with flooding in the Oswego River Basin.

The Ithaca weather station at Cornell University has the longest period of record for re weather stations and was, therefore, selected as the source of data for an analysis of t precipitation pattern for the 97 year period, 1900-1996. The analysis demonstrated th precipitation patterns are cyclical. Periods with high annual precipitation are followed b with relatively low annual precipitation.

Daily precipitation patterns in 1996 at six weather stations within the basin were exam compared to the runoff volume at corresponding downstream gage stations. The statio Ithaca, Aurora Research Farm, Canandaigua, Geneva Research Farm, Penn Yan and Sy revealed that precipitation peaks in the first part of the year generally corresponded to or a developing snowpack.

Historical Water Levels

An investigation of highest annual water surface elevations over two time periods for S Cayuga, and Oneida Lakes was undertaken as part of the Climate Assessment. Table 1 the data examined and shows a comparison between the average annual maximum wa elevations for each time period.

The data indicate that the period of 1990-1996 has experienced maximum water levels with the maximum water levels experienced at other times during the history of record term trend of higher levels is not evidenced by the data. The average annual maximum of 447.5 feet Barge Canal Datum (BCD) for Seneca Lake between 1990-1996 falls with of annual highs, which is 446.2 feet to 450.1 feet for the longer period of 1929-1996. average annual maximum elevation for Cayuga Lake between 1990 and 1996 is 385 fe which is within the long-term range of maximum lake levels, 383 feet to 387.4 feet. Al long term range for Oneida Lake represents only a 46 year record (1951-1996), the 19 average of 372.7 feet is within the range of annual maximums of 371.1 feet to 374.5 f

Table 1. Average Annual Maximum Elevations

Lake	Average Annual Maximum Elevation feet BCD, (1926-1996)	Average Annual Maximum Elevation feet BCD, (1990-1996)
Seneca	447.6	447.5
Cayuga	384.8	385
Oneida *	372.5	372.7

* Data record is from 1951-1996

Runoff

Several factors influence the amount of runoff (overland flow) which reaches a waterco result of a precipitation event:

- precipitation intensity and form (e.g., inches/hour)
- event duration (e.g., hours)
- extent of rain or snowfall within the basin (e.g., square miles)
- sequence of precipitation events and existing soil conditions
- land cover
- seasons

The casual observer might expect a noticeable increase in stream level as the result of storm in the upper reaches of a watershed; however, the duration and extent of the pr event within the basin must also be considered when predicting the volume of runoff. (longer storm of equal intensity will produce more precipitation than a short storm. Con steady drizzle over a long period of time can result in a volume of runoff comparable to intense event. It must also be noted that precipitation intensity is not typically uniform area such as a watershed. Therefore, a short intense storm over a small area in the up of a watershed may have very little influence on stream levels, whereas a continuous s over the entire region can have disastrous effects.

All precipitation which falls to the ground does not reach a stream as runoff. Some of t is absorbed by the soil, some is transpired or intercepted by trees and plants, and som evaporates into the atmosphere. Since existing soil moisture affects the ability of the s additional precipitation, a series of precipitation events may decrease the amount of pı which can be absorbed by the ground, and the excess runs off into streams. Land cove seasonal variations in runoff are related because land covered by heavy vegetation dui growing season quickly uses available moisture, leaving less runoff. Land cover variety (agriculture, forest, urban) and distribution within a watershed can alter runoff volume each land cover type displays differing capabilities for draining runoff. Similarly, seasoı temperature variations affect the amount of moisture which is evaporated, as well as t snowmelt.

The Oswego River Basin is particularly vulnerable to flooding in the early spring when a combination of factors which may increase runoff occur simultaneously. Before the spr season begins, vegetation in the basin is scarce. Trees without leaves require less moi: transpiration, the ground lacks grasses and plants to intercept precipitation and slow r barren agricultural fields may facilitate rapid runoff. A rainfall event coupled with rising temperatures and subsequent snowmelt increases the likelihood of flooding due to the increase in runoff volume which reaches streams, rivers, and lakes.

1993 Event

The 1993 spring weather pattern was typical of the meteorological conditions that can extensive flooding in the Finger Lakes region. The impacts of this weather pattern on C were investigated as part of this audit. During March and in anticipation of spring thaw Cayuga and Seneca Lakes were drawn down below historic seasonal levels. On March : temperatures began to rise above freezing and the existing snowpack which developec of the March 13 blizzard melted quickly. Heavy rainfall in April increased the rate of sn Flooding occurred due to the combination of snowmelt and rainfall and the lack of surp in the lake to contain the additional volume of water.

The April 1993 storm event had a much greater volume of water and a longer duration major events in recent years. The volume of water associated with the 1993 storm is approximately three times greater than the volume associated with Tropical Storm Agr Flooding in 1993 was more severe than in other years due to the larger volume of wat

6.0 Land Use

Changes in land use within a watershed can have an impact on the frequency and seve downstream flooding over time. The amount of precipitation which finally reaches a str influenced by the amount of moisture that is absorbed by the ground, the amount inte trees or plants, the amount transpired by trees or plants, and the amount evaporated atmosphere. A reduction in vegetation and/or increase in impervious surfaces (e.g., hi parking lots, roofs) which do not allow water to be absorbed by the land can increase t of runoff and shorten the time necessary for the runoff to reach the stream. Land deve agricultural practices which do not account for, and manage the increase in runoff that changes may produce, can negatively impact flood levels downstream.

Land use patterns within three areas of Cayuga County were examined to determine tl and impact of regional land use changes over the period 1950 to 1978. Results from tl indicate that the Union Springs area experienced a 30-percent increase in runoff volum due to a decrease in brushland and simultaneous increase in high density residential a commercial centers. Land use changes and changes in runoff were insignificant for the Auburn areas. Additional land use data such as detailed information on local agricultur and detailed soil type data are necessary to adequately model the changes in runoff vc results of the land use study are, therefore, considered inconclusive.

7.0 Conclusions