WATER RESOURCES OF THE WESTERN OSWEGO RIVER BASIN, N. Y.

INTERIM REPORT

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ABSTRACT

This report contains a tabulation of data collection sites established by the U.S. Geological Survey in the Western Oswego River basin. Information on the types of data collected at each site is also provided.

Statistical summaries are furnished for selected stream-gaging stations in the form of duration, flood frequency, and low-flow frequency curves.

Climatological data on long-term average precipitation is provided in the form of an isohyetal map of the study area.

Selected results of computerized data on flow passing Mud Lock and on Cayuga Lake levels are presented.

Data being collected in the course of the ground-water studies includes test borings, information on existing wells, and geologic mapping. Preliminary analysis of this data indicates that the areas with the greatest potential for development of large ground-water supplies are portions of the basin underlain by carbonate rocks, the unconsolidated deposits in the northern portion of the basin, and the unconsolidated deposits south of the four lakes.

INTRODUCTION

The U. S. Geological Survey began an investigation of the hydrology of the Western Oswego River basin in July 1964, in cooperation with the New York State Conservation Department, Division of Water Resources, to aid in the formulation of a comprehensive plan for the development, utilization, and control of the water resources of the area. Other local, State, and federal agencies participating in the study will also provide data which will be used in the plan. Locally, this investigation is under the direct supervision of the Cayuga Lake Basin and the Wa-Ont-Ya Basin Regional Water Resources Planning and Development Boards.

PURPOSE AND SCOPE

This interim report documents the work of the Geological Survey in the Western Oswego River basin during the period July 1964 through December 1965. The future work plans discussed in the report include work up to October 1, 1966. Work that may be continued after that date is largely dependent on needs that may arise during the remainder of the study and is beyond the scope of this report. An integrated analysis of the occurrence and availability of water resources in the basin will be made in the final project report.

All basic data that is available at this time can be inspected at the project field office in Seneca Falls or at the Geological Survey District Office in Albany.

SURFACE ENVIRONMENT

Climate

A study of climate is essential to any hydrologic investigation because climatic conditions control such things as floods, droughts, evaporation, runoff, and ground-water recharge. The U.S. Weather Bureau and the Cornell University Agricultural Research Centers are the main sources of the climatic data for the project area. The analysis and interpretation of these data will be a part of the final report.

Since a large amount of snow cover represents a potential flood, snow surveys are conducted each year as an aid to predicting possible runoff conditions. Four snow survey sites have been maintained by the New York State Department of Public Works for several years and ten temporary stations were established by the U.S. Geological Survey in the winter of 1964 as a part of this study. Approximately four measurements of snow depth and water content are made at each site during the months of January, February, and March. The ten temporary sites will be discontinued in the spring of 1966.

Surface Water

The surface-water phase of the Western Oswego River Basin Study is the single most important aspect of the project. Data on streamflow are being collected at 71 stations in the area. The stations are listed and described in table 1 and their locations are shown in figure 1, along with those of other data collection sites. Surface-water basic data are published by the U.S. Geological Survey in a series of annual reports. These data include (1) records of 15 permanent, full-time, continuous-

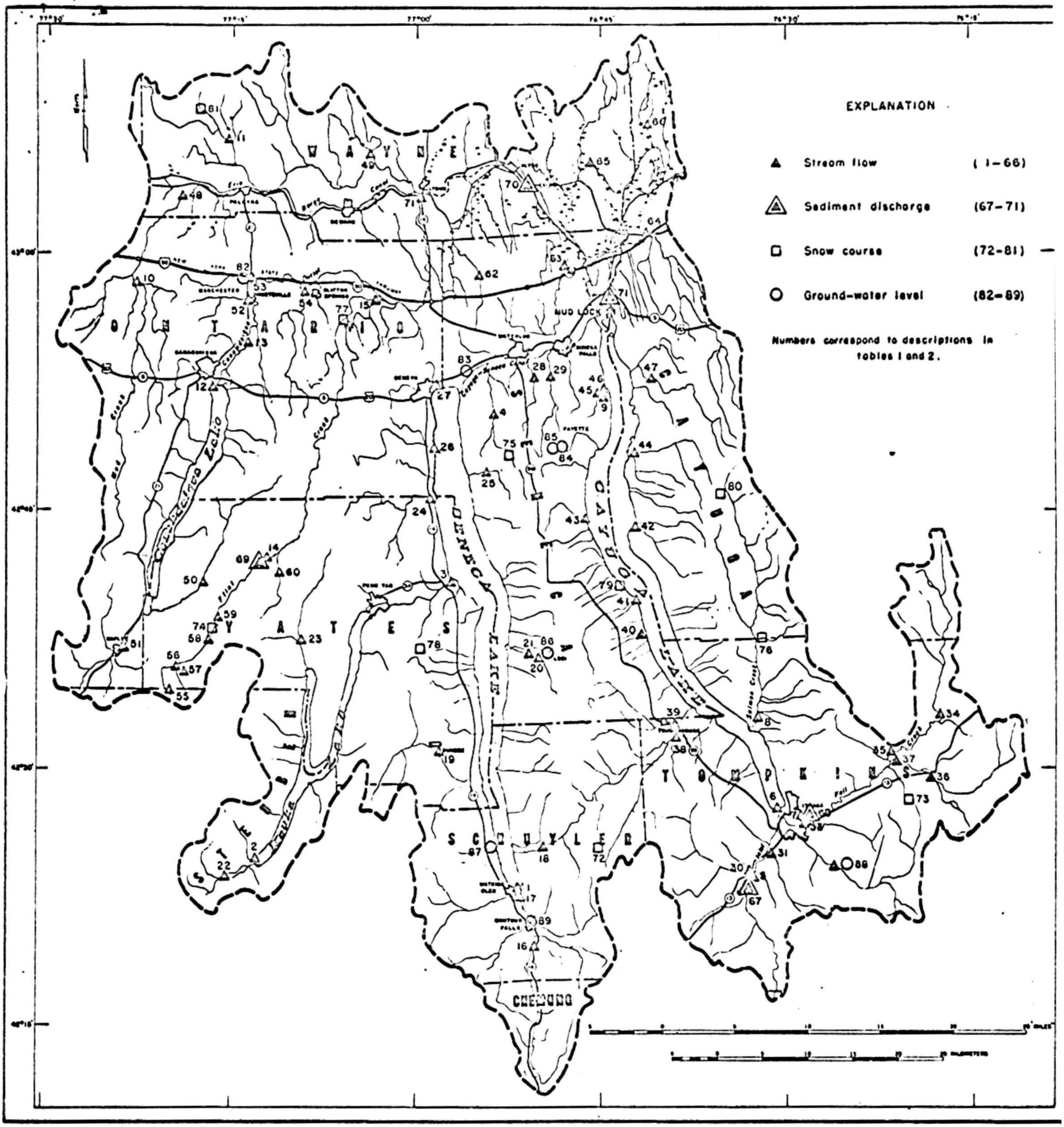

Figure 1.--Map showing location of 89 periodic data-collection sites.

recording gaging stations (including lake stage stations), (2) base-flow discharge measurements at low-flow partial-record stations, (3) annual peak stages and discharges at flood crest partial-record stations, and (4) discharge measurements at miscellaneous sites. Prior to September 30, 1960, these data were published in a series of U.S. Geological Survey Water-Supply Papers entitled, "Surface Water Supply of the United States." The records for the Western Oswego River basin were contained in Part 4 of that series. From 1961 to 1964 these data were published by the Geological Survey in Surface Water Records of New York, and commencing in 1965, the title of this report will be changed to Water Resources Data For New York, Part 1. Surface Water Records.

An intensive area-wide data collection program was conducted during the period June 30 to July 2, 1965, to provide data for determining (1) ground-water contributions to streamflow, (2) differences in ground-water quality, and (3) streamflow data for correlation purposes. During this period eight teams collected water quality samples and made discharge measurements at approximately 250 previously selected stream sites. The streams were all sampled under base-flow conditions and at or near the same duration point, which in this case was around 95 percent (the flow at the 95 percent duration point is that flow which is equaled or exceeded 95 percent of the time). Results of all of these discharge measurements will be published in Water Resources Data For New York, Part 1. Surface Water Records, 1965.

Base-flow discharge measurements needed for the development of flow-duration curves at the partial-record stations are about 60 percent complete. These measurements are being made at the stations indicated in table 1, and will be completed in the summer of 1966, if suitable flow conditions occur.

A considerable amount of time has been spent on the evaluation of data collected on the flow passing Lock No. 1 (Mud Lock) on the Cayuga-Seneca Canal. The drainage area above this point includes more than half the study area. The rating table used by the Department of Public Works to calculate discharges through the taintor gates is apparently no longer applicable. Through the excellent and close cooperation of the Department of Public Works, it has been possible to control the flow through these gates for measuring purposes in the development of a new rating table. Most of the discharge measurements needed to develop a new rating table for the six taintor gates at Mud Lock, which includes a value for previously unreported leakage, have been completed. The data indicate that the old rating table yields figures which are too low during low flows and too high during high flows. Leakage through the six gates appears to vary from 0 to 200 cubic feet per second (cfs) as the head varies from 0 to 10 feet. To further define the new rating table some additional discharge measurements will be made in the spring of 1966, when there are high flows under a condition of low head.

To more accurately define past conditions of flow it was necessary to recompute the Mud Lock outflows using the newly developed rating. With 45 years of record the task would have been formidable without the use of a computer. Excellent coordination among the New York State Conservation Department, Cornell University, New York State Department of Public Works, and the Geological Survey, resulted in all of the available data being gathered, punch cards prepared, a computer program written, and the data processed. A preliminary copy of the revised data is now available and the final results should be available by late 1966.

The outflow at Mud Lock represents the combined outflows of Cayuga and Seneca Lakes. In order to separate the contribution from each lake the discharge from Seneca Lake must be independently determined, and subtracted from the toal passing Mud Lock. Records are kept of Seneca Lake outflow by New York State Electric and Gas Corporation (water used for power generation) and the New York State Department of Public Works (lockages, diversion, power generation). Two discharge measurements of flow in the Cayuga-Seneca Canal have been made between Seneca Falls and Waterloo for the purpose of evaluating the accuracy of these available flow records. Several more discharge measurement will be made to complete the evaluation. Measurements to determine leakage through the powerplant and lock at Waterloo will be made in the winter of 1965-66.

Nine discharge measurements have been made in the New York State Barge Canal at Lock 26 near Clyde, N. Y., to evaluate the discharge ratings for the taintor gate and spillway. A preliminary evaluation of this data indicates that the rating used by the Department of Public Works for this gate is accurate. To provide statistical analysis of flow data for the period of record, past flow data from Lock 26 will be recomputed.

Sediment

Some sediment data were collected at 11 sites before this aspect of the study was modified. Eight of these 11 stations were discontinued and two new stations added, giving a total of five stations currently being sampled. Approximately 20 samples will be collected at each site and analysed for sediment concentration. These analyses will be used to form a general assessment of the suspended sediment discharges in the project area.

SUBSURFACE ENVIRONMENT

An evaluation of the occurrence, movement, and availability of water found below the land surface requires that the physical and chemical characteristics of the subsurface environment be thoroughly understood. One effective means of developing this knowledge is through geological studies.

Geologic Studies

The Western Oswego River basin is characterized by nearly horizontal beds of shale, sandstone, and limestone covered with a variety of unconsolidated glacial deposits.

Field geologic mapping of the surficial deposits has been carried out in conjunction with an inventory of selected water wells. Presently available reports and soils maps are being used as an aid in this work. Well logs collected during the inventory provide data on deposits not visible at the surface. During the summer of 1966 a truck-mounted power auger will be used to collect subsurface data on unconsolidated deposits in areas where such information is scarce, and where the ground-water potential is considered to be significant on the basis of geologic data.

Mapping of surficial deposits and the collection of well log data will be intensified during the remainder of the project in those areas where the most promising water-bearing deposits are known to exist. This information will be used to produce maps showing the location, thickness, and character of the unconsolidated deposits.

Ground Water

The initial phases of the ground-water study concern the collection of data through the well inventory and geologic mapping. The well inventory provides data such as logs, yields, well construction, and water quality for selected wells. The inventory of municipal, industrial, and other large supplies is nearing completion and the total well inventory is about 50 percent completed, including a general reconnaissance inventory covering the entire study area. This general inventory, together with the geologic mapping, has been used to locate the most promising areas for future ground-water development. Also, much valuable data is available from previously published ground-water reports by Mazola (1951), Griswold (1951), and Mack and Digman (1962).

The second phase of the ground-water program includes intensive localized well inventories and geologic mapping to define the maximum perennial amount of ground water available from areas of the basin identified in the reconnaissance inventory as having the greatest ground-water potential. In general, the ground-water portion of the study will focus on the following areas: (1) the old glacial-stream channel along the Barge Canal from Lyons to the western edge of the basin (the course of which is now partially followed by the Barge Canal); (2) the carbonate bedrock in the northern half of the basin; and (3) the thick deposits of unconsolidated material found in the stream valleys at the southern ends of each of the lakes. There are also some smaller scattered areas which deserve intensive study, such as the deltas found in the lakes. The remainder of the basin generally consists of areas where only small quantities of ground water are available, and where the hydrologic situations are simple enough to be defined with relatively little new or specialized data. Intensive ground-water data collection has already begun in Tompkins County where it is envisioned that the information will be needed at an early date.

Eight ground-water level recorders are in operation in the area and one has an eleven year period of record. Water levels are also being measured in several other wells on a periodic basis. Installation of a few additional recorders is planned, and previously installed recorders may be shifted to new locations if the need arises. The water-level fluctuations thus observed will be used to calculate perennial changes in ground-water storage and to evaluate the ground-water flow systems. The locations of observation wells presently equipped with continuous recorders are indicated in figure 1 and described in table 2.

Table 2.--Observation wells equipped with continuous water-level recorders

(Map number - corresponds to numbers in figure 1.)

Map number	Location: Latitude	Location: Longitude	Location: Nearest city or village	Depth of well (feet)	Record begins
82	42°58'40"	77°13'39"	Manchester	139	June 1955
83	42°53'14"	76°65'48"	Geneva	76	July 1965
84	42°48'37"	76°48'38"	Fayette	106	Aug. 1965
85	42°48'37"	76°48'39"	Fayette	290	Aug. 1965
86	42°36'36"	76°49'25"	Lodi	61	Feb. 1965
87	42°25'13"	76°54'12"	Watkins Glen	148	Aug. 1965
88	42°23'52"	76°24'48"	Ithaca	95	Dec. 1965
89	42°20'55"	76°50'30"	Montour Falls	52	July 1965

Pumping tests will be conducted on selected wells to define the hydraulic characteristics of the different aquifers. These tests will be scheduled throughout the remainder of the study, as the opportunities arise.

SURFACE WATER STATISTICS

The flow-duration, flood-frequency, and low-flow frequency curves (figs. 2, 4, and 5, respectively) presented in this report are statistical summaries of data collected at selected stream-gaging stations in the study area, and indicate a variety of flow conditions found in the Western Oswego River basin.

The curves represent different periods of record and only depict the flow conditions at the gaging station during these periods. Nevertheless, they are useful as probability curves to predict future occurrences to the extent that the periods on which they are based are representative of the total range of flow conditions.

The duration curves for four of the selected stations (nos. 5, 7, 10, 13) are assumed to be representative of the total range of flow conditions, due to the long periods of record on which they are based (the Mud Creek curve, no. 10 in figure 2 has only six years of record, 1958 to 1963, and has been adjusted to a longer period by correlation with a gaging station on another stream with records from 1926 to 1955). The curve for Flint Creek (no. 15), which is based on only four years of record (1960-63), is assumed not to be representative of the total range of flow, although the curve is still useful.

For the final report, similar curves will be prepared for all stream-gaging stations and many of the partial-record stations listed in table 1. All of the curves will be updated to include more recent data and will be adjusted by correlation to the standard long-term period, 1931-60, wherever possible.

Flow Duration

The flow-duration curve is a cumulative-frequency curve that shows the

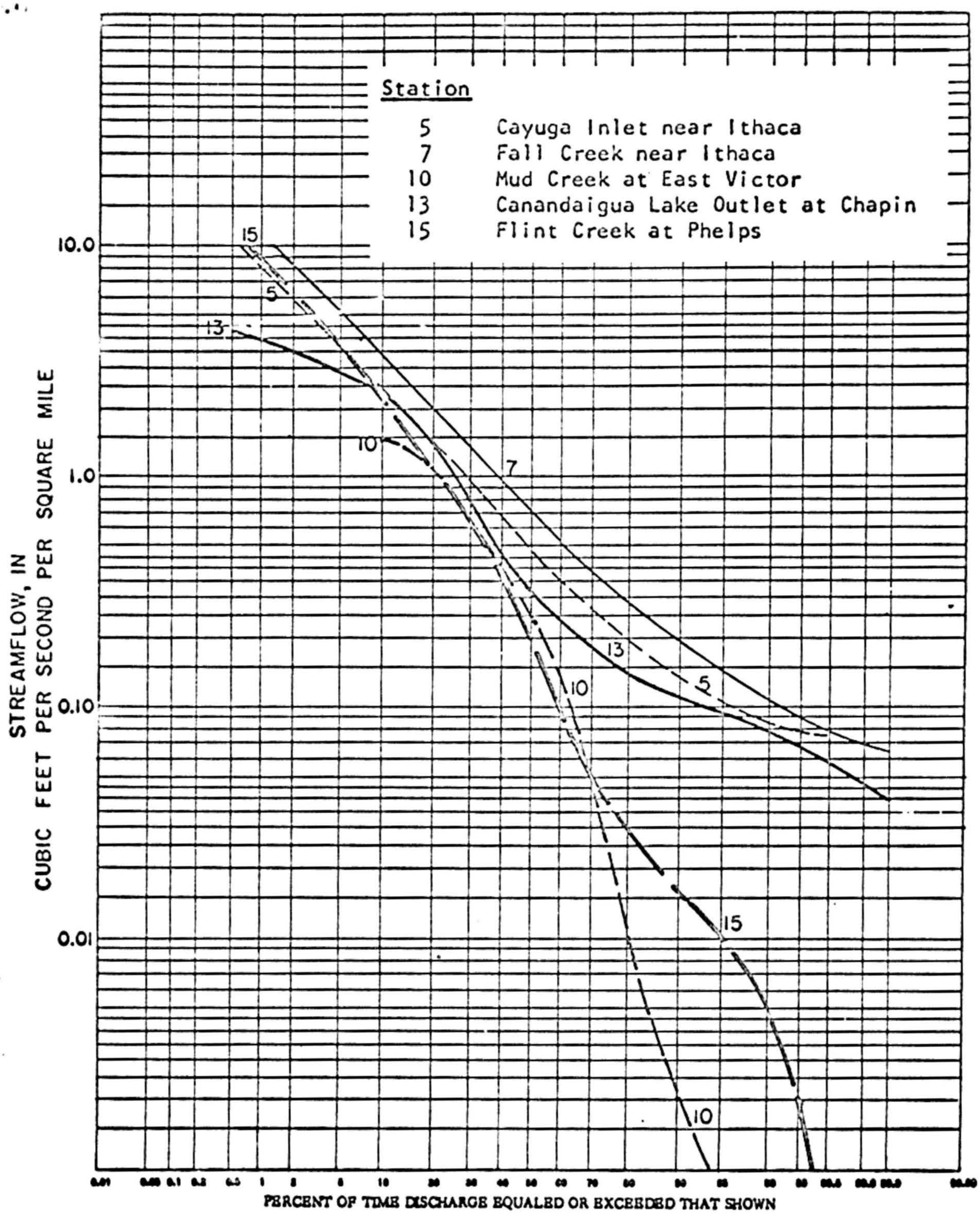

Figure 2.--Flow-duration curves of mean daily discharge for selected streams.

percent of time indicated streamflows were equaled or exceeded during a given period and reflects the integrated effect of the various factors that affect runoff, such as precipitation distribution, topography, and geology. Flow-duration curves for the five selected gaging stations in the Western Oswego River basin are presented in figure 2.

Curve 7 (fig. 2) for Fall Creek, shows the greatest discharge per unit area because its drainage basin receives the highest rainfall in the area. (See figure 3.)

The Mud Creek and Flint Creek curves (nos. 10 and 15, respectively in fig. 2) show that these streams have very low unit-area discharges at low flows. This indicates that their basins do not have the large surface- or ground-water storage necessary to sustain a high unit-area yield at low flow. In addition, water is bypassing the gages through solution channels in the limestone and dolomite formations underlying the stream channels and this causes the unit-area yield to be even lower.

The Canandaigua Outlet curve (no. 13 in fig. 2) conforms to the shape expected for a stream subject to regulation. The control of the flow limits the high and low extremes of flow. The effects of flood control are evident in the sharp break in the curve at the higher flows. No significant underflow is in evidence at this station.

Flood Frequency

Flood-frequency curves are graphs of the highest annual stream discharges versus recurrence interval. Recurrence interval is the average interval of time within which a flood of given magnitude will be equaled or exceeded once.

A flood having a recurrence interval of ten years is one that has a 10-ercent chance of occurring in any year; likewise, a 50-year flood has a 2-percent chance, and a 100-year flood has 1-percent chance of occurring in any year. A flood-frequency analysis of a single gaging

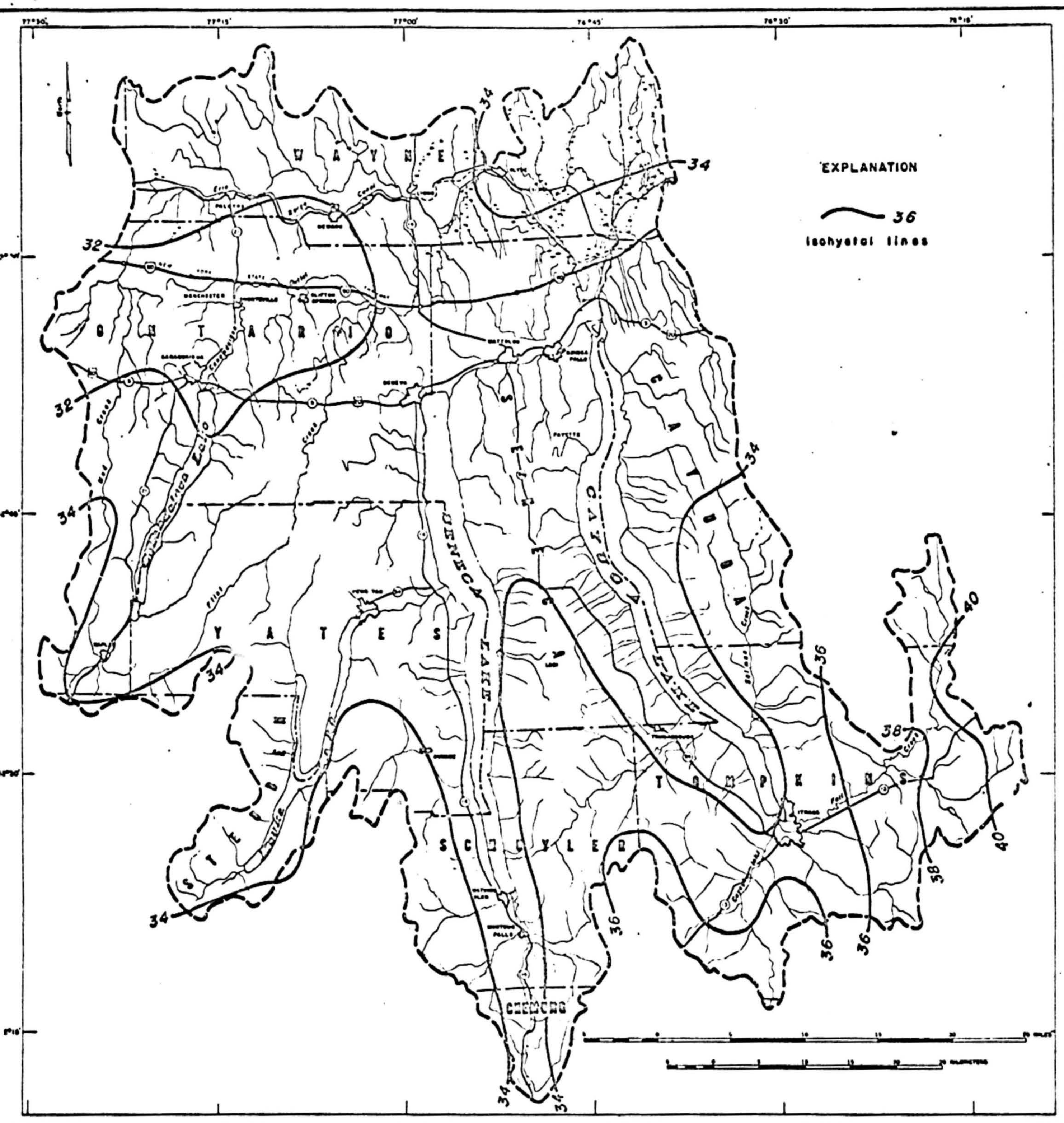

Figure 3.--Isohyetal map showing the average annual precipitation for the period 1930-49.

station is, in effect, a description of what has happened in the past at that station during the period of record.

Peak flow information collected at gaging stations and crest-stage gages during this study, and data collected previously (Robison 1961) can be used to determine probable peak streamflows throughout the basin.

Figure 4 shows flood-frequency curves for the respective periods of record of three gaging stations. The curve for Cayuga Inlet shows a higher unit-area flood flow than the curve for Fall Creek even though the basin averages lower unit-area rainfall. In this basin, geology and topography are the dominant factors in determining the magnitude of peak flows. Cayuga Inlet with its smaller drainage area and steeper valley walls has higher unit-area flood flows. Because of regulation, Canandaigua Lake Outlet has very much lower unit-area flood flows than the other streams shown.

Low-flow Frequency

Low-flow frequency curves are designed to provide data on droughts by grouping consecutive days as units. In this way they overcome the deficiency inherent in duration curves which do not indicate whether the lowest values of daily discharge were the result of some outstanding drought or were scattered throughout the period of record. Low-flow frequency curves indicate how often the average discharge for prestated periods of consecutive days may be expected to be equal to or be lower than a specific value.

For the final report, low-flow frequency curves will be prepared for selected periods of consecutive days for all continuous recording stream-flow stations. Estimates of frequency for specific periods of

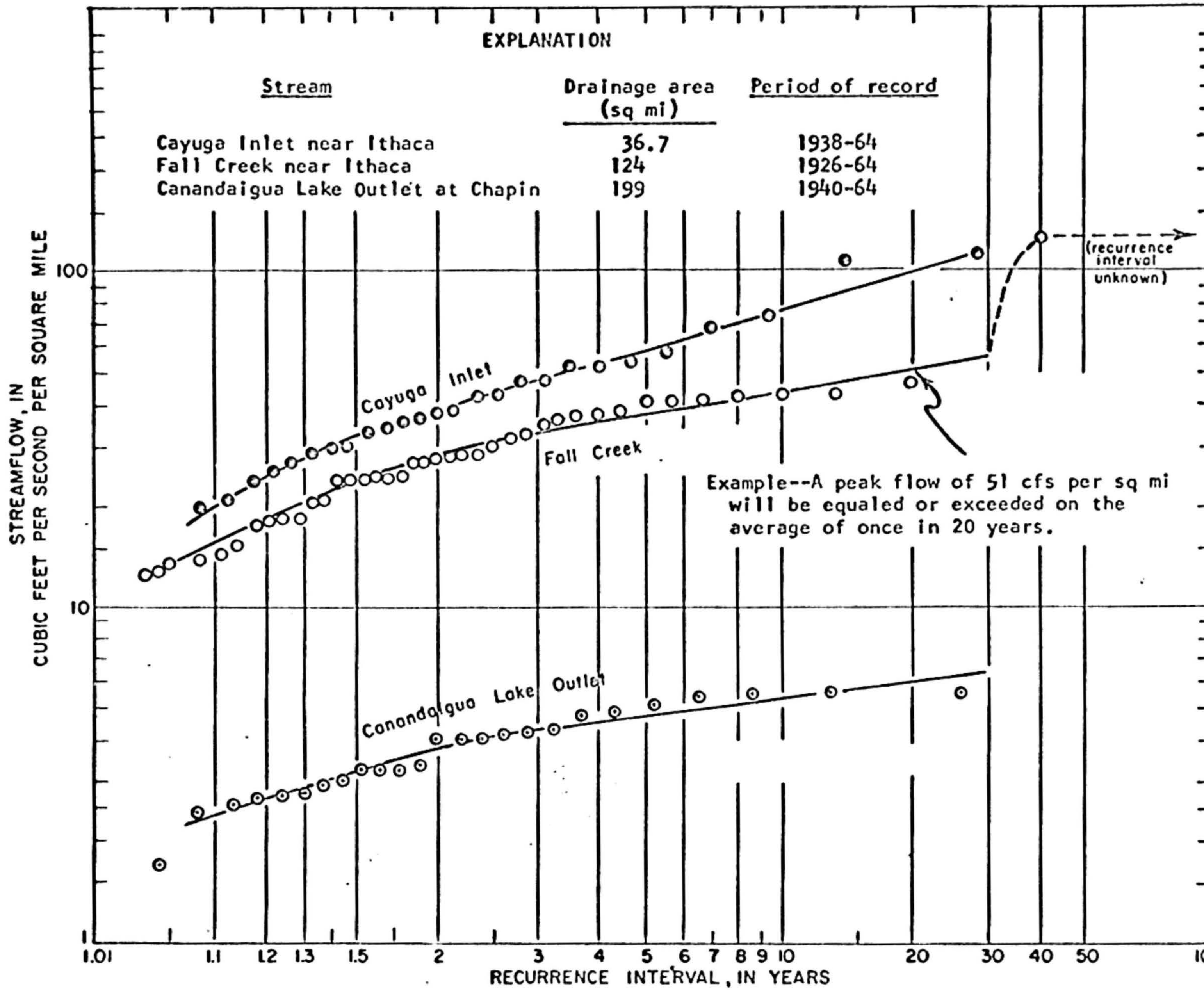

Figure 4.--Graphs showing magnitude and frequency of annual floods for selected streams.

consecutive days will be provided for most of the low-flow partial-record stations; e.g., 7-day minimum average flows with a recurrence interval of 10 years.

Figure 5 shows low-flow frequency curves for three stream-gaging stations in the study area. The higher unit-area flows of Fall Creek are a reflection of the higher unit-area rainfall this basin receives. The lowest unit-area flows shown are for Canandaigua Lake Outlet. This results from flow regulation, lower precipitation in this basin, and evaporation from Canandaigua Lake.

Mud Lock Evaluation

The study being conducted at Mud Lock, as described earlier in this report, will provide the information needed to evaluate past stream-flow data at this site. By recomputing the 45 years of record available at Mud Lock, the surface discharge for more than half of the project area can be accurately defined for this period.

A preliminary copy of the recomputed data is now available but these results of the Mud Lock evaluation still contain a number of errors. Therefore, only a limited amount of data from these results are presented below. In cooperation with the New York State Conservation Department, the computer program will be revised and the errors removed before the final results are made available.

The minimum consecutive 7-day discharge for the period 1930-64 was calculated as 40 cfs. This flow was due entirely to leakage when all six gates were closed and its accuracy is dependent on the validity of assumptions made in the evaluation (such as a constant leakage rate). The minimum mean daily discharge was 0 cfs, which results when the Seneca

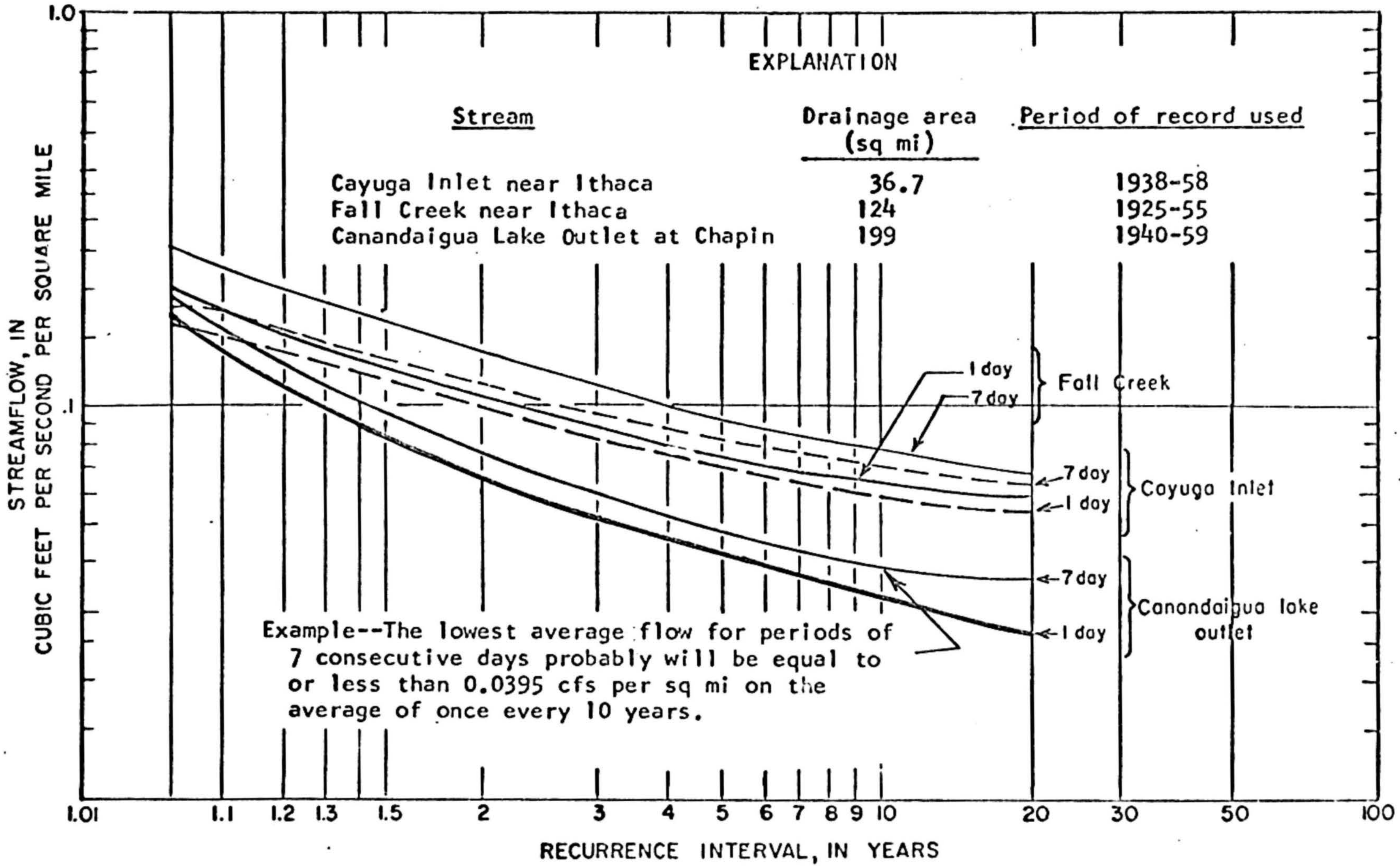

Figure 5.--Graphs showing magnitude and frequency of annual floods for selected streams.

River rises sufficiently to cause a zero head between Cayuga Lake and the river. On rare occasions, the Seneca River has risen above Cayuga Lake level causing a reversal of flow back into Cayuga Lake.

Cayuga Lake level is controlled both by natural conditions and artifically at Mud Lock. When the level of the lake exceeds 385.0 feet above mean sea level, damage from flooding occurs in Ithaca. In the period between 1930 and 1964, this level has been equaled or exceeded only 1.5 percent of the time. The lake level has been maintained within the 1-foot range, 382.5 feet to 383.5 feet (which is generally conceded to be the best range during tourist season) about 29 percent of the time. Spreading this range to 2 feet (382.0 feet to 384.0 feet) increases the percentage to about 58 percent. The lake has had an elevation of 380 feet or higher about 98 percent of the time. During the navigation season (April through November) these percentages are higher as follows: 382.5 feet to 383.5 feet, about 38 percent; 382 feet to 384 feet, about 73 percent. The range 382.5 to 383.5 feet has been maintained about 48 percent of the time during June, July, and August; and about 87 percent of the time the range has been maintained between 382 feet and 384 feet.

GROUND-WATER POTENTIAL

Ground water is utilized by nearly everyone in the project area except those served by one of the municipal supplies or water districts. Many of these same public supplies and numerous industries in the area depend upon ground water as their source of supply. Because ground water is heavily used in the area and can often provide large supplies of water in areas not adjacent to surface sources, a thorough evaluation of the areas where ground-water supplies may be expanded or developed in the future is necessary.

The amount of water which may be developed from a well is governed principally by the permeability (ability to transmit water) of the saturated materials penetrated, the available recharge, the volume of water in storage, and the design and construction of the well. The permeability of a deposit depends upon the size, shape, and number of interconnected openings or fractures it contains. The larger and more interconnected the openings, the greater the permeability. This is why, for example, gravel is much more permeable and has a greater ability to transmit water than does clay.

On the basis of the well inventory and available geologic data, it is possible to delineate those areas where the most productive water-bearing deposits (aquifers) are either known or believed to exist. These areas have the greatest potential for future development of ground-water supplies and are shown in figure 6. For convenience of discussion, these areas have been divided into bedrock and unconsolidated deposits. The maximum perennial yields of individual aquifers and water quality will be discussed in the final project report on the area.

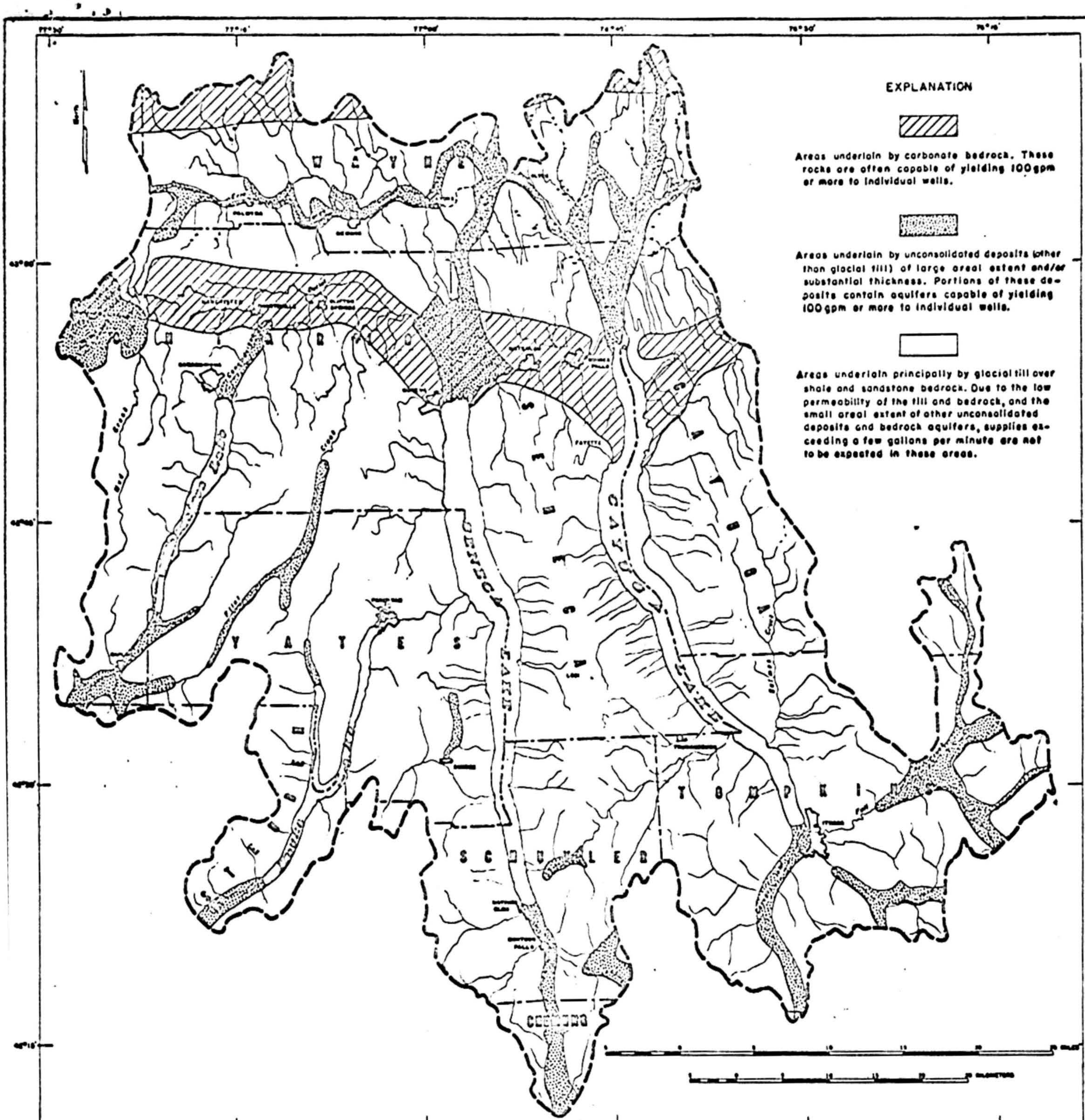

Figure 6.--Map showing areas of the greatest potential for ground-water development.

Bedrock

The bedrock underlying the area is composed of beds of shale, siltstone, sandstone, limestone, and dolomite. These rocks occur in recognizable units ranging from less than 1 foot to hundreds of feet in thickness. The bedrock units are nearly horizontal, dipping to the south at only about 50 feet to the mile. These bedrock units vary greatly in their ability to store and transmit water.

The most important bedrock aquifers are carbonate rocks found in the northern portion of the area. The two productive bedrock areas shown in figure 6 are composed of dolomite in the extreme north, and both dolomite and limestone in the latitude of Clifton Springs and Seneca Falls. Carbonate rocks such as these are slightly soluble which permits circulating ground water to enlarge openings along the naturally occurring factures. These solution openings greatly increase the permeability and water-storing capacity of the rocks. To be productive a well must penetrate one or more of these openings. Individual wells with yields of up to 300 gallons per minute (gpm) have been developed in these limestone and dolomite aquifers. The more productive wells are generally located in areas where the bedrock is overlain by sand and gravel or is in contact with perennial streams.

The bedrock throughout the remainder of the area is predominately shale with some sandstone and thin layers of limestone. The sandstone is too fine-grainded and the limestone is too thin to constitute important distinct aquifers. Thus, these bedrock units can be treated as having similar water-bearing characteristics. The shale and sandstone are, for all practical purposes, nearly insoluble. Therefore, the openings in these rocks are restricted to the minute natural fractures and cracks providing very low permeability and storage capacity. Most of the wells penetrating these rocks have yields of less than 3 gpm. In certain areas around and between Seneca and Cayuga Lakes, many bedrock wells are inadequate even for small supplies and have been abandoned.

Unconsolidated Deposits

All of the more productive unconsolidated aquifers are composed of sand and gravel and owe their origin, either directly or indirectly, to glaciation of the area. These deposits, along with non-productive silt and clay deposits, occur mainly in the valleys and channels that were either cut or enlarged by glacial ice (fig. 6). These valleys and channels were then filled with unconsolidated materials, which were deposited by the vast amount of water that was released when the ice sheet melted. The thickness of these unconsolidated deposits ranges from a few tens of feet in the northern portion of the area to several hundred feet in the valleys south of the lakes. The sand and gravel was deposited as outwash, or delta deposits by rapidly flowing water, while silt and clay was deposited in lake waters. As the glacial ice melted, flowing streams may have existed intermittently with lakes at some locations and thus, the lake deposits and sand and gravel are often found interbedded with one another. Therefore, the occurrence of the productive aquifers within those areas shown in figure 6 is very complex, not always apparent at the surface, and not continuous in large areas. Also, the silt and clay make up the bulk of unconsolidated material in most areas. This characteristic of the deposits is clearly apparent along Cayuga Inlet. In the city of Ithaca, wells have been drilled which yielded over 300 gpm from an aquifer buried under about 250 feet of silt and clay. However, less than 2 miles upstream, wells drilled to depths of more than 400 feet do not penetrate any such aquifer and are reported to yield less than is normally required for domestic purposes.

However, the sand and gravel aquifers that are present in the areas of unconsolidated deposits shown in figure 6 are often extremely productive. Such aquifers in the deposits along the Barge Canal from Lyons to the western edge of the project area yield from 100 to 400 gpm to individual wells. One well near Newark is reported to yield 1,200 gpm. Yields to individual wells of up to 400 gpm are reported from portions of the deposits found south of the four lakes. Even higher yields have been reported from the small delta deposits along the edges of the lakes.

Large portions of the area are underlain by glacial till (fig. 6). Till is an unsorted mixture of boulders, gravel, sand, silt, and clay that was deposited directly by the ice sheet. It ranges in thickness from a few feet on the hilltops and slopes in the southern portion of the area to more than 100 feet in some valley areas and portions of the northern part of the area. Because of its unsorted nature, till has a very low permeability. It is utilized as a source of water in many areas by large-diameter dug wells, which compensate for the low yields by having a large storage capacity. Many of these wells are inadequate under present day demands for water and are being replaced with deeper drilled wells in bedrock.

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Table 1.--Descriptions of periodic data collection sites in the surface environment in the [illegible]

Gaging station.--A water-level recorder installed in a permanent shelter providing a continuous record of water levels of a stream or lake. [illegible] measurements are made to develop and maintain a stage-discharge relationship which will yield a continuous record of [illegible]
Recession recorder.--A temporary installation of a water-level recorder operated in a manner similar to those at gaging stations, and which would yield the same data except for limitations such as: a limited range in stage, discharge measurements made less frequently and generally poor winter records.
Low flow partial-record station (C-22).--A particular site where limited streamflow data are collected systematically over a period of years. These stations will yield a computed flow duration curve by correlation with gaging station records.
Flood crest partial-record station (C-21).--A particular site where a crest-stage gage has been installed to collect data systematically over a period of years on peak water surface elevations and discharges. Discharge measurements are made during periods of flood runoff to obtain a stage-discharge relationship (rating curve). Frequency of occurrence of peak flows are estimated from gaging station records.
Map number.--Corresponds to numbers in figure 1. *Drainage area approximate.

Map number	Station number	Station name	Latitude	Longitude	Drainage area (sq mi)	Period of record	Remarks
				GAGING STATIONS			
1	4-2324	Seneca Lake at Watkins Glen	42°23'03"	76°52'05"	714	Oct. 1956 -	
2	4-2324.5	Keuka Lake at Hammondsport	42°24'22"	77°13'08"	179	Aug. 1960 -	
3	4-2324.82	Keuka Outlet at Dresden	42°40'49"	76°57'15"	210*	Mar. 1965 -	Flow regulated by releases from Keuka Lake
4	4-2326.3	Kendig Creek near MacDougall	42°50'57"	76°53'33"	15*	Oct. 1964 -	
5	4-2330	Cayuga Inlet near Ithaca	42°23'35"	76°32'40"	36.7	Mar. 1937 -	
6	4-2335	Cayuga Lake at Ithaca	42°26'25"	76°30'45"	1,587	Aug. 1905 - Dec. 1909	
						Jan. 1910 - Sept. 1925	In State report only
						Aug. 1956 -	
7	4-2340	Fall Creek near Ithaca	42°27'20"	76°28'30"	126	Feb. 1925 -	
8	4-2340.18	Salmon Creek at Ludlowville	42°33'14"	76°32'07"	83*	Oct. 1964 -	
9	4-2340.35	Canoga Creek at Canoga	42°51'44"	76°44'59"	3.20	Oct. 1964 -	
10	4-2342	Mud Creek at East Victor	42°58'32"	77°22'56"	64.1	Apr. 1959 -	No winter records
11	4-2342.7	Red Creek near Walworth	43°06'47"	77°95'14"	25*	Oct. 1964 -	
12	4-2345	Canandaigua Lake at Canandaigua	42°52'20"	77°16'20"	189	Dec. 1927 - Nov. 1939	West side of lake
						Nov. 1939 - Sept. 1945	North side of lake
						Oct. 1945 -	Contents available
13	4-2350	Canandaigua Lake Outlet at Chapin	42°55'00"	77°14'00"	159	Nov. 1939 -	Flow regulated by releases from Canandaigua Lake
14	4-2351.5	Flint Creek at Potter	42°42'09"	77°12'26"	31.0	Mar. 1964 -	
15	4-2352.5	Flint Creek at Phelps	42°57'27"	77°04'05"	101	Oct. 1959 -	
				PARTIAL RECORD SITES			
16	4-2322	Catherine Creek at Montour Falls	42°19'42"	76°50'40"	41.1	June 1955 -	C-22
17	4-2323.95	Glen Creek at Watkins Glen	42°21'34"	76°52'09"		May 1965 -	C-22
18	4-2324.05	Hector Falls Creek at Burdett	42°25'21"	76°49'58"	12.1	Sept. 1964 -	C-22
19	4-2324.15	Big Stream at Dundee	42°31'05"	76°58'30"		Sept. 1965 -	C-22 - Recession recorder
20	4-2324.28	Mill Creek at Lodi	42°35'57"	76°49'27"		Nov. 1965 -	C-22 - Recession recorder
21	4-2324.3	Mill Creek at Lodi Station	42°36'44"	76°50'56"		Dec. 1964 -	C-21 - Crest-stage gage
22	4-2324.48	Keuka Lake Inlet at Pleasant Valley	42°23'41"	77°15'31"	13.6	Oct. 1964 -	C-22
23	4-2324.6	Sugar Creek at Guyanoga	42°37'23"	77°09'30"		Sept. 1955 -	C-22
						Dec. 1964 -	C-21 - Crest-stage gage
24	4-2324.9	Kashong Creek near Bellona	42°45'55"	76°58'36"		May 1965 -	C-22
						Dec. 1964 -	C-21 - Crest-stage gage
25	4-2324.93	Reeder Creek near MacDougall	42°47'23"	76°54'36"		May 1965 -	C-22
26	4-2324.97	Wilson Creek near Geneva	42°48'43"	76°58'38"		May 1965 -	C-22
27	4-2326	Marsh Creek at Geneva	42°52'32"	76°58'35"	6.37	May 1957 -	C-22
28	4-2327	Silver Creek near Waterloo	42°52'48"	76°50'26"		May 1965 -	C-22
29	4-2327.2	Sucker Brook near Seneca Falls	42°52'49"	76°48'29"		May 1965 -	C-22
30	4-2332	Enfield Creek near Ithaca	42°23'54"	76°32'45"	27.9	July 1956 -	C-22
31	4-2332.5	Buttermilk Creek near Ithaca	42°25'02	76°31'28"	11.3	Sept. 1961 -	C-21 - Crest-stage gage
32	4-2333	Sixmile Creek near Ithaca	42°24'11"	76°26'07"	39.3	July 1955 -	C-22
33	4-2336	Cascadilla Creek near Ithaca	42°26'33"	76°26'13"	12.7	July 1955 -	C-22
34	4-2336.33	Fall Creek at McLean	42°33'05"	76°17'33"		Nov. 1965 -	C-21 - Crest-stage gage
35	4-2336.48	Fall Creek at Freeville	42°30'51"	76°20'51"		Nov. 1965 -	C-21 - Crest-stage gage
36	4-2336.76	Virgil Creek at Dryden	42°29'18"	76°18'08"		Nov. 1965 -	C-21 - Crest-stage gage
37	4-2337	Virgil Creek at Freeville	42°30'18"	76°21'01"	40.4	July 1955 -	C-22
38	4-2340.25	Taughannock Creek at Halseyville	42°31'47"	76°35'14"		Sept. 1964 -	C-22
39	4-2340.28	Trumansburg Creek at Trumansburg	42°32'31"	76°38'52"		Sept. 1964 -	C-22
40	4-2340.3	Lively Run at Interlaken Beach	42°37'47"	76°41'20"	1.9*	May 1965 -	C-22 - Recession recorder
41	4-2340.31	Sheldrake Creek at Sheldrake	42°39'54"	76°42'06"		Dec. 1964 -	C-22
42	4-2340.32	Paines Creek at Aurora	42°44'15"	76°42'11"		Dec. 1964 -	C-21 - Crest-stage gage
						May 1965 -	C-22
43	4-2340.33	Hicks Gully Creek near East Varick	42°44'43"	76°46'14"		May 1965 -	C-22
44	4-2340.34	Great Gully Brook near Union Springs	42°48'28"	76°42'09"		May 1965 -	C-22
						Dec. 1964 -	C-21 - Crest-stage gage
45		Canoga Springs Tributary 1 at Canoga, above spring	42°51'57"	76°44'56"		Mar. 1965 -	C-22
46		Canoga Spring Tributary 1 at Canoga	42°51'56"	76°44'52"		Nov. 1964 -	C-22
47	4-2340.38	Yawger Creek near Union Springs	42°52'44"	76°41'02"		Sept. 1964 -	C-22 - Recession recorder
48	4-2342.5	Ganargua Creek at Macedon	43°03'29"	77°19'04"		Sept. 1964 -	C-22
						Dec. 1964 -	C-21 - Crest-stage gage
49	4-2343	Ganargua Creek Tributary at Fairville Station	43°05'59"	77°03'49"		Nov. 1964 -	C-22 - Recession recorder
						Feb. 1965 -	C-21 - Crest-stage gage
50	4-2344	West River near Middlesex	42°41'06"	77°17'19"		Sept. 1964 -	C-22
						Dec. 1964 -	C-21 - Crest-stage gage
51	4-2344.5	Naples Creek at Naples	42°37'04"	77°23'45"		Mar. 1965 -	C-21 - Crest-stage gage
						Sept. 1964 -	C-22 - Recession recorder
52	4-2350.2	Padelford Brook at Shortsville	42°57'33"	77°13'39"		May 1965 -	C-22
53	4-2350.3	Black Brook at Manchester	42°58'42"	77°13'32"		May 1965 -	C-22
54	4-2350.4	Rocky Run at Clifton Springs	42°57'48"	77°09'12"		Sept. 1964 -	C-22
55	4-2351	Flint Creek near Prattsburg	42°34'25"	77°20'09"	.76	May 1964 - Sept. 1964	Flint Creek basin study
56	4-2351.1	Flint Creek near Italy	42°36'04"	77°19'27"	3.70	Oct. 1963 - Sept. 1964	Flint Creek basin study
57	4-2351.2	Sugar Gully near Italy	42°36'06"	77°19'11"	4.03	May 1964 - Sept. 1964	Flint Creek basin study
58	4-2351.3	Flint Creek near Italy Hill	42°37'31"	77°16'54"	13.2	Oct. 1963 - Sept. 1964	Flint Creek basin study
59	4-2351.4	Flint Creek near Middlesex	42°39'05"	77°16'15"	17.9	May 1964 - Sept. 1964	Flint Creek basin study
60	4-2351.6	Nettle Valley Creek near Potter	42°41'33"	77°11'22"	6.98	Oct. 1963 - Sept. 1964	Flint Creek basin study
61	4-2352.55	Canandaigua Outlet at Lyons	43°03'38"	76°59'53"		Dec. 1964 -	C-21 - Crest-stage gage
62	4-2352.6	Dublin Brook at Dublin	42°58'58"	76°54'52"		Sept. 1965 -	C-22
63	4-2352.7	Black Brook at Tyre	42°59'30"	76°48'13"		Sept. 1964 -	C-22 - Recession recorder
						Dec. 1964 -	C-21 - Crest-stage gage
64	4-2352.8	Crane Brook at Montezuma	43°01'17"	76°41'20"		May 1965 -	C-22
65	4-2352.85	Crusoe Creek near Savannah	43°05'23"	76°45'45"		Dec. 1964 -	C-21 - Crest-stage gage
66	4-2352.90	Spring Lake Outlet at Spring Lake	43°07'36"	76°41'10"		May 1965 -	C-22
				SEDIMENT			
67	4-2330	Cayuga Inlet near Ithaca	42°23'35"	76°32'40"		Feb. 1965 -	
68	4-2340	Fall Creek near Ithaca	42°27'20"	76°28'30"		Feb. 1965 -	
69	4-2351.5	Flint Creek at Potter	42°42'09"	77°12'26"		Dec. 1964 -	
70		N.Y.S. Barge Canal at Clyde	43°03'34"	76°50'20"			
71		Seneca River near Seneca Falls	42°57'47"	76°44'48"			
				SNOW SURVEY			
72		Bennettsburg	42°25'30"	76°43'20"		Jan. 1965 -	Taughannock Creek watershed
73		Dryden	42°28'10"	76°19'20"		Jan. 1965 -	Sixmile Creek watershed
74		Italy	42°37'50"	77°16'50"		Jan. 1965 -	Flint Creek watershed
75		MacDougall	42°43'32"	76°51'20"		Jan. 1965 -	Kendig Creek watershed
76		North Lansing	42°36'50"	76°31'30"		Jan. 1965 -	Salmon Creek watershed
77		Phelps	42°56'20"	77°06'00"		Jan. 1965 -	Flint Creek watershed
78		Second Milo	42°36'50"	77°00'20"		Jan. 1965 -	Keuka Outlet watershed
79		Sheldrake	42°41'20"	76°43'20"		Jan. 1965 -	Groves Creek watershed
[illegible]		Sherwood	42°45'50"	76°35'45"		Jan. 1965 -	Great Gully Creek watershed
[illegible]		[illegible]	[illegible]	[illegible]		Jan. 1965 -	Red Creek watershed