W A T E R R E S O U R C E S

O F T H E

T O W N O F C A R O G A

Fulton County Planning Department
March 10, 1976

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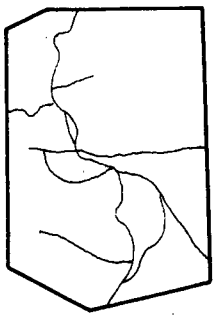
contents



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PURPOSE

This report examines the hydrology of the Town of Caroga. As such, it inventories surface and ground water features, flood zones, potential aquifers, water quality classifications, fishery inventory and stream classifications.

The analysis of Caroga's hydrology is important to the planning process because of the town's responsibility to protect community-wide resources. Drainage basins, re-charge aquifers, wildlife habitats and underground water supplies are natural systems vital to more than the individual property owner, as well as important for future generations of town residents. In addition to water quality, the quantity of water supplies is important to agricultural, industrial and residential uses.

DATA SOURCES

Adirondack Park Agency Wetland Classification, Natural Resource Planning, Ray Brook, NY, 1975.

Fulton County Comprehensive Water Supply Study CPWS-66, Morrell Vrooman Engineers, May 1972.

Fulton County General Soils Report, U.S. Department of Agriculture, Soil Conservation Service, 1971.

Hydrology, Fulton County Planning Department Report, NY, 1972.

New York State Department of Environmental Conservation, Water Quality Classification and Fish Stocking Data, Fish Wildlife Bureau Warrensburg, NY.

Snow Resources, Fulton County Planning Department Report, NY, 1972.

Streams and Drainage Basins, Fulton County Planning Department Report, NY, 1970.

Town of Caroga Conservation Advisory Council, Water Quality Records, 1973-1974.

INVENTORY

The following is a review of the water resources which comprise important elements of the town's hydrologic cycle.

WATERSHEDS

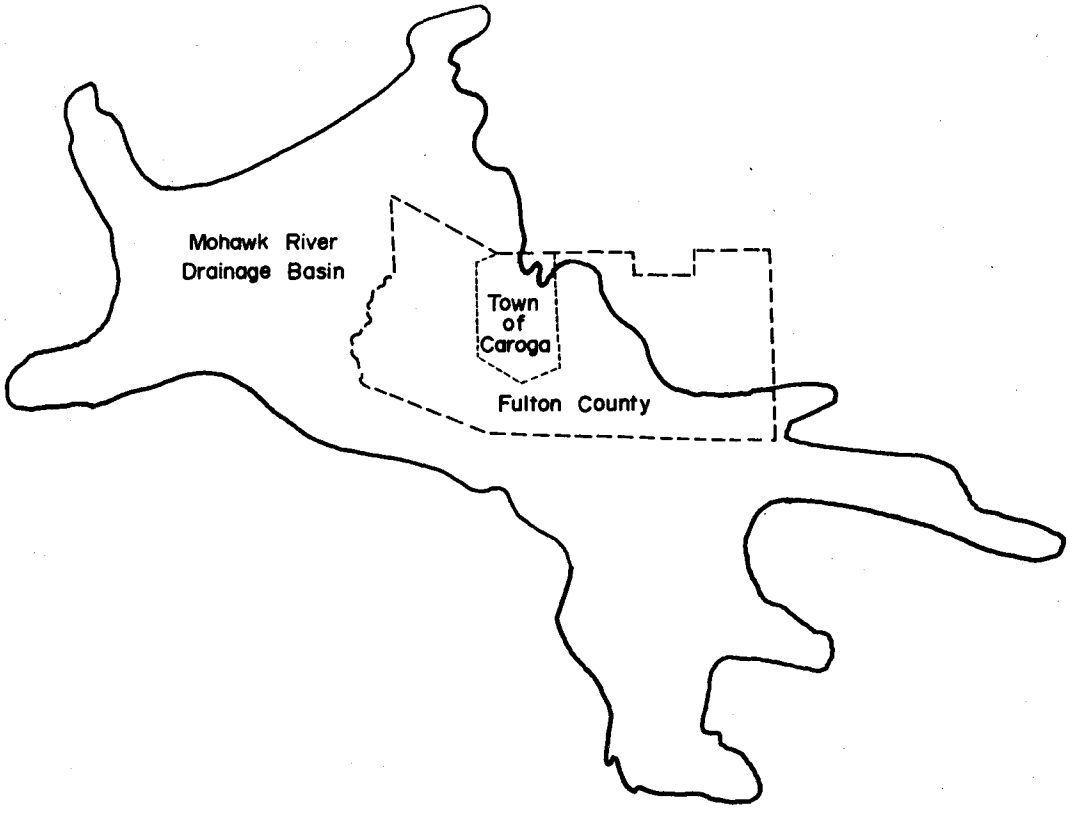
Watersheds or drainage basins are areas that drain into a specific river, stream, lake or pond. The basins that are delineated on the hydrologic map are of two types; major and minor. Minor basins feed those tributaries flowing into the larger rivers or lakes of the major basins.

Drainage pattern information aids Town Planning and Project Review functions because land development directly affects both quantity and quality of surface and groundwater. This information, together with slope, soils, vegetation, and climate information can be used to help evaluate the impact of potential development on water bodies in respective drainage areas.

The Town of Caroga is a part of the Mohawk River drainage basin. All its surface streams drain in a southerly direction into the Mohawk River. Figure 1 illustrates the general location of Fulton County and the Town of Caroga within the 3,462 square mile area of the Mohawk River Drainage Basin. None of the forty-six major discharges of the basin are located within the town, as found in the more industrialized and urbanized areas.

Figure 1

LOCATION WITHIN MOHAWK RIVER BASIN



The most important drainage basins within Caroga include the drainage areas surrounding Canada Lake and Caroga Creek.

The Canada Lake Basin drains Stoner Lakes, Pine Lake, Nine Corners Lake, Burnt Vly, Green Lake, Sprite Creek, Bellows Lake, Irving Pond and Mud Lake. The outlet for the Canada Lake Basin is Lily Lake, which is drained by the Sprite Creek starting at or near Stewart Landing in the Town of Stratford.

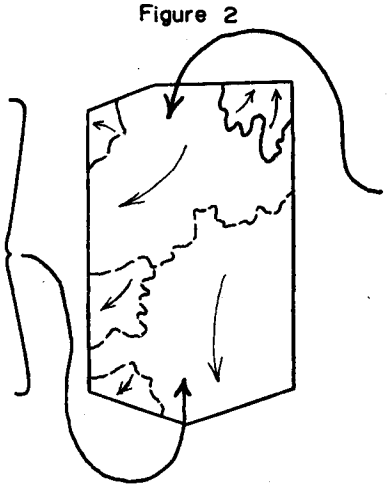
The Caroga Creek Basin drains West and East Caroga Lakes, Durey Creek, Peck Creek and Glasgow Creek. The Caroga Creek drains through a portion of the Town of Johnstown and then into Rockwood Lake in the Town of Ephratah.

North Creek, Middle Sprite and Zimmerman Creeks drain small portions, of New York State lands in a westerly direction.

The northeast section of Caroga drains to the north as a part of the Upper Hudson Drainage Basin. All of this area, including Oxbarn Lake and Whitman Flow, are on lands owned by the State of New York.

The following figure illustrates the largest drainage areas and lists general conditions and problems for each:

Figure 2



1174 Dwellings
25% New York State Lands (approximately)
Flood Hazard Areas
Town Land Fill Site
Highway salt and oil run-off

608 Dwellings
75% New York State Lands (approximately)
Flood Hazard Areas

STREAM ORDER

In the Caroga Area, streams vary in size from the Caroga Creek down to intermittent streams and small brooks. A consistent process for describing streams by their relative size is the Strahler Method.*

* Leopold, L.B., Wolman, M.G., and Miller, J.P. (1964) Fluvial Processes in Geomorphology. W.H. Freeman and Company, San Francisco, California.

TOWN OF

CAROGA, N.Y.

DRAINAGE PATTERNS

Legend

DRAINAGE SYSTEMS

MAJOR BASIN DIVIDE

CREEK BASIN DIVIDE

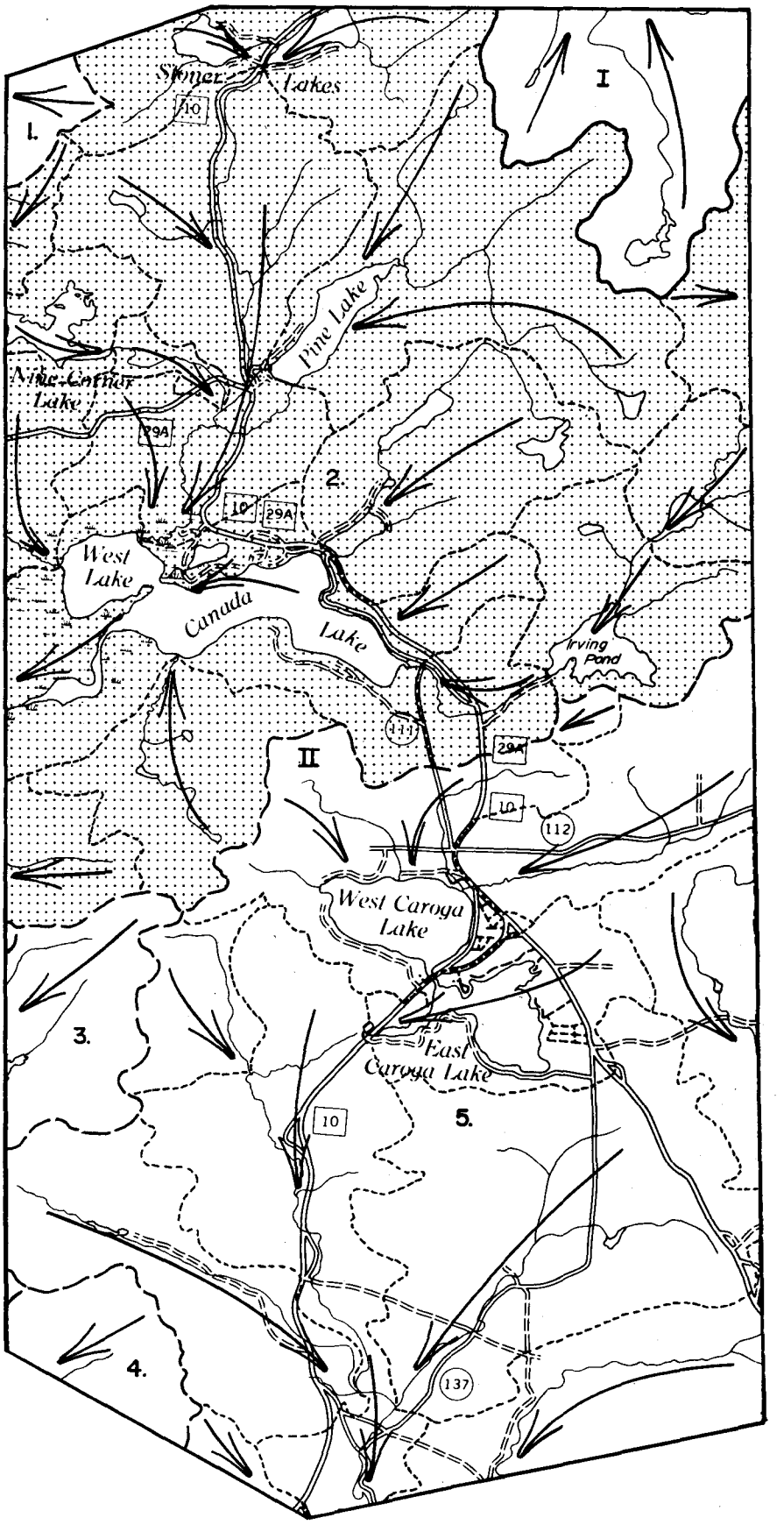
SUB BASIN DIVIDE

DIRECTION OF FLOW

I UPPER HUDSON RIVER DRAINAGE BASIN

II MOHAWK RIVER DRAINAGE BASIN

1. NORTH CREEK BASIN
2. CANADA LAKE BASIN
3. MIDDLE SPRITE CREEK BASIN
4. ZIMMERMAN CREEK BASIN
5. CAROGA CREEK BASIN



Scale

Data Source: Streams and Drainage Basins, Fulton County, 1970.

Basically, this method orders streams sequentially from the source downstream; thus, for many streams, it was necessary to go beyond the boundaries of the town. A first order stream is identified at the first point downstream where two intermittent streams join to form a stream that flows year round. A second order stream starts where two first order streams join; third order streams result from the joining of two second order streams, and so on.

It is important to note that the Strahler Method only provides a relative ordering of streams and does not necessarily rank streams by volume of discharge at the stream mouth. The primary source for stream location is the 7.5 minute U.S.G.S. topographic maps.

Two third order streams are located in Caroga. The Stoner Lakes/ Pine Lake Outlet is the longer, ranking as a third order stream from approximately one mile north of Pine Lake to the point where it empties into West Lake. The remaining third order stream is Caroga Creek, from the confluence of Durey and Caroga Creek, to the southern town border.

Second order streams include portions of Stoner Lake Outlet, Burnt Vly, Indian Lake Outlet, East Stoner Creek, Erie Creek, Negro Lake Outlet, Irving Pond Outlet, Durey Creek, Caroga Creek and Peck Creek. Approximately forty-five intermittent streams have been identified in the town, all of which are classified as first order streams.

The velocity of streamflow is generally low throughout the Town of Caroga. Water of low velocity (rate) is limited in the amount of sediment or suspended particles that it can transport. Due to the extremely stony character of the town's soils and the rugged terrain, surface run-off may be excessive at times. Caroga's streams are sensitive to increases in erosion and sedimentation. Erosion is not only heightened in the early stages of construction but also after substantial areas of the watershed have been developed. The increase in impenetrable surfaces increases the quantity and velocity (rate) of storm water run-off. This often results in stream bed and bank scouring, as well as greater spring flood heights.

WATER QUALITY

The Department of Environmental Conservation has classified New York State Waters according to standards (Environmental Conservation Law,

Parts 700-703), such as, coliform, pH, total dissolved solids and dissolved oxygen. The following legend describes classifications applicable to Town of Caroga waters:

Class AA - best use: Source of water supply for drinking, culinary or food processing purposes and any other usages.

Class A - best use: Source of water supply for drinking, culinary or food processing purposes and any other usages. Conditions related to best use: The waters, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities will meet NYS Department of Health drinking water standards and will be considered safe and satisfactory for drinking water purposes.

Class B - best use: Primary contact recreation and any other uses except as a source of water supply for drinking, culinary or food processing purposes.

Class C - best use: Suitable for fishing and all other uses except as a source of water supply for drinking, culinary or food processing purposes and primary contact recreation.

Class D - best use: These waters are suitable for secondary contact recreation, but due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery of stream bed conditions, the waters will not support the propogation of fish. Conditions related to best use: The water must be suitable for fish survival.

Designation T: These waters are trout waters and the dissolved oxygen specification for trout waters shall apply.

None of the water resources of Caroga are classified (AA or A) with a best use being a source for drinking water.

Pine Lake, West Lake, Canada Lake, Green Lake, Irving Pond, West Caroga Lake and East Caroga Lake are classified as B - water with a suitability for primary contact recreation. Quality standards for Class B waters include: monthly median coliform value (100 ml of sample) not exceeding 2400, pH value between 6.5 and 8.5, and minimum dissolved oxygen daily averages of 6.0 mg/1 for designated trout waters.

All of the remaining streams (includes Mud Lake) are classified as C and D. Numerous streams of the town are suitable for fishing and have been classified as trout streams by the Department of Environmental Conservation.

The D.E.C. fish stocking list for the period January 1 to December 31, 1974 details the location, number, species and average size of fish planted:

STREAM	NUMBER	SPECIES	SIZE (inches)
Canada Lake	4,150	Lake Trout	5.25
Caroga Creek	1,580	Brown Trout	7.75
Durey Creek	480	Brook Trout	6.00
Indian Lake	600	Brook Trout	5.50
Otter Lake	540	Brook Trout	5.50
Stewart Pond	1,800	Brook Trout	5.50
	9,150		

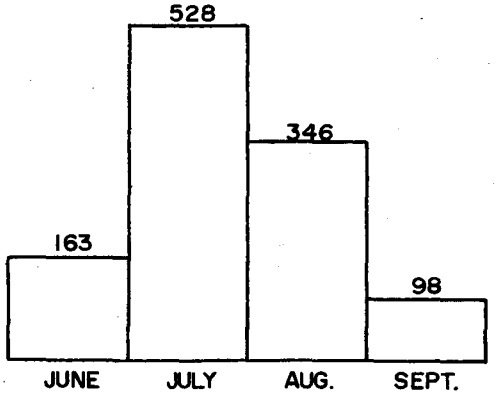
Water quality has been monitored, throughout the Town of Caroga, by the Conservation Advisory Council. Created in the Spring of 1973, the council conducts water pollution tests on five intensely used lakes. The purpose of these tests is to monitor the effect of the increased seasonal population on the lakes and to provide information to the Town Sanitary Engineer for corrective actions.

A grant of $800.00 by the Ford Foundation, in 1973, provided the initial funding for the purchase of equipment to test the bacteria content of water. The 1973 test results partially supported the correlation of increased lake pollution to the influx of seasonal residents. It is estimated that the population of the Town of Caroga increases by 800% during the summer months. Warmer lake temperatures, combined with a variety of non-point sources of pollution, explains the higher coliform counts recorded for the tested lakes (West Caroga, East Caroga, Canada, Green, Pine and Stoner Lakes) during 1973 are illustrated as follows:

Figure 3

FIVE LAKE MONTHLY COLIFORM AVERAGE

June 1973 — September 1973



The New York State Department of Health issues public beach permits based upon Part 6, Section 6.20 (3)(c) of the Sanitary Code, which establishes the coliform limit as a logarithmic mean of 2400 per 100 milliliters for five or more samples in a thirty-day period (nor shall 20% of total samples during the period exceed 5000/100 ml). The 1973 to 1975 Caroga Environmental Advisory Council test results have been far below the 2400 coliform limit utilized by the Department of Health, as indicated by the average coliform counts for 1973.

The New York State Department of Environmental Conservation issues permits to commercial operators with designed discharges in excess of 1000 gallons per day. At present, a total of three permits have been issued (one pending) to these large-scale facilities in the Town of Caroga. No industrial operations exist within the town limits which would require a permit for industrial discharges.

The fecal content of water, caused by human and animal wastes, is the most important measure of safe water for primary contact recreation. The Environmental Advisory Council tests for the fecal content in water when it is suspected that a septic system is discharging into a lake. During the testing years of 1973 to 1975, the fecal content counts have consistently been below Department of Health beach standards.

An additional measure of water quality is clarity. The secchi disc, a black-on-white circle, is placed at a four foot water depth to determine visibility. Tannic acid, caused mainly by decaying leaves, combined with excessive turbidity and algae, results in clarity problems. Although not a major health problem, turbidity may act as an irritant to skin and mucous membranes i.e. ears, eyes and nose. Generally, lakes in the Town of Caroga are not significantly affected by clarity problems.

On the other hand, algae and weed growth has increased as a water quality problem in recent years. Soap wastes and the natural aging process of lakes contribute to these water quality problems. An assessment of the extent of accelerated aging (euthrophic status) taking place in Town of Caroga Lakes would provide valuable planning information.

FLOOD HAZARD

The Flood Disaster Protection Act of 1973 provides previously unavailable flood insurance protection at federally subsidized rates, to property owners in flood-prone areas.

TOWN OF

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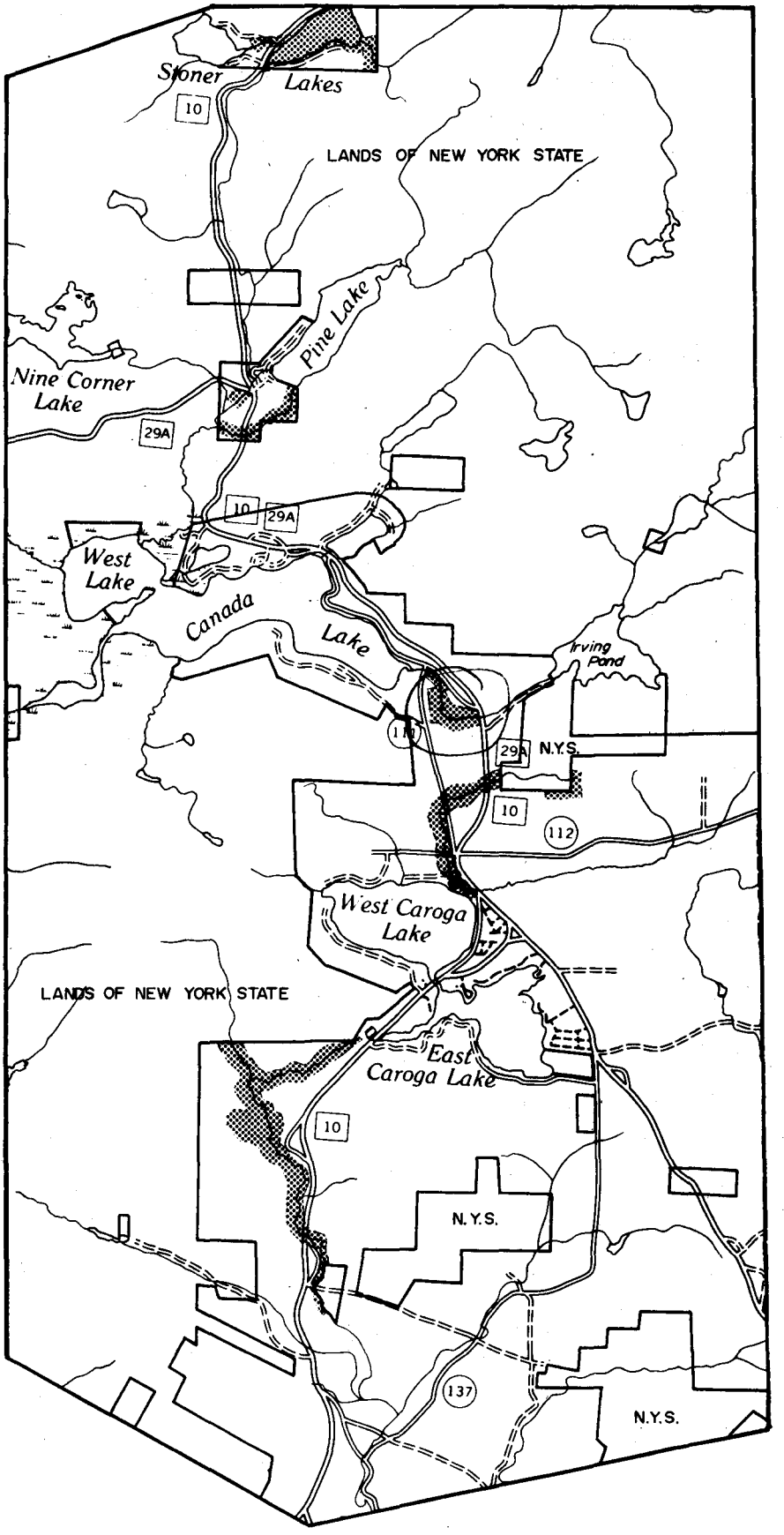
SPECIAL FLOOD HAZARD AREAS



True North

Legend

FLOOD HAZARD AREAS

FLOOD PRONE AREAS AS DESIGNATED BY THE FEDERAL INSURANCE ADMINISTRATION.

Scale

1 Mile ½ 0 ½ 1 Mile

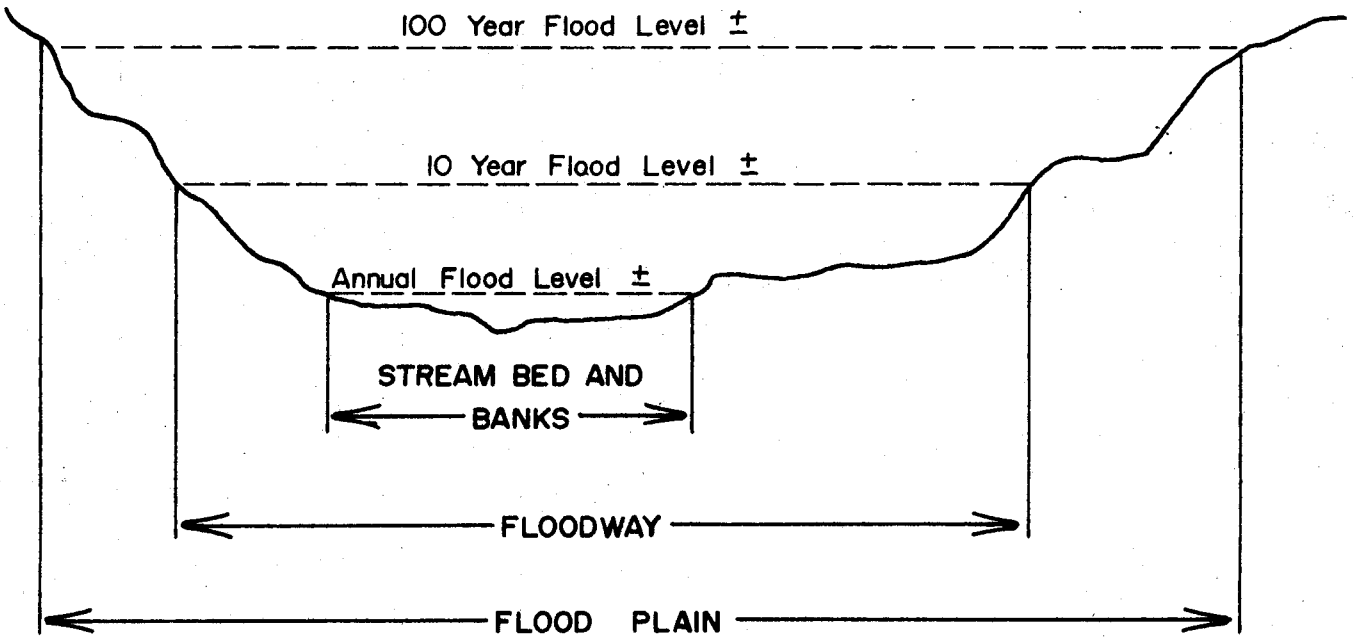
Data Source: Department of Housing and Urban Development, Federal Insurance Administration, 1975.

A flood hazard map, as prepared by the National Flood Insurance Program, indicates that portions of several of the streams of the town are flood hazard areas.

Flood hazard areas are divided into a floodway and flood plain, as illustrated below:

Figure 4

CROSS SECTION OF FLOOD AREA



Within the floodway, (10% flood risk) development is limited to open space uses having low flood damage potential and offering minimum obstruction to the flow of floodwaters (e.g., parks, agriculture, golf courses and parking areas). The flood plain (1% flood risk) may have limited building with special limitations concerning the siting of structures as well as requirements on septic system design and placement.

In compliance with the Flood Disaster Protection Act, the Town of Caroga has incorporated the necessary regulations of Flood Plain areas into their existing Building and Sanitary Codes.

WETLANDS

Under the Adirondack Park Act, all wetlands larger than one acre in size and those contiguous to streams, lake and ponds of any size are subject to special review procedures prior to undertaking of new land uses and development. The common natural functions of wetlands which make them valuable resources to the town are; wetlands serve as filters helping to protect downstream water resources from siltation and pollution, influencing the quantity of water by maintaining minimum low flows by slow release of water during dry periods and storing it during floods, and wetlands as a complex and diverse environment provides for valuable plant and animal communities with the resultant benefits of related human activities (such as fishing, trapping, recreational and educational uses).

The largest wetland of the Town of Caroga is located along the western shore of West Lake and is owned by New York State.

Over eightly small wetlands, ranging from one to forty acres, are located on the private lands in the town. Property owners are required to apply for a permit from the Adirondack Park Agency for any new land use and development in their wetlands.

PRECIPITATION

Precipitation includes all water deposited on the earth's surface in the form of rain, snow, sleet or hail.

The Atmospheric Weather Services, formerly known as the United States Weather Bureau, is the official federal agency providing reliable records of precipitation, temperature and other atmospheric conditions.

Precipitation data is a basic element of the planning process. Snow depth averages are useful for comparing Caroga's snow resources to other Fulton County and Adirondack Park areas concerning the viability of winter recreational uses. The water-content-in-snow data is also useful in anticipating potential spring floods. Long-term precipitation records established an average of rainfall expected and a base for calculating approximate amounts of surface run-off and the extent of re-charge for underground water supplies..

Snow fall is recorded for the Town of Caroga at the elevation of 1,550 (Canada Lake) feet above sea level. Selected snow-survey data records from 1926 to present are available for reference at the U.S. Geological Survey, P.O. Box 1350, Albany, NY 12201.

TOWN OF

CAROGA, N.Y.

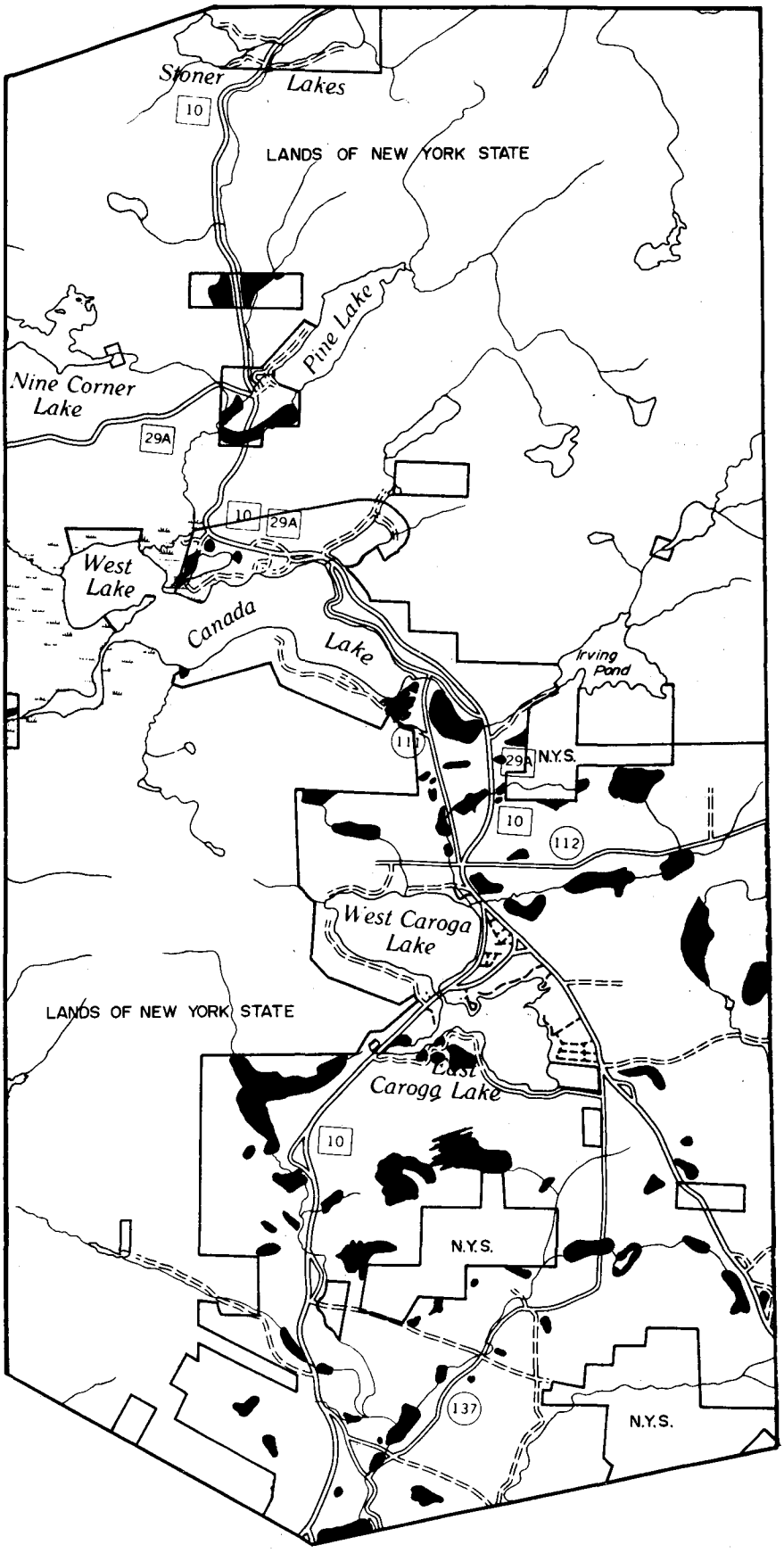
WETLANDS

Legend

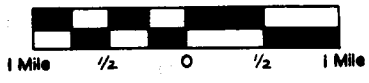
WETLANDS

PRIVATELY OWNED WETLANDS (1 ACRE OR MORE)

NOTE: DESIGNATION AS WETLAND IS PRELIMINARY AND SUBJECT TO REVISION.



Scale



Data Source: Adirondack Park Agency

A flood, such as the Hudson River Flood of 1936, clearly illustrates the importance of snow accumulation data to predict the impact of rapid melting of a deep snow cover by a substantial warm rain. Near the end of winter, the probable water-content of the snow on the ground is slightly more than thirty percent. As an example, the mid-April water-content in snow for Canada Lake (1975) of 8.2 inches if added to a 4 inch rainfall would create a potential run-off in excess of 12 inches of water. If the melt takes place in two or three days, floods could develop.

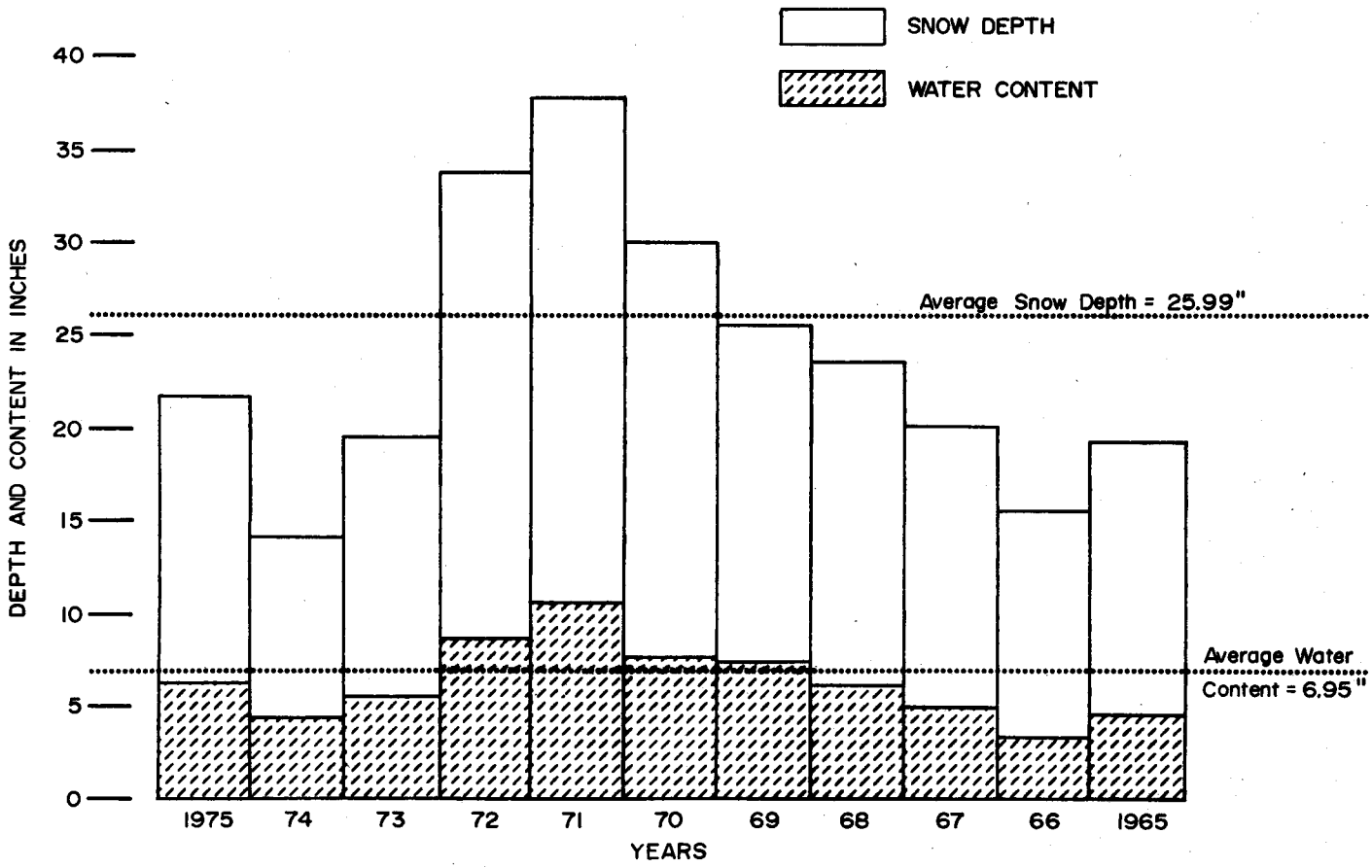
The Fulton County Snow Resources Report analyzes the snow accumulation data for the period 1965-1972. In addition, snow depth and water content data for the 1973 to 1975 years were collected to prepare the following graph for the Canada Lake snow survey site (the exact measurement dates vary from year to year between early January and late March).

Figure 5

SNOW SURVEY DATA

CANADA LAKE

Elevation 1550



The snow depths recorded for 1970, 1971 and 1972 are considered unusually high, ranging from four to eleven inches in excess of the ten year snow depth average of 26 inches.

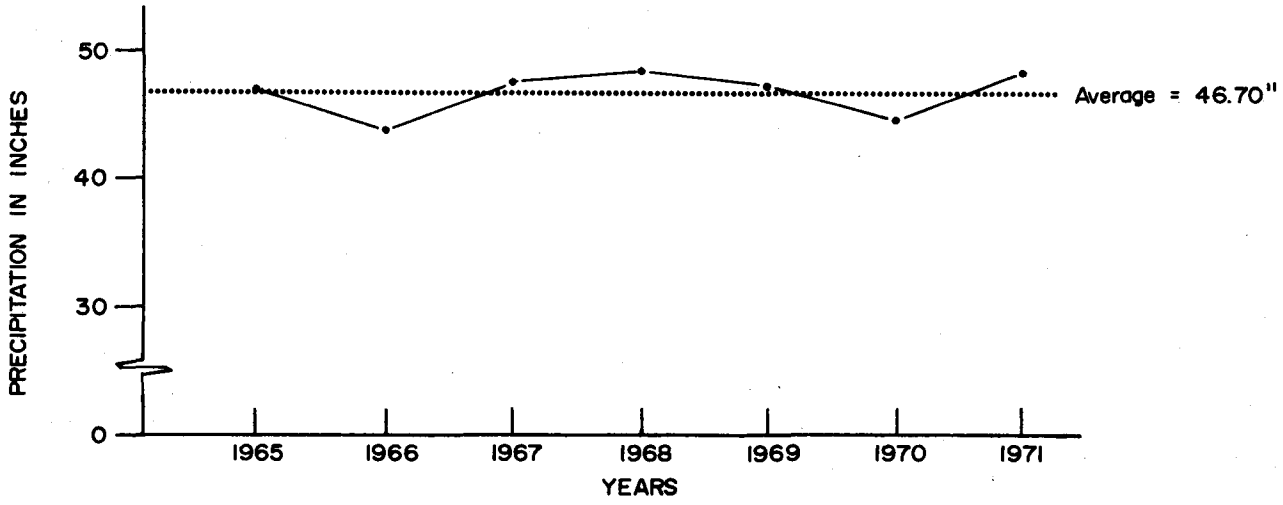
The snow resources of Caroga are a significant asset for the promotion of winter recreational activities, such as, cross-country skiing, snowshoeing, ice fishing, toboggoning and snowmobiling.

Precipitation measurements from Canada Lake at 1,560 feet above sea level, are utilized as the single measurement site for the Town of Caroga. The average yearly total of precipitation (based upon 1965-1971 data) was 46.7 inches. The higher number of inches of precipitation realized in Caroga and for other towns at higher elevations, is partly due to the greater depths of snow occuring in these areas.

The following graph displays the yearly total and the seven year average of precipitation for the Canada Lake site:

Figure 6

PRECIPITATION RATES



The range of precipitation rates between forty and fifty inches per year represents the normal hydrologic condition. Events such as, tropical storms or prolonged droughts will significantly alter the normal precipitation rates for the town.

Due to the steep slopes and snow melt, over frozen ground, the distribution of precipitation between run-off and evapotransporation is approximately 50% each*, within the Adirondack Region. Run-off within

*Lull, H.W., Sopper, W.E., Hydrologic Effects from Urbanization of Forested Watersheds in the Northeast; U.S.D.A. Forest Service Research Paper NE-146, 1969; pp 8-9.

the Town of Caroga, to both surface and groundwater, totals approximately 24 inches per year. The potential effects caused by clear-cutting and other forms of major watershed alterations are significant, due to the role played by vegetation in keeping porous surface soils from washing away. This porous soil enables a greater portion of the precipitation to reach groundwater.

GROUNDWATER

The groundwater supplies in Caroga are of considerable significance due to the total reliance on wells for individual water supplies. The yield of such wells varies according to location and type of bedrock material in which the well is located (although many wells may be shallow and in surficial till).

Approximately 80% of Caroga's bedrock is classified as cambrian to pre-cambrian crystallines, generally yielding 5 to 25 gallons per minute (to properly developed 6" wells penetrating less than 200 feet of rock). Very little water moves within these essentially non-permeable rocks except within open fractures or joints. This crystalline is the only bedrock type in Fulton County yielding "soft" water (10-60 ppm total hardness).

The southeast section of Caroga is of an uncertain bedrock formation, covered by a thick overburden (loose soil, sand and gravel over bedrock).

Higher water yields are generally expected in fault zones, such as identified in the three separate areas of Caroga. These fault zones provide potential areas for large amounts of groundwater to circulate. A geologist's report, on potential groundwater in Fulton County, states:

> "The major factor in determining potential groundwater yield in Fulton County is the nature and frequency of the bedrock fracture system. Ideally, two or more intersecting sets of open fractures facilitate groundwater collection and movement, and these conditions occur in the area where the rock has been broken and faulted."*

Although no intersecting sets of open fractures are indicated, the individual fault zones are important for providing areas which may give higher yields in an otherwise low yielding bedrock.

*Fulton County Comprehensive Public Water Supply Study CPWS-66, May, 1972, Recommendation Section, page 10.

TOWN OF

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GROUNDWATER

Legend

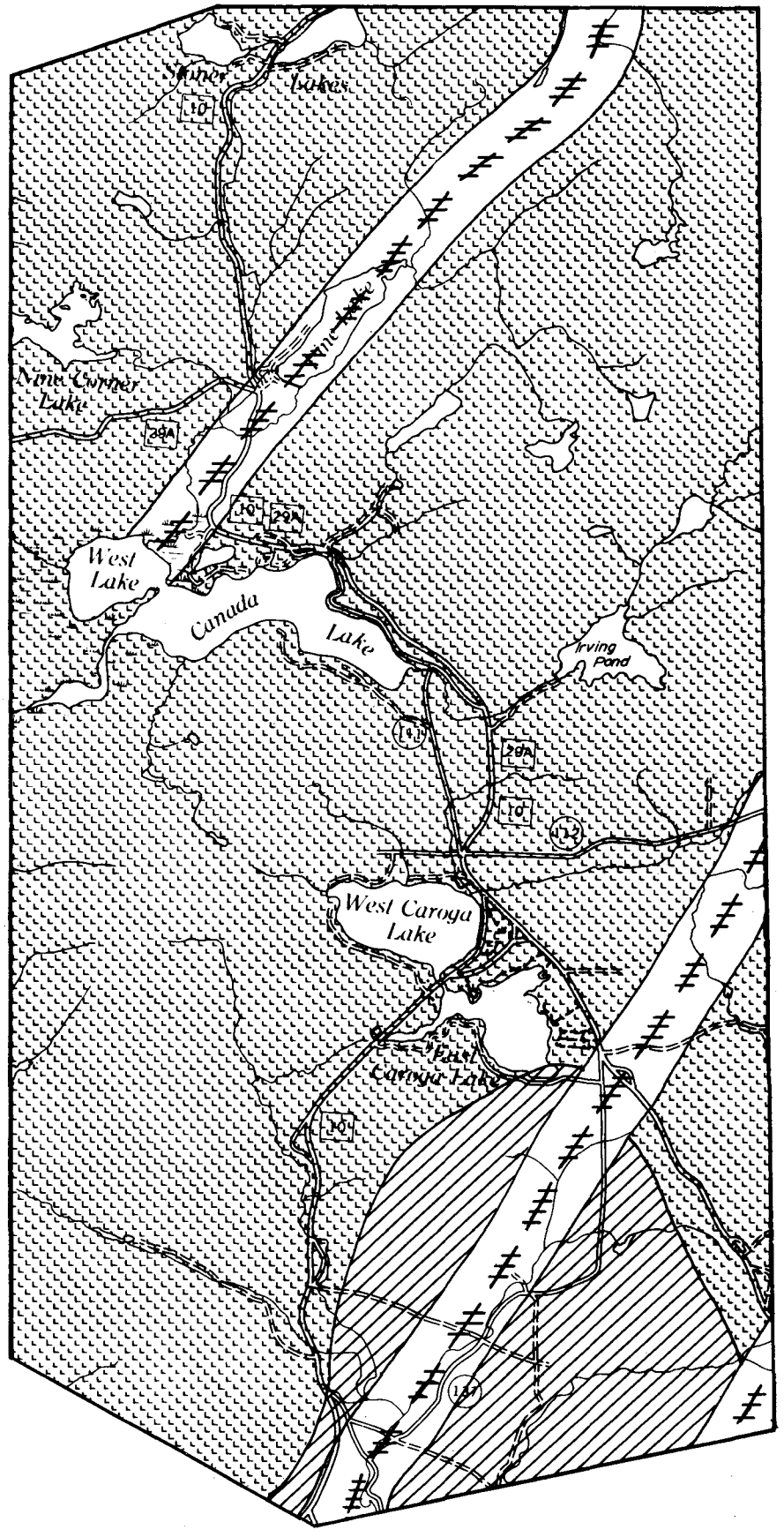
POTENTIAL GROUNDWATER IN BEDROCK

Low to moderate yield. (5–25 G.P.M.) Cambrian Crystallines

FAULT ZONE
Areas of potentially high water yields. (+ 100 G.P.M.)

Bedrock covered by thick overburden. Bedrock type uncertain.

G.P.M. = Gallons Per Minute.



Scale

Data Source: W. J. Miller and well data supplied by the U.S. Geological Survey.

The potential groundwater supplies are dependent upon the areas which provide a means for re-charging these water "banks." Aquifers are large water bearing permeable rock formations or subsoils through which groundwater moves more or less freely. Aquifer re-charge areas are surface soils which are highly permeable and allow rapid transmittal of water down to the water table.

Potential aquifer re-charge areas are identified from general information indicating flat to gentle slopes, permeable soil conditions and proximity to the bedrock fault zones. Mapping the location of a surface aquifer is not possible without detailed test well data. The General Soils Report data, prepared by the Soil Conservation Service, defines the general location of surface permeable soils. Available data allows only for the "potential" identification of re-charge aquifers in the town.

The parent soil materials are of varying use as aquifer soils. The glacial till soils are the predominant parent material of Caroga, and are generally poor for re-charge areas. On the other hand, glacial outwash and organic deposits, are generally good as aquifer soils.

The glacial outwash soils are primarily located in a corridor along N.Y.S. Route 10 between Stoner Lakes and West Lake. Within this area, the dominant soil association is Scarboro, noted as a deep, very poorly drained soil with its water table at the surface (at least seasonally). A smaller section of outwash soil is located along Lane and North Bush Roads. The soil associations represented in this area include the somewhat excessively drained Merrimac soils and the excessively drained Hinckley soils.

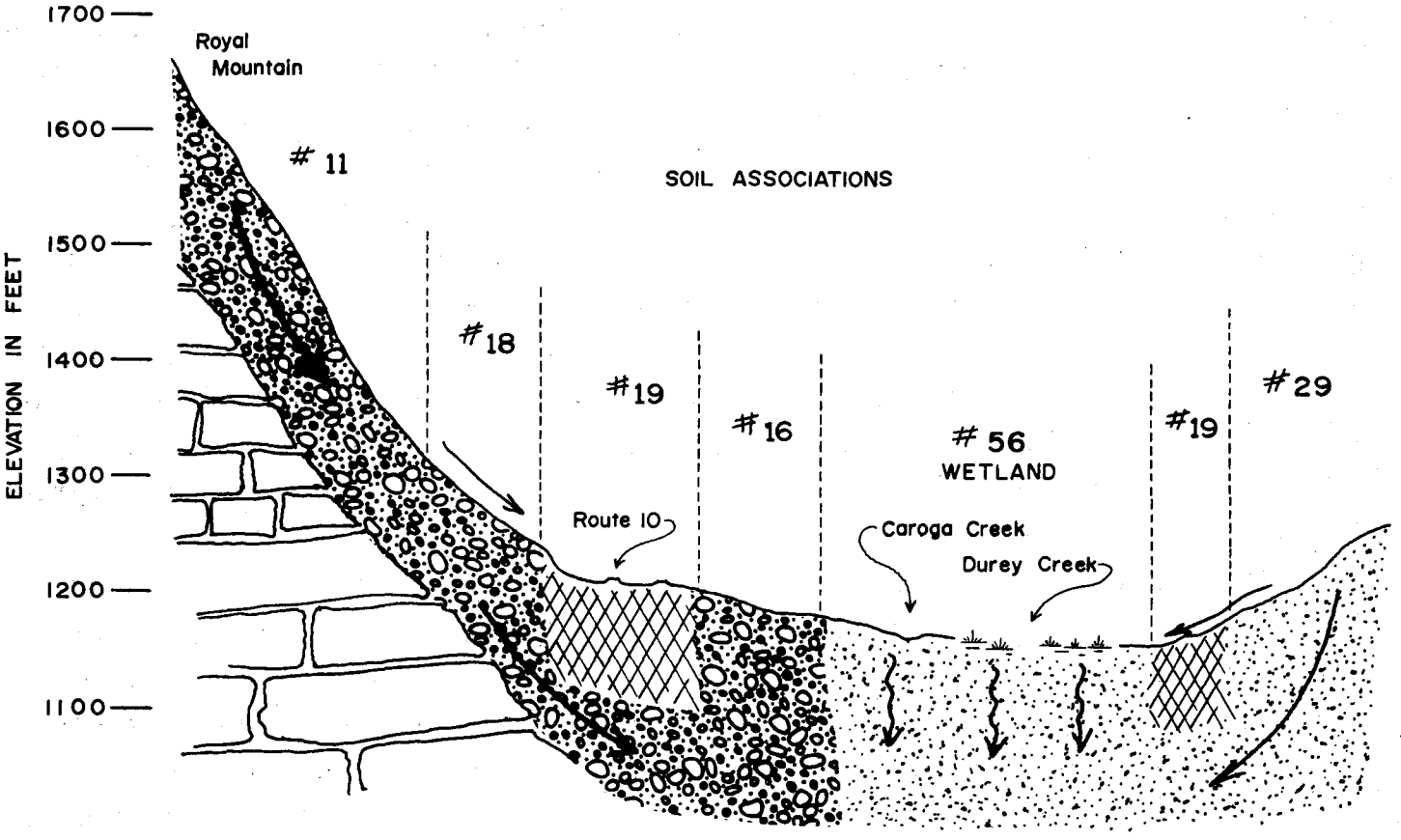
The organic soils of the town are located adjacent to Pine Lake and West Lake, as well as along sections of Caroga Creek, Glasgow Creek and Durey Creek. Carlisle and Palms Muck is the soil association in these areas and is defined as being very poorly drained to ponded areas of largely unrecognizable plant remains. A common feature of these organic soils is their permanent high water table.

Additional physical features utilized in identifying potential aquifers include topography and the areas where surface streams join together. Sizeable aquifers require flat or depressional areas (generally between 0% and 8% slope) for the collection of surface water to channel into the underground water system. The topography for all the outwash and organic soils are generally flat, except for the area located along Lane and Durey Roads.

Available soils, topography, fault zone and stream location data indicates that a potential aquifer is located at the intersection of Glasgow, Caroga, Cape Horn and Durey Creeks and above a fault zone. A cross-sectioned diagram of the area illustrating soil type, topography and stream locations for the potential North Bush Aquifer follows:

Figure 7

CROSS-SECTION OF A POTENTIAL RE-CHARGE AREA



The alluvial soil (#56) of the potential North Bush Re-Charge Aquifer, consists of the material deposited by streams presently flowing through the area. The alluvial soils consist of varying thicknesses of interbedded sands, silts and gravels. The Fulton County Comprehensive Water Supply Study (Recommendations Section, page 14) indicates that "if the deposited alluvium is deep enough, a good supply of groundwater can be stored in these channel deposits."

PUBLIC WATER SUPPLY

The Town of Caroga is without a public water supply or public sanitary system. Development, for the most part, has been concentrated on small lots around West and East Caroga Lakes.

A 1971 referendum vote defeated a proposition to construct a limited public sewer system. Property owners, within the proposed sewer district, were concerned with the cost for this sewer system and felt that a public water system was more urgently needed.

Individual wells for summer residences frequently are of low yield, are contaminated by sewage wastes and have inferior taste and odor. These water problems are caused by one or more of the following factors; poor maintenance of wells, proximity of wells to septic systems or the construction of wells with loose stones (not water tight). Many seasonal residents transport water for drinking and cooking purposes rather than risk the use of water from their wells.

A public water supply system has been recommended, utilizing Irving Pond as the supply source to provide water service for domestic use and fire protection. A yield of 2.5 million gallons per day was estimated as safe and dependable, although the present average daily demand is only 150,000 gallons per day. The estimated cost, in 1972, for the Irving Pond Water Supply System was $1,220,000.*

The proposed water district includes both sides of Route 10/29A from the Firehouse to Sherman's Amusement Park, the entire area between West and East Caroga Lakes and south to the public campsite on Route 29A. According to the 1975 Land Use Report, approximately 800 residences are located within this district. The proposed water system includes a filtration plant (500,000 gallon per day capacity), standpipe reservoir (200,000 gallon per day capacity), 12" water main pipes and a 6" lateral water distribution system.

*Fulton County Comprehensive Water Supply Study, CPWS-66, Morrell Vrooman Engineers, May 1972, pp 105-108.

PLANNING GUIDELINES

One of the Town of Caroga's most valuable natural resources is its abundant supply of quality water. Protection of the town's recreational lakes has been a priority concern since the pollution-scare of 1968. The adoption and enforcement of the Town Sanitary Code, in conjunction with the dedicated water quality monitoring efforts of the Caroga Environmental Council, have significantly improved the condition of the town's lakes.

The following water resource guidelines and conclusions should be considered in the development of a Town Plan and in the review of proposed developments:

1. Continue to monitor water quality and require adequate sewage disposal systems through public support and cooperation for the Town Sanitary Inspector and the Citizens' Environmental Council.

2. The Town of Caroga qualifies under the full provisions of the National Flood Insurance Program through the additional requirements included in the Town's Sanitary Code, Mobile Home Ordinance and Building Code. In developing the Town Plan and Land Use Regulations, it is recommended that commercial and residential uses be excluded from flood areas.

3. The potential groundwater re-charge area of North Bush should be given special consideration in the future Town Plan.

4. Shoreline alterations of designated trout streams and first order streams may cause such problems as increased erosion, sedimentation and higher water temperatures. These water resources are best protected through density controls and building setback requirements.

5. Study is recommended to determine whether "leachate" from the town landfill site, which is located on highly permeable soils, is polluting the area's groundwater resources.

6. Snow depths recorded at Canada Lake average 26 inches between the months of January and March (1965-75 survey years). The base for more intensive winter recreational uses are indicated, particularly in light of the availability of New York State Lands, in the higher elevations of the town.

7. A public water supply system and sewer system would eliminate certain health hazards as well as justify more intensive future development than is currently feasible.

8. The natural aging process of Caroga's lakes is accelerated by intensive seasonal useage. It is recommended that the aging (euthrophic) status of the lakes be studied to provide data on the causes and potential solutions for slowing this process.