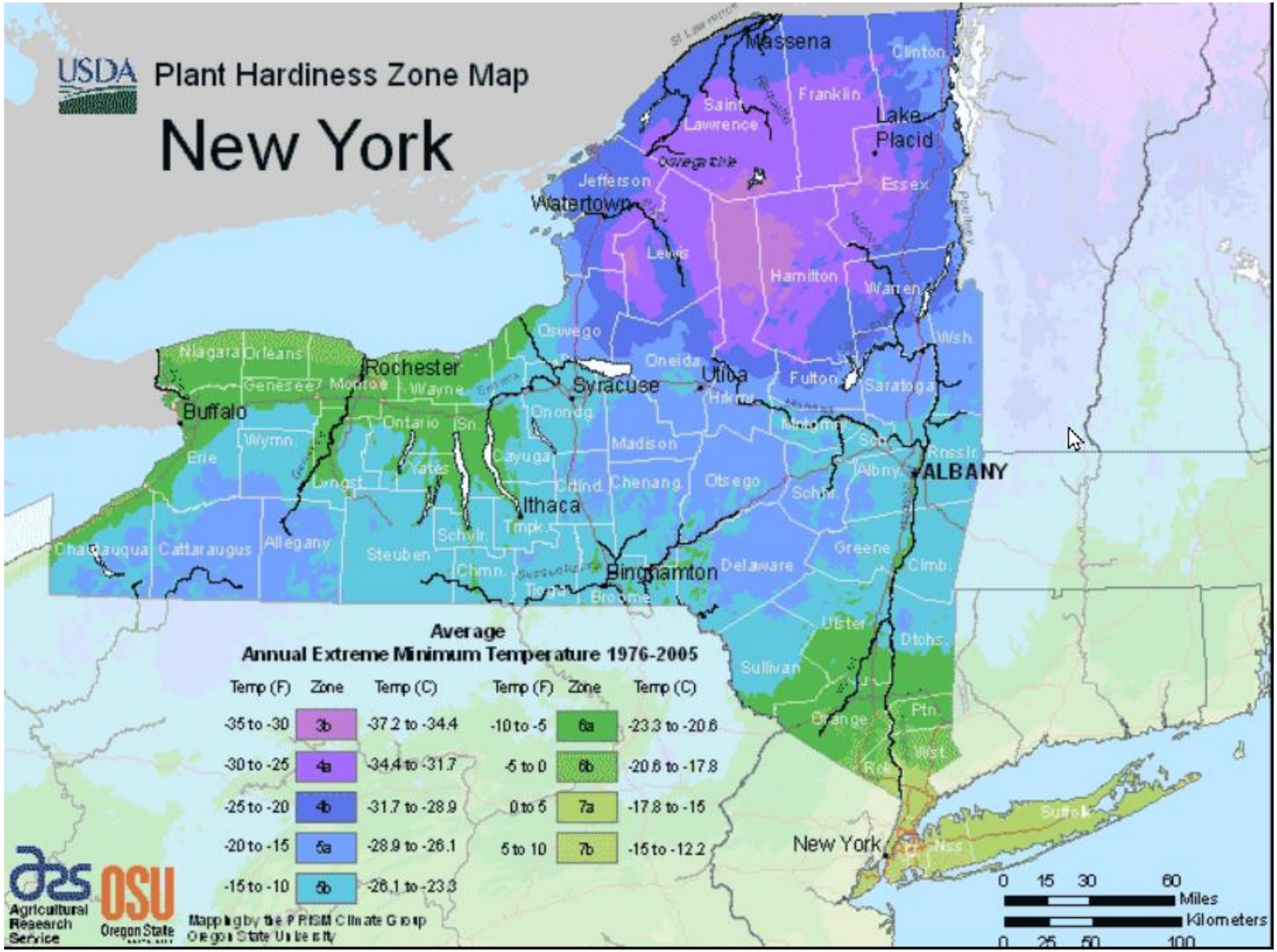
New York Climate Summary

[Plant Hardiness Map]



New York State Climate Zones

Figure 1. New York State Climate Zone Map

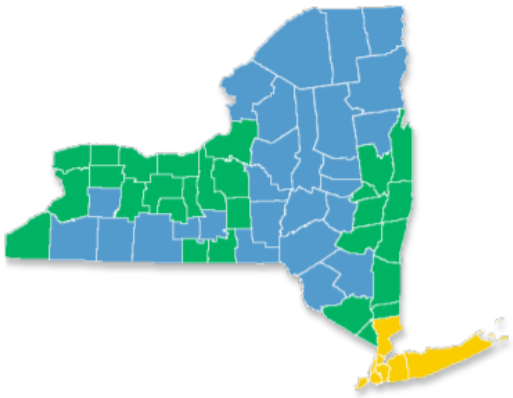


Table 1. New York State Climate Zone by County

Climate Zone 4			
Bronx	Nassau	Queens	Suffolk
Kings	New York	Richmond	Westchester
Climate Zone 5			
Albany	Erie	Ontario	Saratoga
Cayuga	Genesee	Orange	Schenectady
Chautauqua	Greene	Orleans	Seneca
Chemung	Livingston	Oswego	Tioga
Columbia	Monroe	Putnam	Washington
Cortland	Niagara	Rensselaer	Wayne
Dutchess	Onondaga	Rockland	Yates
Climate Zone 6			
Allegany	Franklin	Montgomery	Sullivan
Broome	Fulton	Oneida	Tompkins
Cattaraugus	Hamilton	Otsego	Ulster
Chenango	Herkimer	Schoharie	Warren
Clinton	Jefferson	Schuyler	Wyoming
Delaware	Lewis	St. Lawrence	
Essex	Madison	Steuben	

Reference

2012 IECC - International Energy Conservation Code

Author(s)

International Code Council

Organization(s)

ICC

Description

2012 edition of code establishing a baseline for energy efficiency by setting performance standards for the building envelope (defined as the boundary that separates heated/cooled air from unconditioned, outside air), mechanical systems, lighting systems and service water heating systems in homes and commercial businesses.

THE CLIMATE OF NEW YORK

Physical Description

New York State contains 49,576 square miles, inclusive of 1,637 square miles of inland water, but exclusive of the boundary-water areas of Long Island Sound, New York Harbor, Lake Ontario, and Lake Erie. The major portion of the state lies generally between latitudes 42° and 45°N and between longitudes 73° 30' and 79° 45'W. However, in the extreme southeast, a triangular portion extends southward to about latitude 40° 30'N, while Long Island lies eastward to about longitude 72°W.

The principal highland regions of the state are the Adirondacks in the northeast and the Appalachian Plateau (Southern Plateau) in the south. The latter Plateau is subdivided by the deep channel of Seneca Lake, which extends from the lake plain of Lake Ontario southward to the Chemung River Valley, into the Western and Eastern Plateaus. The former extends from the eastern Finger Lakes across the hills of southwestern New York to the narrow lake plain bordering Lake Erie; the later extends from the eastern Finger Lakes to the Hudson River Valley and includes the Catskill Mountains.

A minor highland region occurs in southeastern New York where the Hudson River has cut a valley between the Palisades on the west, near the New Jersey border, and the Taconic Mountains on the east, along the Connecticut and Massachusetts border. Just west of the Adirondacks and the upper Black River Valley in Lewis County is another minor highland know as Tug Hill.

Much of the eastern border of the state consists of a long, narrow lowland region, which is occupied by Lake Champlain, Lake George, and the middle and lower portions of the Hudson Valley. Another lowland region, the Great Lakes Plain, on the northern and western boundaries of the state adjoins the St. Lawrence River, Lake Ontario, and Lake Erie. This latter region is widest south of the eastern end of Lake Ontario, but does narrow to a width of less than 5 miles in the western portion of the state. A third lowland region, which contains Lake Oneida and a deep valley cut by the Mohawk River, connects the Hudson Valley, and the Great Lakes Plain. Long Island, which is a part of the Atlantic Coastal Plain, comprises the fourth lowland region of the state.

Approximately 40 percent of New York State has an elevation of more than 1,000 feet above sea level. In northwestern Essex County, confined to an area of 500 or 600 square miles, are a number of peaks with an elevation of between 4,000 to 5,000 feet. The highest point, Mount Marcy, reaches a height of 5,344 feet above sea level. Nearby Mount MacIntyre ranges to a height of 5,112 feet. With the exception of the Blue Ridge of North Carolina and the White Mountains of New Hampshire, these are the loftiest mountains in eastern North America.

The Appalachian Plateau merges variously into the Great Lakes Plain of western New York with gradual- to steep-sloping terrain. The valleys of the Finger Lakes, which, resembling the appearance of outstretched fingers on the hand, extend southward from the Great Lakes Plain. The major Finger Lakes going from west to east are Canandaigua, Keuka, Seneca, Cayuga and Skaneateles. Other prominent lakes in the state include Lake George in the central part of the eastern boundary, Lake Oneida in the central New York between Syracuse and Rome, and Chautauqua Lake in the extreme southwest. Sacandaga and Pepacton Reservoirs are sizeable manmade bodies of water in the eastern portion of the Station. Innumerable smaller lakes and ponds dot the landscape, with more than 1,500 in the Adirondack region alone.

Rivers of New York State may be divided into those that are tributary to the Great Lakes and St. Lawrence River and those that flow in a general southward direction. The first group includes rivers such as the Genesee, Oswego, Black, Oswegatchie, Grass, Raquette, Saranac, and Ausable. The Chemung, Susquehanna, Delaware, and Hudson River systems, which are part of the Atlantic slope drainage and the Allegheny River, which is part of the Ohio Basin drainage, comprise the second group.

General Climatic Features

The climate of New York State is broadly representative of the humid continental type, which prevails in the northeastern United States, but its diversity is not usually encountered within an area of comparable size. The geographical position of the state and the usual course of air masses, governed by the large-scale patterns of atmospheric circulation, provide general climatic controls. Differences in latitude, character of the topography, and proximity to large bodies of water have pronounced effects on the climate.

The planetary atmospheric circulation brings a great variety of air masses to New York State. Masses of cold, dry air frequently arrive from the northern interior of the continent. Prevailing winds from the south and southwest transport warm, humid air, which has been conditioned by the Gulf of Mexico and adjacent subtropical waters. These two air masses provide the dominant continental characteristics of the climate. The third great air mass flows inland from the North Atlantic Ocean and produces cool, cloudy, and damp weather conditions. This maritime influence is important to New York's climatic regime, especially in the southeastern portion of the state, but it is secondary to that of the more prevalent air mass flow from the continent.

Nearly all storm and frontal systems moving eastward across the continent pass through or in close proximity to New York State. Storm systems often move northward along the Atlantic coast and have an important influence on the weather and climate of Long Island and the lower Hudson Valley. Frequently, areas deep in the interior of the state feel the effects of such coastal storms.

Lengthy periods of either abnormally cold or warm weather result from the movement of great high pressure (anticyclonic) systems into and through the eastern United States. Cold winter temperatures prevail over New York whenever Arctic air masses, under high barometric pressure, flow southward from central Canada or from Hudson Bay. High-pressure systems often move just off the Atlantic coast, become more or less stagnant for several days, and then a persistent airflow from the southwest or south affects the state. This circulation brings the very warm, often humid weather of the summer season and the mild, more pleasant temperatures during the fall, winter, and spring seasons.

Temperature

Many atmospheric and physiographic controls on the climate result in a considerable variation of temperature conditions over New York State. The average annual mean temperature ranges from about 40° in the Adirondacks to near 55° in the New York City area. In January, the average mean temperature is approximately 16° in the Adirondacks and St. Lawrence Valley, but increases to about 26° along Lake Erie and in the lower Hudson Valley and to 31° on Long Island. The highest temperature of record in New York State is 108° at Troy on July 22, 1926. Temperatures of 107° have been observed at Lewiston, Elmira, Poughkeepsie, and New York City. The record coldest temperature is -52° at Stillwater Reservoir (northern Herkimer County) on February 9, 1934 and also at Old Forge (also northern Herkimer County)

on February 18, 1979. Some 30 communities have recorded temperatures of -40° or colder, most of them occurring in the northern one-half of the state and the remainder in the Western Plateau Division and in localities just south of the Mohawk Valley.

The winters are long and cold in the Plateau Divisions of the state. In the majority of winter seasons, a temperature of -25° or lower can be expected in the northern highlands (Northern Plateau) and -15° or colder in the southwestern and east-central highlands (Southern Plateau). The Adirondack region records from 35 to 45 days with below zero temperatures in normal to severe winters, with a somewhat fewer number of such days occurring near Lake Champlain and the St. Lawrence River. In the Southern Plateau and in the upper Hudson Valley division, below zero minimums are observed on about 15 days in most winters and on more than 25 days in notably cold seasons.

Winter temperatures are moderated considerably in the Great Lakes Plain of western New York. The moderating influence of Lakes Erie and Ontario is comparable to that produced by the Atlantic Ocean in the southern portion of the Hudson Valley. In both regions, the coldest temperature in most winters will range between 0° and -10°. Long Island and New York City experience below zero minimums in 2 or 3 winters out of 10, with the low temperature generally near -5°.

The summer climate is cool in the Adirondacks, Catskills, and higher elevations of the Southern Plateau. The New York City area and lower portions of the Hudson Valley have rather warm summers by comparison, with some periods of high, uncomfortable humidity. The remainder of New York State enjoys pleasantly warm summers, marred by only occasional, brief intervals of sultry conditions. Summer daytime temperatures usually range from the upper 70s to mid 80s over much of the State, producing an atmospheric environment favorable to many athletic, recreational, and other outdoor activities.

Temperatures of 90° or higher occur from late May to mid-September in all but the normally cooler portions of the state. The New York City area and most of the Hudson Valley record an average of from 18 to 25 days with such temperatures during the warm season, but in the Northern and Southern Plateaus the normal quota does not exceed 2 or 3 days. While temperatures of 100° are rare, many long-term weather stations, especially in the southern one-half of the State, have recorded maximums in the 100° to 105° range on one or more occasions. Minimum, or nighttime, temperatures drop to the 40s and upper 30s with some frequency during the summer season in the interior portions of the Plateau Divisions. It is not uncommon for temperatures to approach the freezing level in the Adirondacks and Southern Plateau during June and the latter half of August, but rarely in July.

The moderating effect of Lakes Erie and Ontario on temperatures assumes practical importance during the spring and fall seasons. The lake waters warm slowly in the spring, the effect of which is to reduce the warming of the atmosphere over adjacent land areas. Plant growth is thereby retarded, allowing a great variety of freeze-sensitive crops, especially tree and vine fruits, to reach critical early stages of development when the risk of freeze injury is minimized or greatly reduced. In the fall season, the lake waters cool more slowly than the land areas and thus serve as a heat source. The cooling of the atmosphere at night is moderated or reduced, the occurrence of freezing temperatures is delayed, and the growing season is lengthened for freeze-sensitive crops and vegetables.

The average length of the freeze-free season in New York State varies from 100 to 120 days in the Adirondacks, Catskills, and higher elevations of the Western Plateau Division to 180 to 200 days on Long Island. The important fruit and truck crop areas in the Great Lakes Plain enjoy a frost-free growing

season of from 150 to 180 days in duration. A freeze-free season of similar length also prevails in the Hudson Valley from Albany southward to Westchester and Orange Counties, another zone of valuable crop production. The Southern Plateau, St. Lawrence Valley, and Lake Champlain regions have an average duration of 120 to 150 days between the last spring and first fall freezes.

Precipitation

Moisture for precipitation in New York State is transported primarily from the Gulf of Mexico and Atlantic Ocean through circulation patterns and storm systems of the atmosphere. Distribution of precipitation within the state is greatly influenced by topography and proximity to the Great Lakes or Atlantic Ocean. Average annual amounts in excess of 50 inches occur in the western Adirondacks, Tug Hill area, and the Catskills, while slightly less tan that amount is noted in the higher elevations of the Western Plateau southeast of Lake Erie. Areas of least rainfall, with average accumulations of about 30 inches, occur near Lake Ontario in the extreme western counties, in the lower half of the Genesee River Valley, and in the vicinity of Lake Champlain.

New York State has a fairly uniform distribution of precipitation during the year. There are no distinctly dry or wet seasons, which are regularly repeated on an annual basis. Minimum precipitation occurs in the winter season, with an average monthly accumulation ranging from about 3.5 inches on Long Island to 2.2 inches in the Finger Lakes and Lake Champlain regions. Maximum amounts are noted in the summer season throughout the state except along the Great Lakes where slight peaks of similar magnitude occur in both the spring and fall seasons. Average monthly amounts in the summer vary from 3.0 inches in the lowlands south of Lake Ontario (Great Lakes Division) to 4.0 inches in the Eastern Plateau, Hudson Valley, and Coastal Divisions. New York's precipitation tends to be distributed most uniformly over the year in counties along the coast and the Great Lakes.

Variations in precipitation amounts from month to month or for the same month in different years can be wide for any individual area. Usually such variations range from near 1 inch to about 6 inches; in extreme cases, the variation is from less than 1 inch to 10 inches or more. Almost any calendar month has the potential of having the lightest, or heaviest, monthly accumulation of precipitation within a calendar year at a given location. The greatest monthly precipitation of record in New York State was a total of 25.27 inches at West Shokan (Ulster County) in October 1955. On the other hand, wide areas of the state measured less than 0.3 inch of rain in October 1963. Within relatively short distances, precipitation in the same month may be strikingly different. An extreme example occurred in August 1971 with a total of 16.7 inches falling at New York city's Borough of Richmond (Staten Island), but only 2.9 inches at Riverhead, about 90 miles away in eastern Long Island.

The amount and distribution of precipitation are normally sufficient fro the maintenance of the state's water resources for municipal and industrial supplies, transportation, and recreation. Rainfall is usually adequate during the growing season for economic crops, lawns, gardens, shrubs, forests, and woodlands. Severe droughts are rare, but deficiencies of precipitation may occur form time to time, which cause at least temporary concern over declining water supplies and moisture stress in crops and other vegetation. In some years, a pronounced shortage of precipitation during the spring or fall months results in a considerable fire hazard in the state's woodlands.

Snowfall

The climate of New York State is marked by abundant snowfall. With the exception of the Coastal Division, the state receives an average seasonal amount of 40 inches or more. The average snowfall is greater than 70 inches over some 60 percent of New York's area. The moderating influence of the Atlantic Ocean reduces the snow accumulation to 25 to 35 inches in the New York City area and on Long Island. About one-third of the winter season precipitation in the Coastal Division occurs from storms, which also yield at least 1 inch of snow. The great bulk of the winter precipitation in upstate New York comes as snow.

Topography, elevation, and proximity to large bodies of water result in a great variation of snowfall in the state's interior, even within relatively short distances. Maximum seasonal snowfall, averaging more than 175 inches, occurs on the western and southwestern slopes of the Adirondacks and Tug Hill. A secondary maximum of 150 to 180 inches prevails in the southwestern highlands, some 10 to 30 miles inland from Lake Erie. Three separate areas of the Eastern Plateau record heavy snow accumulations, averaging from 100 to 120 inches: (1) the uplands of southwestern Onondaga County and adjoining counties; (2) the Cherry Valley section of northern Otsego and southern Herkimer counties; and (3) the Catskill highlands in Ulster, Delaware, and Sullivan Counties. Minimum seasonal snowfall of 40 to 50 inches occurs upstate in (1) Niagara County, near the south shore of Lake Ontario, (2) the Chemung and mid-Genesee River Valleys of western New York, and (3) near the Hudson River in Orange, Rockland, and Westchester Counties upstream to the southern portion of Albany County.

In northern New York, the Adirondack region has an average seasonal snowfall in excess of 90 inches, but amounts decreased to 60 to 70 inches in the lowlands of the St. Lawrence Valley and to about 60 inches in the vicinity of Lake Champlain.

Snow produced in the lee of Lakes Erie and Ontario is a prominent and very important aspect of New York's climate. As cold air crosses the unfrozen lake waters, it is warmed in the lower layers, picks up moisture, and reaches the land in an unstable condition. Precipitation in the form of snow is released as the airstreams moves inland an over the gradually sloping higher terrain. Heavy snow squalls frequently occur, generating from 1 to 2 feet of snow and occasionally 4 feet or more. Snowfall produced by this "lake-effect" usually extends into the Mohawk Valley and often inland as far as the southern Finger Lakes and nearby southern tier of counties. Counties to the lee of Lake Erie are subject to heavy lake-effect snows in November and December, but as the lake surface gradually freezes by midwinter, these snows become less frequent. Areas near Lake Ontario, especially those to the southeast and east, are exposed to severe snow squalls well into February because the Lake generally retains considerable open water throughout the winter months.

In the heavy snow belts near Lake Erie and Ontario as well as in the plateau regions of eastern and northern New York, monthly snowfall amounts in excess of 24 inches are experienced in most winters; accumulations of more than 50 inches within 2 consecutive months are not uncommon. Monthly accumulations of between 3 to 10 inches usually occur in New York City and Long Island during the winter season, but occasionally the amounts may exceed 20 inches as a result of recurring coastal storms (northeasters).

A durable snow cover generally begins to develop in the Adirondacks and northern lowlands by late November and remains on the ground until various times in April, depending upon late winter snowfall and early spring temperatures. The Southern Plateau, Great Lakes Plain in southern portions of western upstate New York, and the Hudson Valley experience a continuous snow cover from about mid-December to mid-March, with maximum depths usually occurring in February. Bare ground may occur

briefly in the lower elevations of these regions during some winters. From late December or early January through February, the Atlantic coastal region of the state experiences alternating periods of measurable snow cover and bare ground.

Floods

Although major floods are relatively infrequent, appreciable damage usually occurs every year in one or more localities if New York State. Floods that arise from a variety of causes have been recorded in all seasons. The greatest potential and frequency for floods occur in the early spring when substantial rains combine with rapid snow melting to produced a heavy runoff. Since the turn of the century, several historic floods from this cause have occurred in the major river basins of southern and eastern New York. In northern New York, the normally colder early spring temperatures are conducive to a slower rate of snowmelt. In combination with other factors, major spring floods have been less frequent along streams draining into the St. Lawrence River. Ice jams sometimes contribute to serious flooding in very localized areas.

Damaging floods are caused at other times of the year by prolonged periods of heavy rainfall. Examples in recent years were those in southwestern New York in September 1967, in the lower Hudson Valley in May 1968, and in the Catskills in July 1969. In combination with heavy showers and thundershowers, the rugged terrain of the Adirondacks and Southern Plateau is conducive to occasional severe flash floods on smaller streams. The metropolitan New York City area and other heavily urbanized areas of the state are becoming increasingly subject to severe flooding of highways, streets, and low-lying ground. Replacement of the natural soil cover with cement, asphalt, and other impervious materials encourages such floods from rains of not more than moderately heavy intensity, that formerly were easily absorbed.

The shores of Long Island, especially those facing the Atlantic Ocean, are subject to tidal flooding during storm surges. Winds generated by hurricanes and great coastal storms may drive tidal waters well inland, causing extensive property damage and beach erosion. The great storm of November 1950, hurricane Carol in August 1954, and the historic Atlantic storm of March 1962, are some examples of severe, but infrequent, occurrences of this type of flooding.

Winds and Storms

The prevailing wind is generally from the west in New York State. A southwest component becomes evident in winds during the warmer months while a northwest component is character8istic of the colder one-half of the year. Occasionally, well-developed storm systems moving across the continent or along the Atlantic coast are accompanied by very strong winds, which cause considerable property damage over wide areas of the state. A unique effect of strong cyclonic winds from the southwest is the rise of water to abnormally high levels at the northeastern end of Lake Erie.

Thunderstorms occur on an average of about 30 days in a year throughout the state. Destructive winds and lightning strikes in local areas are common with the more vigorous warm-season thunderstorms. Locally, hail occurs with more severe thunderstorms, but extensive, crippling losses to property and crops are rare.

Tornadoes are not common. About three or four of these storms strike limited, localized areas of New York State in most years. The paths of destruction, mostly in rural, semi-rural, or wooded areas, are usually short and narrow. Tornadoes occur generally between late May and late August.

Storms of freezing rain occur on one or more occasions during the winter season and often affect a wide area of the state in any one incident. While such storms are usually limited to a thin but dangerous coating of ice on highways, sidewalks, and exposed surfaces, crippling destruction of utility lines, transmission towers, and trees over an extensive portion of the state may result on rare occasions. Such a destructive ice storm affected east-central and southeastern New York in December 1964.

Hurricanes and tropical storms periodically cause serious and heavy losses in the vicinity of Long Island and southeastern upstate New York. Only one such storm in recent years (October 1954) has brought serious damage to the interior portion of the state.

The greatest storm hazard in terms of area and number of people affected is heavy snow. Coastal northeaster storms occur with some frequency in most winters. Snow yields of from 12 to 24 inches or more from such storms have fallen over the southeastern one-quarter of the state, including Long Island, and will often extend into western and northern interior New York. Snow squalls along the Great Lakes have been previously cited. These may persist over a period of 1 week or more, bringing snow amounts in excess of 40 inches to local areas that lie to the eastern lee of Lakes Erie and Ontario. During heavy snow squall, surface visibility is reduced to zero. Blizzard conditions of heavy snow, high winds, and rapidly falling temperature occur occasionally, but are much less characteristics of New York's climate than in the plains of Midwestern United States.

Other Climatic Elements

The climate of the state features much cloudy weather during the months of November, December, and January in upstate New York, especially those regions that adjoin the Great Lakes and Finger Lakes and include the southern tier of counties. From June through September, however, about 60 to 70 percent of the possible sunshine hours are received. In the Atlantic coastal region, the sunshine hours increases from 50 percent of possible in the winter to about 65 percent of possible in the summer.

The Atlantic Coastal Plain and lower Hudson Valley experience conditions of high temperature and high humidity with some frequency and duration during the summer. By comparison, such conditions occur less frequently in the broad interior of New York State where they are usually shortened by the arrival of cooler, drier air masses from the northwest.

The occurrence of heavy dense fog is variable over the state. The valleys and ridges of the Southern Plateau are most subject to periods of fog, with occurrences averaging about 50 days in a year. In the Great Lakes Plain and northern valleys, the frequency decreases to only 10 to 20 days annually. In those portions of the State with greater maritime influence on the climate, the frequency of dense fog in a year ranges from about 35 days on the south shore of Long Island to 25 days in the Hudson Valley.

Climate and the Economy

New York State's diversified economy, involving agriculture, industry, commerce, and recreation, is greatly influenced by the climate. An invigorating winter climate and a generally comfortable

atmospheric environment during summer, whether in labor pursuits or recreation, stimulates human activities.

The general climate as well as regional variations in climate throughout New York State support diversified agriculture. Dairying is the largest, most widespread enterprise. Precipitation and temperature conditions favor the growth of alfalfa and grasses for hay and of corn for silage throughout rural New York, except where limitations are imposed by soils and topography. Corn for grain is produced on some 850, 000 acres, mostly in the Great Lakes Plain, Southern Plateau, and Hudson Valley; climatic conditions couple with technology to realize an average statewide yield of 70 to 80 bushels per acre. The amount and distribution of rainfall, warm (rather than hot) daytime temperatures, and frequent cool nights in western and central New York are important environmental factors that aid in the growing of 450,000 acres of small grains. Dry beans, snap beans, and sugar beets are additional valuable crops, which thrive well in New York's climate.

A nationally important production area of apples and other tree fruits is found along Lake Ontario, largely the result of favorable climatic conditions induced by the nearby Lake. The climate over the Great Lakes Plain is also benevolent for a wide variety of vegetable crops. New York is a leading producer of grapes, with suitable weather conditions for viticulture existing in the western Great Lakes counties and on the sloping terrain along the Finger Lakes where good air drainage and moderating influence of lake waters produce a suitable temperature regime. The lower Hudson Valley has a climate, which also supports important acreage of tree fruits and truck crops.

The warmer climate of eastern Long Island permits a significant production of potatoes for the early season market. Late-season potato varieties are grown in the cooler climate of the Southern Plateau and of northeastern New York. The uplands northwest of the Catskills Mountains have a cool climate very suitable for cauliflower production.

The sugar maple tree (Acer saccharum Marsh) finds a climate optimum for growth in New York State. Thus, the production of syrup and other maple products constitutes a valuable segment of the agricultural and forestry economy.

Ample precipitation, dependable runoff, and adequate ground water supplies contribute to vast water resources in the Empire State. These water resources have supported the growth of many large metropolitan areas, the establishment of diverse industries, and the development of waterways and impoundments for transportation, power, recreation, and municipal supplies.

Though rigorous and sometimes severe, New York's winter climate is an asset to the economy. Abundant snowfall ahs made possible the development of skiing and snowmobiling into very important activities for winter sports and recreation. The climate at other times of the year is a prominent factor in attracting tourists and vacationers to the state.

In summary, the climate contributes greatly to the agricultural, industrial, commercial, and recreational economy. It has been an unquestionable asset to the historical development of New York State and to its economic expansion of recent decades. Undoubtedly, the climate will continue its important role in the remainder of this century and beyond.