the river, from which the public water supplies of Philadelphia, Chester, and Bristol, in Pennsylvania, and Burlington, in New Jersey, are obtained, more than 400 million gallons of untreated domestic sewage and industrial wastes are discharged daily.

Status of Sewerage Systems

More than 80 per cent of the five million persons living in the Delaware River Basin enjoy the advantage of having a public sewerage system serve them in carrying domestic wastes away from their homes and places of occupation. Comparable attention however has not been given to protection against stream pollution through sewage treatment processes. The "used water" of approximately two-thirds of the Basin's population is discharged into the Delaware River and its tributaries without any effort to condition it properly for final disposal.

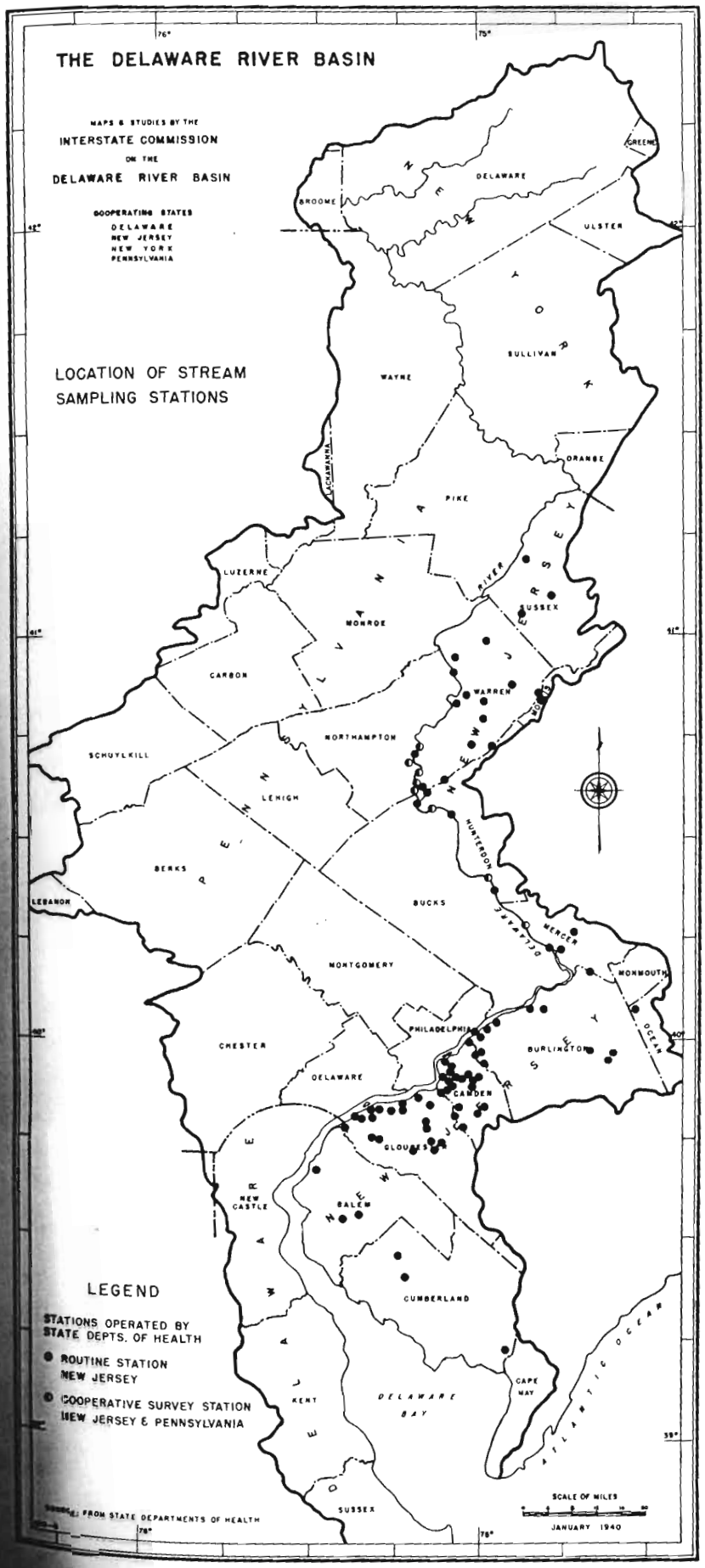
About three-fourths of the Basin's population lives within incorporated municipalities having a population of more than 2,500. Of the 128 such places within the Basin, 110 have a public sewer system. Sixty-seven of these, as well, have provided sewage treatment plants which condition approximately 36 per cent of the total volume of sewage before it is discharged into the Delaware River system.

More than 60 per cent of the total sewage load from urban municipalities, however, is contributed from Philadelphia and Camden. These two cities account for more than 50 per cent of the burden of untreated domestic sewage, which is dumped unwarrantedly into the waters of the river. If Philadelphia and Camden had kept pace with the other urban municipalities in meeting their respective responsibilities, more than 85 per cent, instead of 36 per cent, of the total volume of the Basin's domestic wastes would have been subjected to pollution correction processes.

The following tabulation summarizes the present status of sewage treatment in terms of percentage of population residing in incorporated urban municipalities.

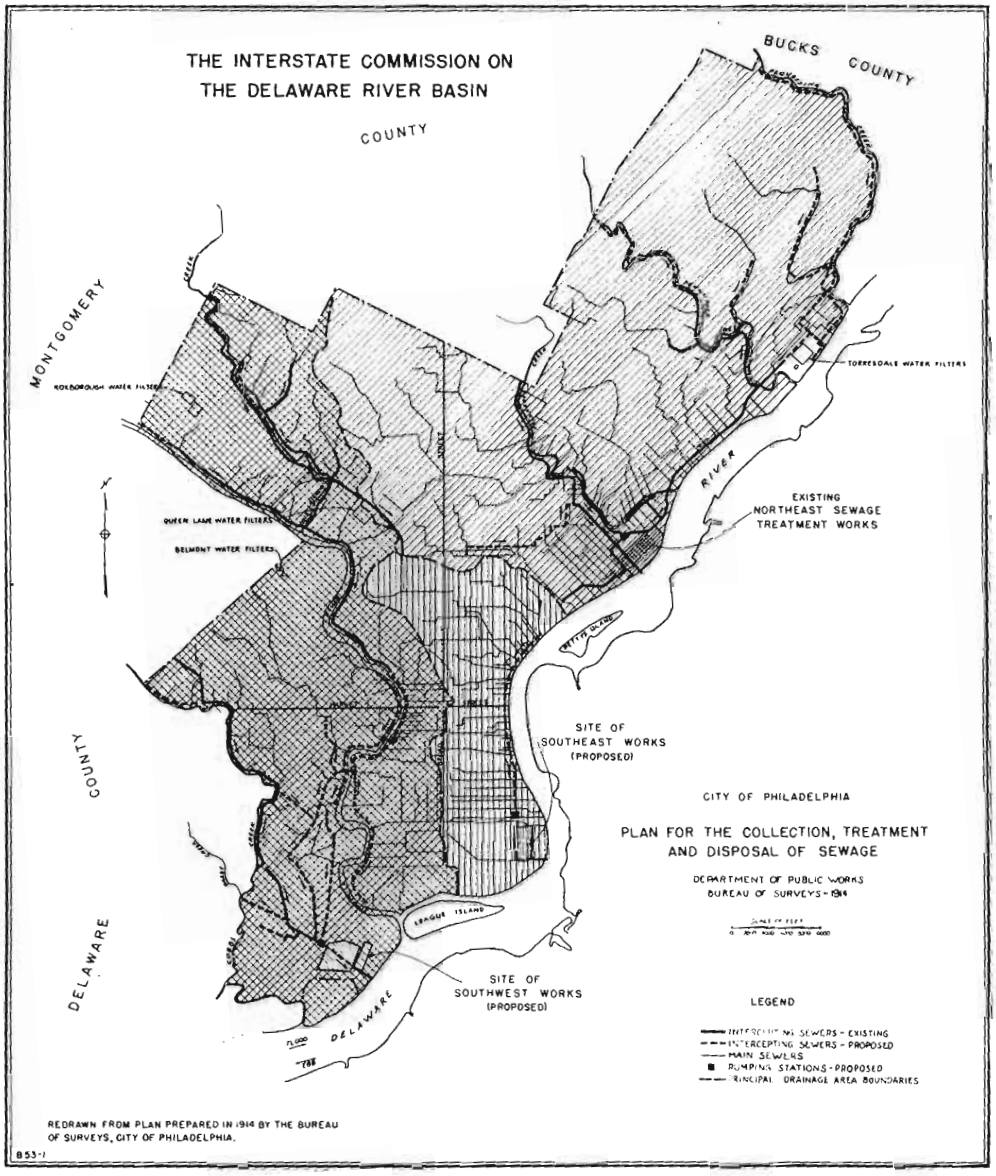
Status of Sewage Treatment
In Urban Municipalities In The Delaware River Basin

Population Classification	Number	Total Population	Per Cent Population Served By Sewage Treatment
Over 1,000,000	1	1,950,961	15
100,000 to 150,000	4	459,824	55
50,000 to 100,000	3	209,619	100
25,000 to 50,000	3	88,721	79
10,000 to 25,000	16	227,706	68
5,000 to 10,000	36	253,247	47
2,500 to 5,000	65	242,122	49
TOTAL	128	3,432,200	36



Location of Stream Sampling Stations

The New Jersey State Department of Health maintains a large number of stream sampling stations in the Delaware River and its tributaries from which water is taken periodically for chemical and bacteriological analyses. This work enables the Department to maintain a running record of sanitary conditions. It also is particularly advantageous in furnishing specific evidence upon which to base pollution abatement programs, and to measure the effectiveness of municipal sewage and industrial waste treatment installations.

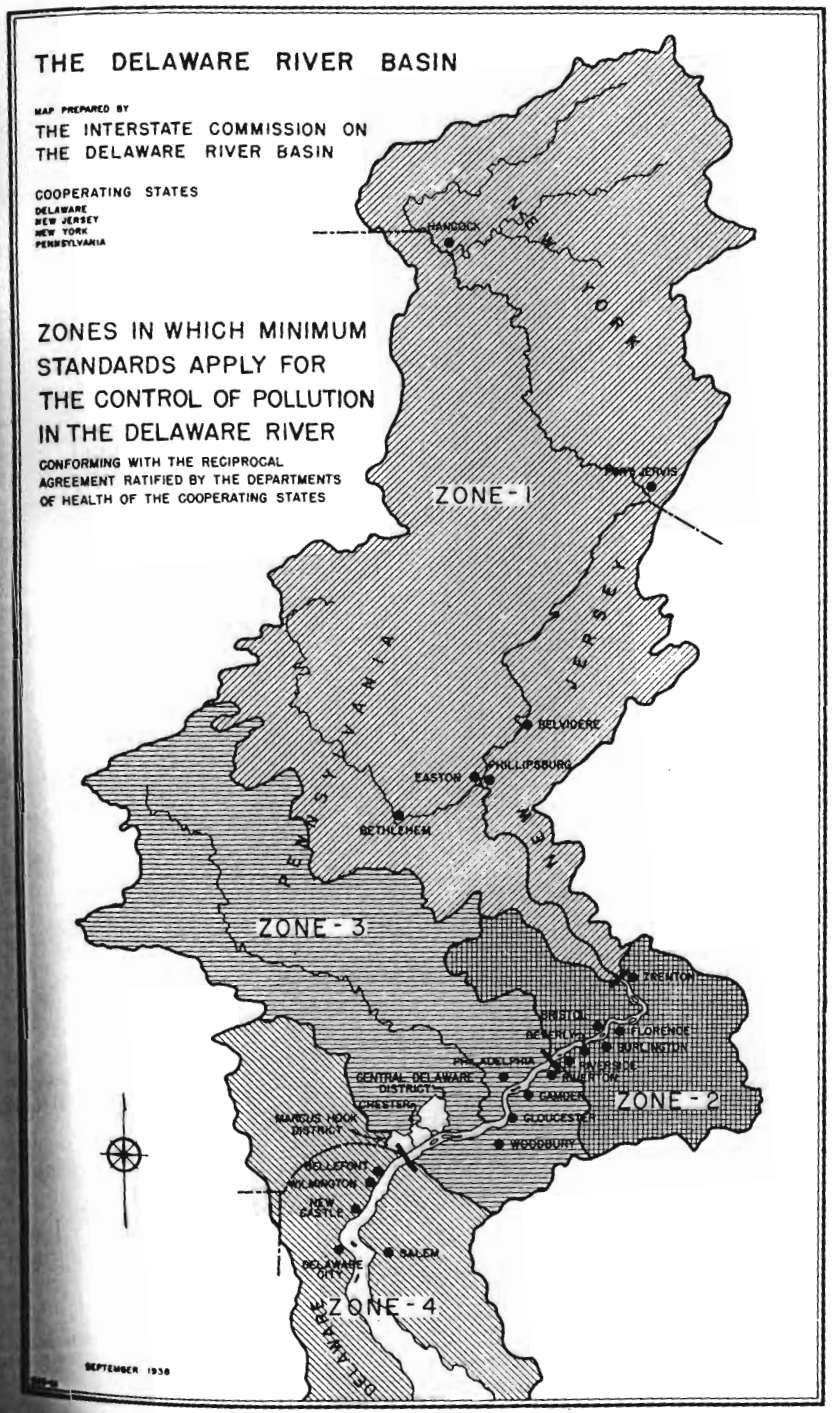


Plan for the Collection and Treatment of Sewage in Philadelphia

In 1914, after several years of intensive study, the Department of Public Works of the City of Philadelphia completed a comprehensive survey and report regarding the collection and treatment of domestic sewage of the city. This plan, as submitted to the Pennsylvania Department of Health, was approved in 1915.

It recommended the division of the city into three districts: the sewage from each was to be intercepted and conveyed to separate sewage treatment plants. The type of treatment was to consist of screening and sedimentation in Imhoff tanks, after which the effluents would be disposed of by diffusion into the Delaware River through submerged outfalls.

Based upon this plan, an agreement was made with the State Department of Health, whereby the city agreed to provide about $3,000,000 annually for sewage disposal works. Up to this time, a total of approximately $25,000,000, has been spent on the work outlined in the comprehensive plan, principally for work in the northeast division. No appropriations have been made for the past ten years, and the city is now far behind, to the extent of $30,000,000, in its sewage collection and treatment program.

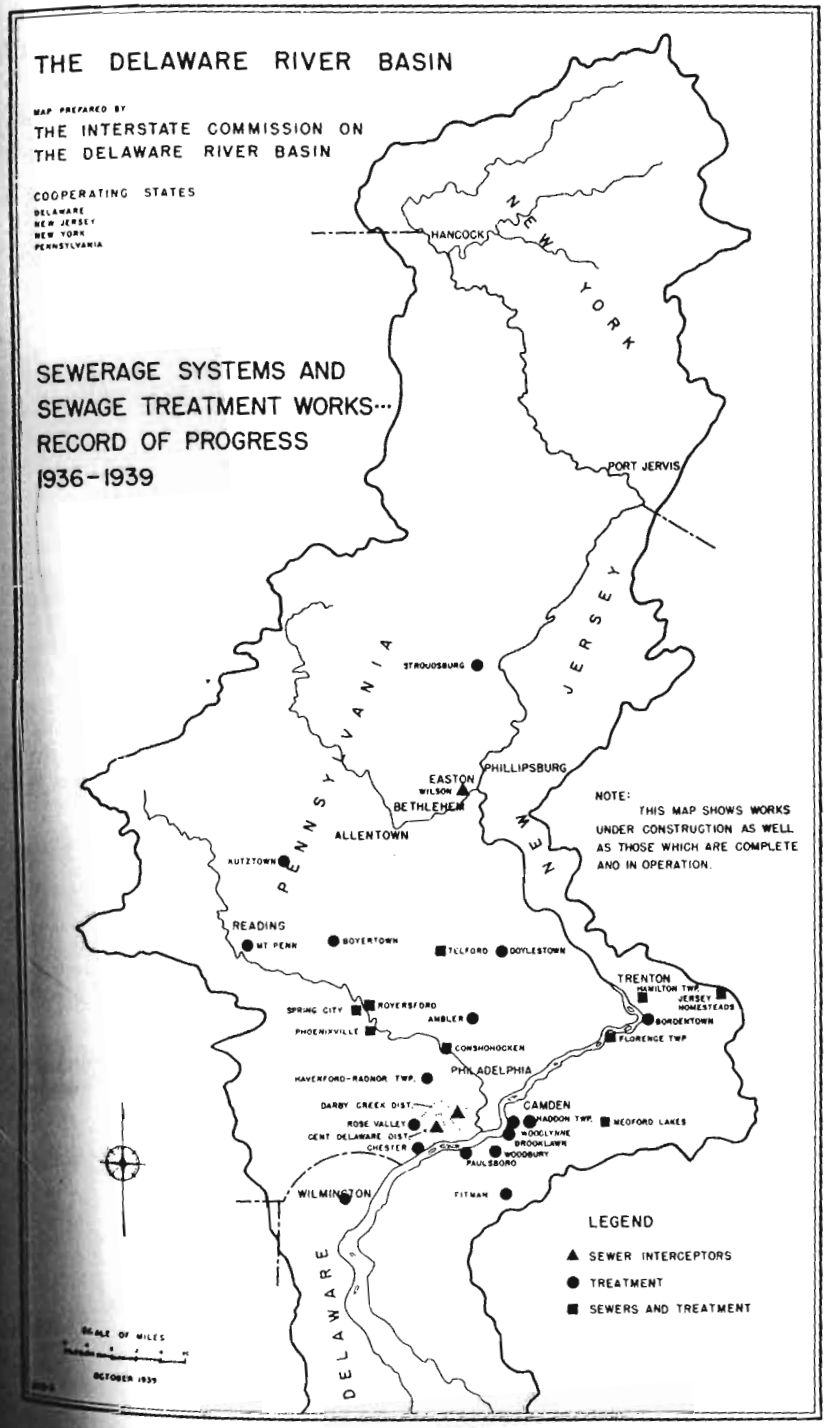


The Delaware River Basin: Zones

The key problem in planning for pollution abatement is to determine upon those reasonable standards of water quality for each section of a stream which express the best balance between the stream's use as a natural sanitation system and its use for other purposes, aesthetic and economic. In the Delaware River Basin, human use of land ond water varies as widely within the wotershed os does the quality and quantity of water.

To conserve and protect the land and water resources of the Upper Basin for their proper use as sources of public water supplies, after treatment or purification, and for recreational facilities; to preserve and improve public health, to protect and attract industry, to conserve fish and other aquatic life, to aid navigation in the Lower Basin, demands a restoration and maintenance of the purity of waters of the Delaware River and its tributaries through the adoption of standards of water quality based upon the natural condition of the water in relation to its present and potential use.

Practical application of this principle has been made in the Delaware River Basin by means of the geographical-areal divisions shown on this map which serve as the basis for the interstate plan of pollution abatement and control.



Record of Progress: 1936-39

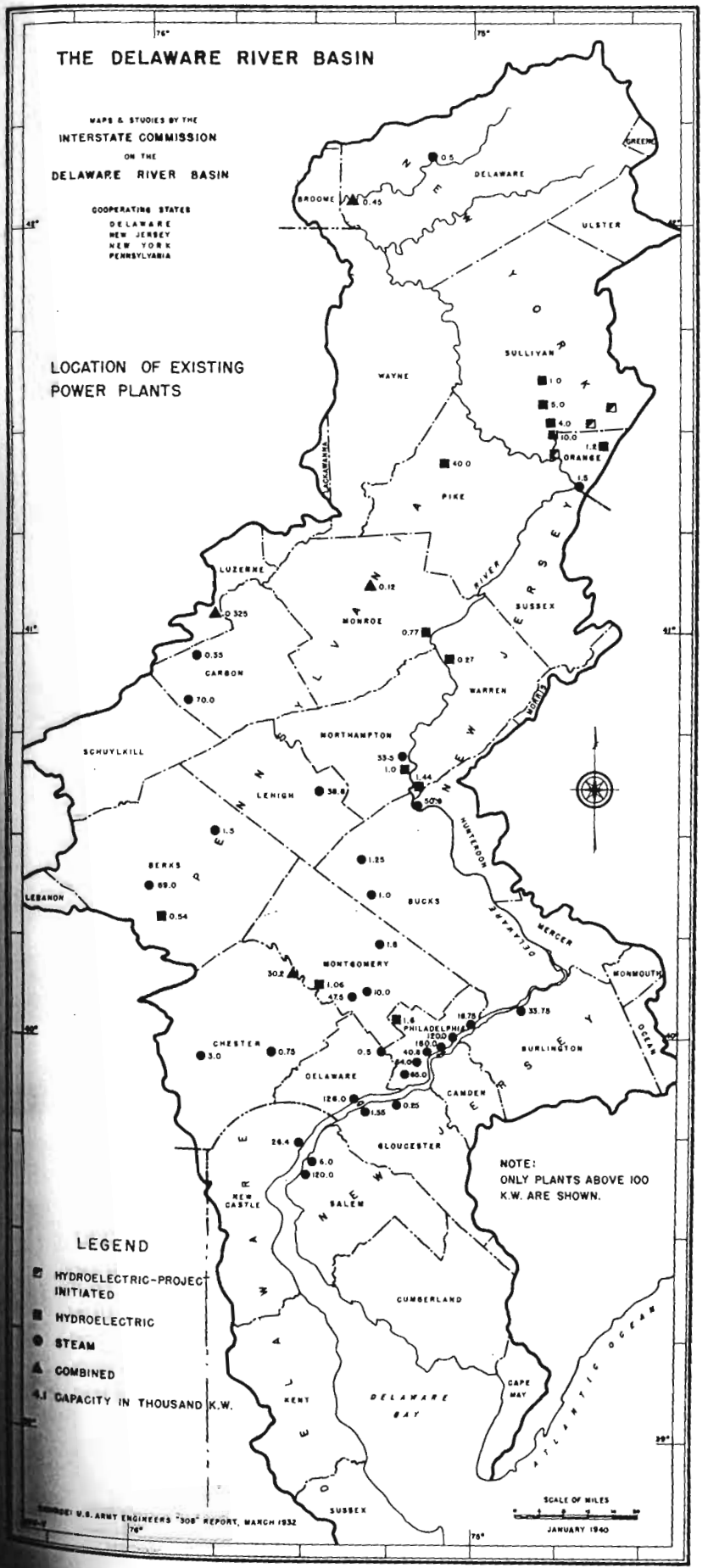
Sewage Collection and Treatment Facilities

In the three years, from 1936-1939, more than ten million dollars was spent in the construction of sewage collection and treatment works in the Delaware River Basin. Municipalities in southeastern Pennsylvania have spent in excess of seven million dollars; the remaining three million was expended in municipalities of southern New Jersey.

The present population served by the improvements constructed totals 282,500 of which 219,500 reside in Pennsylvania municipalities and 63,000 in New Jersey municipalities.

The sewage collection and treatment works constructed include all types, varied as to the specific needs of the municipalities for primary or secondary treatment plants, interceptors, pumping stations, outfalls, or other facilities. Substantial improvements, defined as progress, may bring the projects to one of several stages in the process of attaining adequate sewage collection and treatment systems.

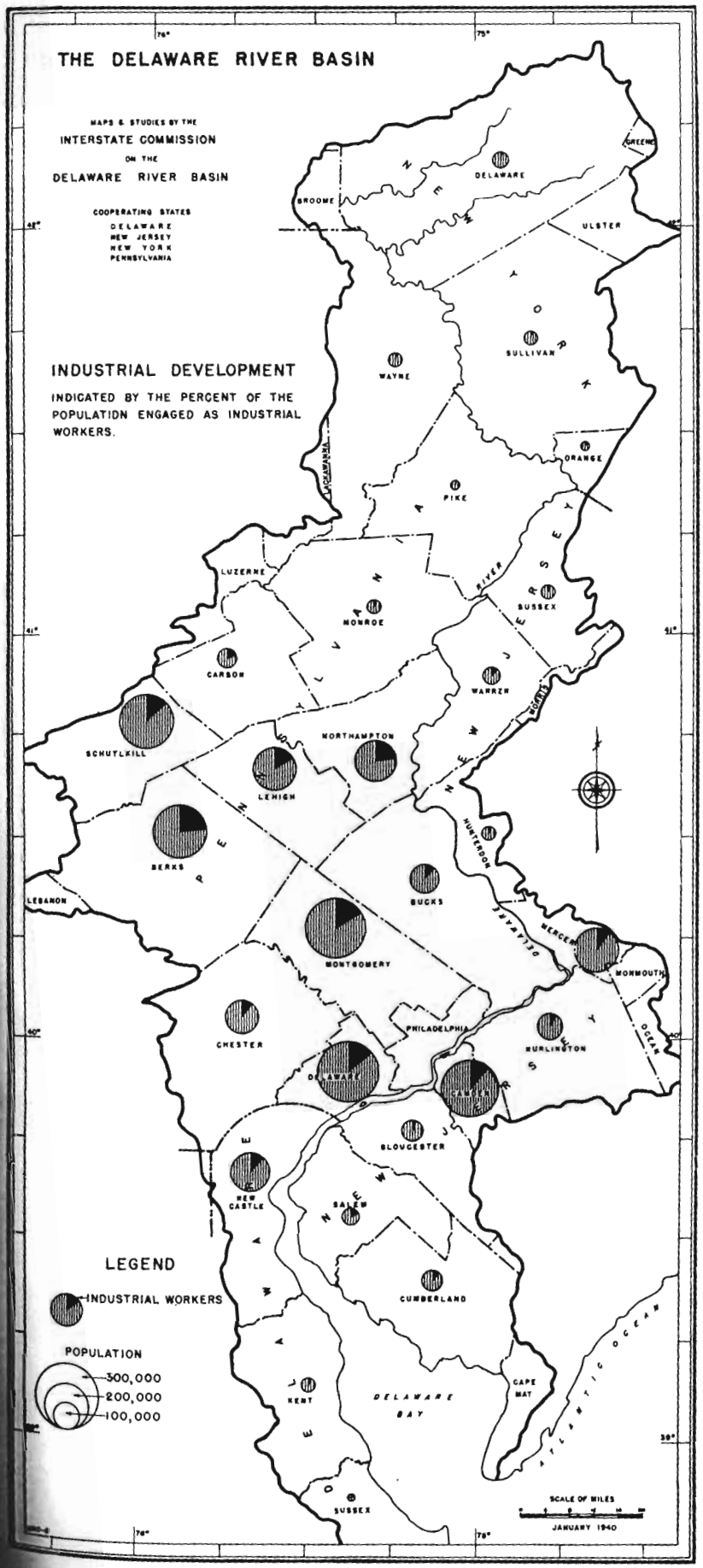
While the responsibility for water pollution abatement is primarily local, the progress noted in construction has been accelerated by the availability of federal funds through the public works and work-relief programs. Approximately 90 per cent of the work done was accomplished with the use of federal funds as grants-in-aid, or loans, or both. Construction work progress has been concentrated in the chief problem area, the tidal estuary section of the river, into which the wastes from the Philadelphia-Camden metropolitan region are discharged.



Existing Power Plant Locations

Within the Delaware Basin are 47 electric powe plants of more than 100 kilowatts capacity.

Thirty of these are steam generation units having a total capacity of 1,131 thousand kilowatts, thirteen are hydro-electric plants, the combined capacity of which is 73 thousand kilowatts; four plants, of 31 thousand kilowatts capacity, are combination steam and hydro-electric plants. The total capacity of all 47 plants is 1,235 thousand kilowatts.



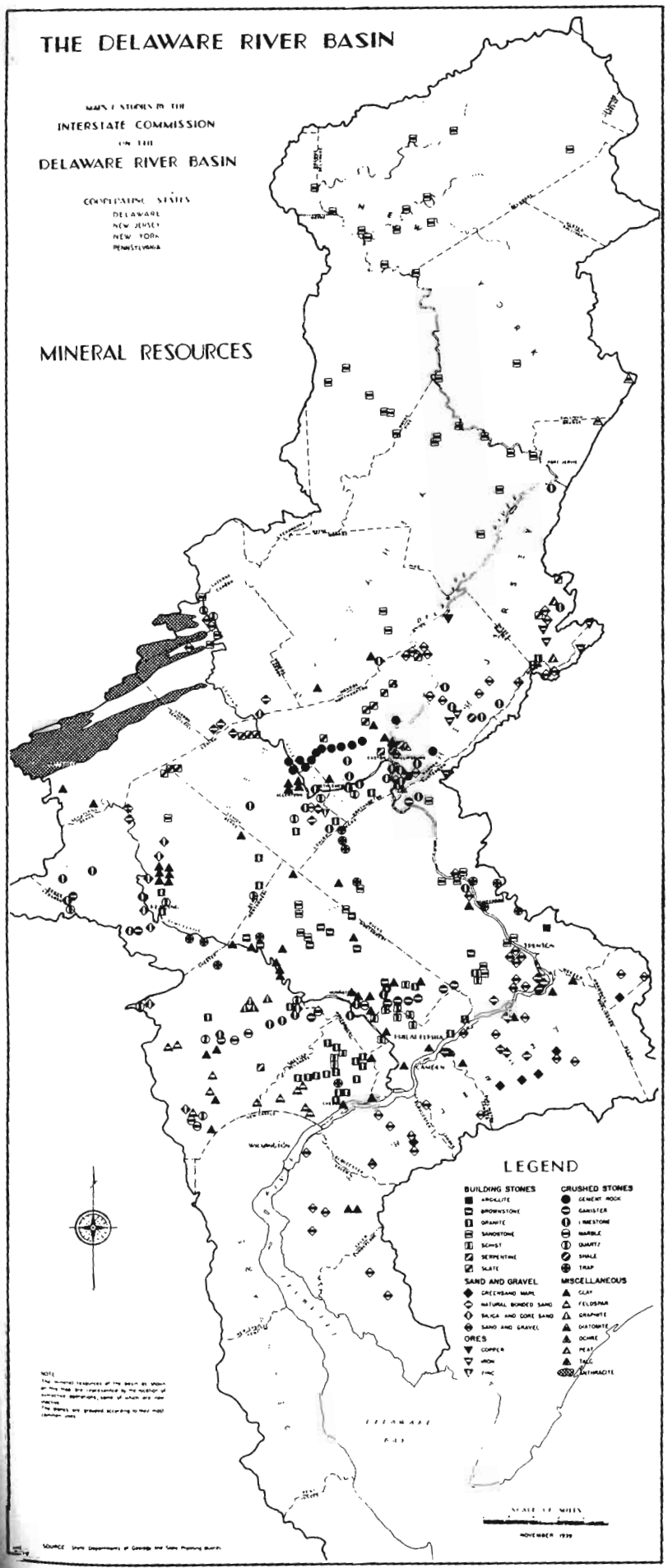
Industrial Development

Approximately 674,000 persons, or 15 per cent of the total population of the Delaware River Basin is engaged in the mining or manufacturing of products, the annual value of which exceeds 3 billion dollars.

The distribution of such industrial operations is pictured graphically on the map of "Industrial Development" which shows, by counties, the ratio between the number of workers engaged in industry and the total population. On the basis of both total numbers and population percentages, greatest activity is centered around the Philadelphia-Camden and the Trenton metropolitan areas, and in the Lehigh and Schuylkill River Valleys; the least occurs in the Upper Basin above Port Jervis.

The number and percentage of industrial workers by states is as follows:

State	Number Of Industrial Workers	Percentage Engaged In Industry
Pennsylvania	569,548	16.0
New Jersey	79,957	10.4
Delaware	21,583	11.4
New York	2,957	4.0
TOTAL	674,045	15.0



Mineral Resources

The mineral resources of the Delaware River Basin, as shown on this map, are represented by the location of extractive operations, active and inactive.

As would be expected, mineral production in the upper part of the Basin, in the mountainous sections, and in the lower tidal section is negligible.

The bulk of active mineral production is centered in the anthracite coal fields in the upper Lehigh and Schuylkill drainage basins in Pennsylvania, and in the Allentown-Bethlehem-Easton area in which three-fourths of the cement produced in Pennsylvania is made. The production of slate, crushed stone and building stone also is an extensive and important operation.

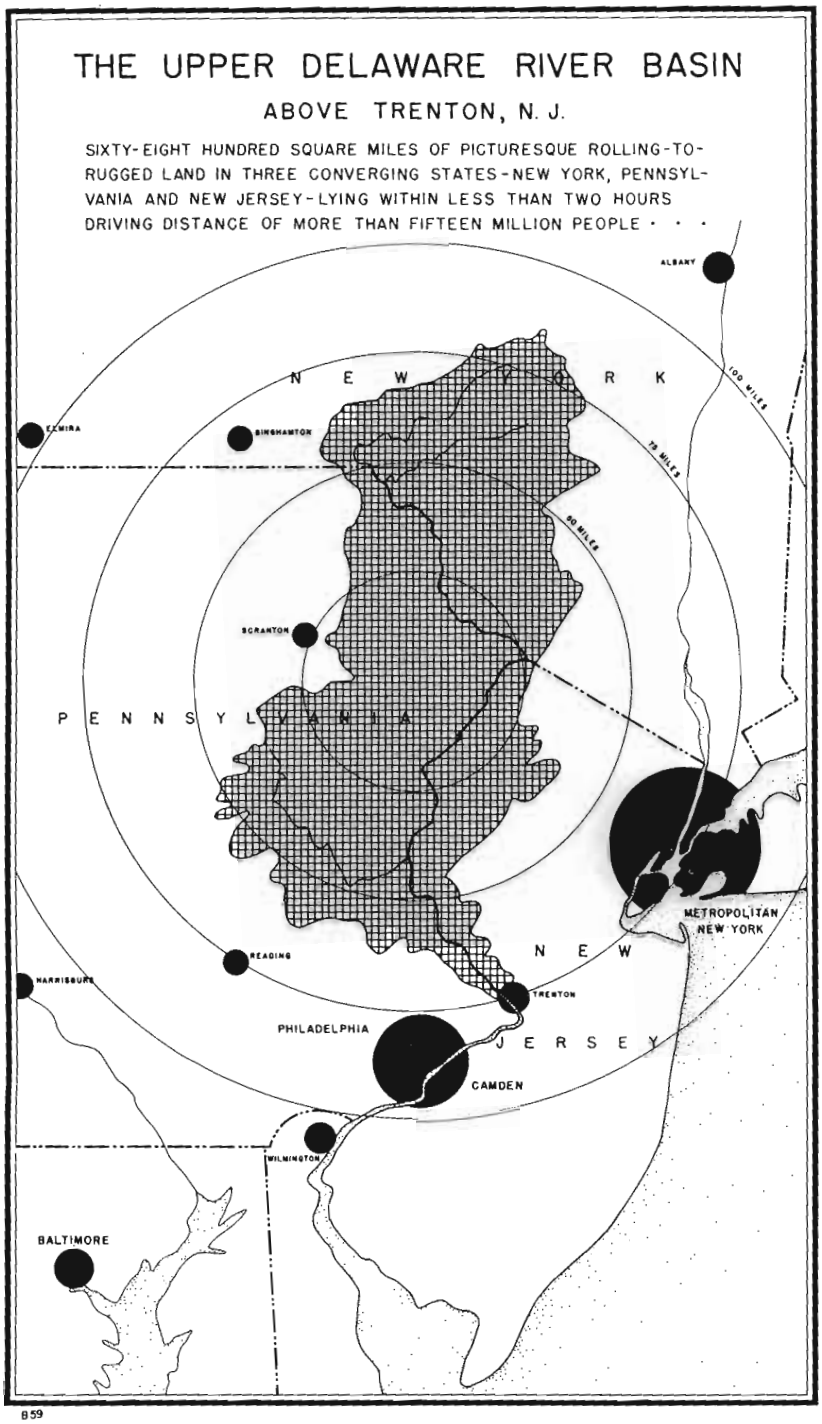
Transportation

A network of over 2,000 miles of hard-surfaced, all-weather state highways serves the people of the Basin. Above Stroudsburg, because of the mountaninous character of the region, the road pattern becomes more open, with highways and railroads generally following stream valleys. In this region, too, are many areas of publicly owned lands which provide opportunities for recreation and which, in nearly every instance, can be reached by a hard-surfaced highway.

The major rail lines, in general, follow the valleys of the Delaware, Schuylkill and Lehigh Rivers, while secondary lines connect most of the principal municipalities within the industrial and agricultural regions.

Major air transportation terminal facilities are centered in the Philadelphia-Camden area. The Central Airport, near Camden, is a focal point for airlines operating planes to the south and west from Newark and New York City. Other airways cross the Basin near Easton and north of Stroudsburg.

The Lower Delaware River has been developed as a navigable waterway to the head of tidewater at Trenton. A 40-foot channel is now being dredged to serve the Port of Philadelphia, the second largest port in the United States from the standpoint of export and import tonnage; a 25-foot channel is now complete from Philadelphia to Trenton.



The Upper Delaware River Basin Above Trenton, New Jersey

The Upper Delaware River Basin above Trenton, New Jersey, is an area more than three-fifths forested, with a population of only three-quarters of a million persons. It is a land of farms, forests and many streams, still largely unspoiled. This land now serves, and by careful planning may be made to serve much better, as a home and a play-place for millions of people.

Increasing congestion in nearby cities brings greater need for the relief afforded by the open country. Growing consciousness of this need, increased leisure time to satisfy it, and automobiles to make the going easy, are bringing rapidly-growing thousands into this close-at-hand natural recreation center in the Delaware River Basin.

Delaware River Above Port Jervis

That portion of the Upper Delaware River Basin, from Port Jervis, New York, to the north, is an area which abounds in recreational resources. Good roads and scenic highways, as shown on this map, have recently reached into the more remote parts of this valley to bring its attractions within easy access of more thon 15 million people.

Extensive state-owned forest preserves, fish and game areas, and parks, are being carefully preserved in order to prevent exploitation destructive of the valley's resources. Concurrently there is definite need for the adoption and effectuation of measures for the conservation, protection, and far-sighted development of the valley's basic wealth in soils, forests, waters and scenery.