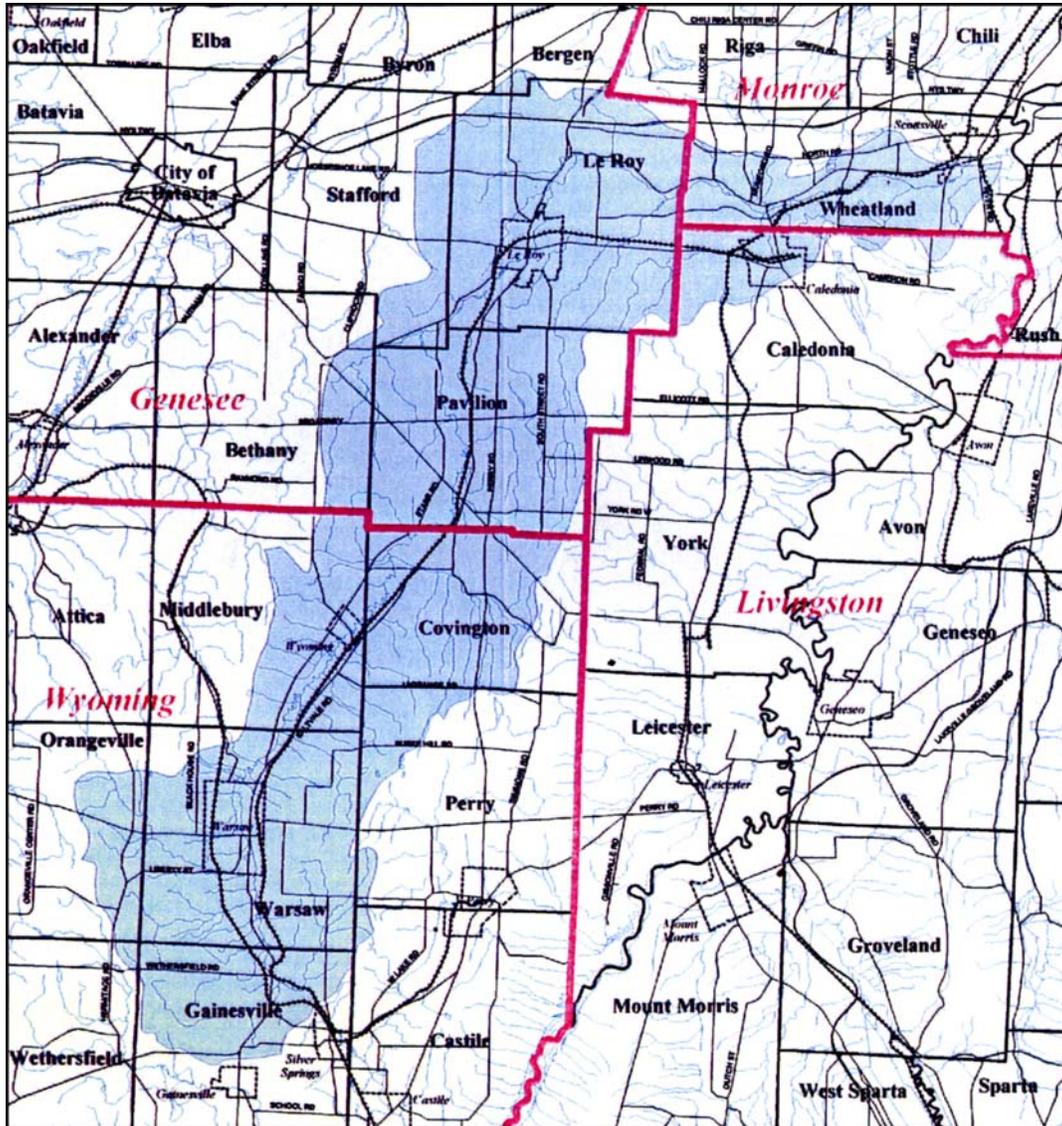


# THE OATKA CREEK WATERSHED

## STATE OF THE BASIN REPORT



This report was prepared with guidance from  
The Oatka Creek Watershed Committee

Prepared by:

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Funding for this project was provided by Rochester Area Community Foundation

COVER: Map prepared by the Genesee Finger Lakes Regional Planning Council. Blue area shows the region within the Oatka Creek Watershed boundary.

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## PROLOGUE

It is nearly impossible to describe the quality of Oatka Creek waters or its watershed in one or two words. However, the reader will find that the general condition of this water and land in many areas is satisfactory - but there are also several areas of potential concern. It is clear that protective management efforts need to be promoted to maintain and perhaps improve conditions in the creek and its watershed. Some recommendations for future projects include the continued development of a Watershed Management Plan, continuation of the Outreach Program designed to involve municipalities in the development of that plan, and continued data and information gathering and research (e.g. continued evaluation of land use and water quality monitoring in different regions of Oatka Creek and its tributaries).

This report represents an initial attempt to consolidate information pertaining to Oatka Creek and its watershed. Information has been gathered from a variety of sources. It is likely that additional information will become available as management efforts for the Oatka Creek Watershed continue. Therefore, this document should not be considered as a final step in a process. Rather, the information in this report should be reviewed, updated, and supplemented every few years as new information becomes available and, at some point, incorporated into a watershed management plan.

I have attempted to be as accurate as possible with the information and sources. The reader is encouraged to forward any questions, contributions or sources of error to the Oatka Creek Watershed Committee:

Oatka Creek Watershed Committee, Inc. P.O. Box 181 Scottsville, N.Y. 14546

## **ACKNOWLEDGEMENTS**

There are many individuals, groups and agencies that have assisted in the completion of this report. The list of sources of information is long and can be found on the following pages. Please see this list for contributors. It is difficult to list all individuals who provided some assistance with this project without inadvertently omitting a few. Still, I would like to mention the following groups and individuals - and I apologize for any I have omitted.

This project was endorsed and supported by the Oatka Creek Watershed Committee (OCWC). I thank all members for their assistance and patience. Former and present members of the OCWC who reviewed earlier drafts of this report and submitted valuable suggestions and information include Matt Balling (Genesee County Planning), Jack Bradbury (Past Chairperson, OCWC), Margit Brazda (Monroe County Health Dept.), Lisa Compton, Pat Hirokawa, Charles Knauf (Monroe County Environmental Lab), and George Squires (Genesee County SWCD). Other individuals affiliated with agencies who helped to provide valuable information and access to information through personal communication include Matthew Gillette (NYSDEC Region 8), David Reckahn (Wyoming County SWCD), Matthew Sanderson (NYSDEC, Region 8), David Zorn (GFLRPC).

The Rochester Area Community Foundation provided funding and support for this project. Evan Lowenstein helped with logistics throughout the development and completion of this report.

Finally, I would like to acknowledge the efforts of Mr. Rich Hamell, a colleague at Monroe Community College who helped with some of the technological work necessary to produce this report.

## REFERENCES AND SOURCES OF INFORMATION

While it is often customary to list sources and references at the end of a report, I chose to list them at the beginning because they are important and may be more accessible at the beginning especially since the maps are located at the end of the report (to hopefully improve their accessibility as well). I apologize for any confusion this may cause.

Much of the information in this report was provided in unpublished form from several individuals and agencies. The following is a list of several sources that provided information incorporated in this report. I have listed written documents and reports first followed by the groups that also provided data. I have listed web sites that were used to acquire some of the information.

In the report, I have attempted to name the source(s) for the information as it is described. It is suggested that the reader consult the reference or contact the agency listed if more information on a particular topic is wanted.

### REPORTS/PUBLICATIONS:

Cole, G. A. 1979. Limnology, 2nd ed., C.V. Mosby, publ.

Dowling, C., Renz, M.J., Hunt A.G., and Poreda, R.J. 2001. The Geochemistry of Oatka Creek, New York State. Unpubl.

Sutton, W. 1999. A 1997 Five Year Follow-up Biological Monitoring assessment of Oatka and Spring Creeks in Upstate New York (in cooperation with NYSDEC). Unpubl.

Sutton, W. 1995. Biological Monitoring of Oatka Creek in Upstate New York. Unpubl.

Tatakis, T. 1990. Watershed Evaluation and Management For Lakes LeRoy and LaGrange. Unpubl.

### AGENCIES/INDIVIDUALS

Genesee Finger Lakes Regional Planning Council (GFLRPC)

- GIS maps
- Demographics
- Road de-icing information

## Genesee County

- Genesee County Soil Water Conservation District (SWCD)
- Planning Department

## Monroe County

- Health Department
- Environmental Health Laboratory – Water Quality Data
- Dr. James Zollweg, SUNY Brockport - Land Use Map
- Rochester Embayment Remedial Action Plan

## New York State Department of Environmental Conservation (NYSDEC)

- Fisheries - Region 8; Water Quality - Region 8
- Unified Watershed Assessment Plan (UWA)
- RIBS (Rotating Intensive Basin Survey) data - 1989, 1990
- Priority Waterbodies Lists (PWL)
- New York State Heritage Program
- Other information (e.g. SPDES permits, water supplies)
- Discharge data - Garbutt and Warsaw (USGS)

## Wyoming County

- Soil and Water Conservation District
- Land use information (EQIP proposal)

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## EXECUTIVE SUMMARY

This *State Of The Basin Report* for the Oatka Creek Watershed was prepared under the guidance of the Oatka Creek Watershed Committee (OCWC). The OCWC was formed in 1998 as an outcome of the Caring for Creeks Conference held in Rochester in February of that year. The formation of the group was guided by representatives from several agencies and concerned citizens. Today, the OCWC consists of representatives and citizens from four counties (Genesee, Livingston, Monroe and Wyoming).

One goal of the OCWC is to facilitate the preparation of a watershed management plan that is accepted and used as a guide for all municipalities and individuals that affect Oatka Creek, it's watershed, and its tributaries. The *State Of The Basin Report* is deemed as an important step in the preparation of the watershed management plan and will be incorporated as a chapter of that plan. This report summarizes information pertaining to the Oatka Creek Watershed including sections on the watershed ecosystem, stream water quality, and the potential effects of humans.

The headwaters of Oatka Creek are located in Wyoming County, south of the Village of Warsaw. Along its length of approximately 58 miles (93 km), it flows north through several towns and villages, until it "turns" east just north of the Village of LeRoy and ultimately reaches the Genesee River east of the Village of Scottsville.

The watershed of a stream can be defined as all of the land area that will eventually drain into that stream. The Oatka Creek watershed encompasses approximately 215 square miles (557 km<sup>2</sup>) . The watershed is mainly rural and agricultural in nature. However, Oatka Creek does flow through several villages including Wyoming, LeRoy and Scottsville. These regions have locally dense human populations, industries, and other characteristics typical of larger, urban environments.

Section 1 of this report introduces the reader to a variety of general characteristics of the Oatka Creek watershed. Bedrock geology varies greatly in the watershed. The bedrock associated with Upper Oatka (from the headwaters to LeRoy) are primarily shales and limestone while the Lower Oatka (LeRoy to the Genesee River) is a mostly Onondaga limestone. Several small, fragmented wetlands are found scattered throughout the watershed. Other natural resources include many plants, animals and other organisms that live in the watershed. These include several plants that are considered rare or endangered and other unique ecological communities. Several state and regional groups are conducting studies in the Oatka Creek Watershed. For example, the New York State Department of Environmental Conservation is currently updating its Priority Waterbodies List (PWL). The 1996 PWL listed Oatka Creek as "threatened", meaning that the Oatka Creek ecosystem is not currently showing obvious signs of stress, but it is a valuable resource and the potential exists for future changes to cause a deterioration of water quality.

Section 2 of The *State Of The Basin* report includes water flow rates recorded for many years at the USGS monitoring stations at Warsaw and Garbutt. These data show that

the water discharge rates (flow rates) change dramatically with season and on shorter-term basis depending on runoff events (e.g. snowmelt, summer rain events). Oatka Creek water quality information has been collected through different sampling programs in the Lower Oatka Creek, especially at Garbutt. In general, this section of the stream has satisfactory water quality and supports a "Blue Ribbon" brown trout fishery. Studies conducted through the years by several agencies, including the New York State Department of Environmental Conservation, have indicated some water quality potential problems. Suspended solid concentrations and phosphorus concentrations in Oatka Creek increase during periods of high water flow rates, suggesting non-point source runoff from surrounding land areas and perhaps stream bank erosion. Concentrations of different forms of nitrogen also fluctuate throughout the year. For example, nitrate and nitrite concentrations are especially higher during the winter months. Similarly, total phosphorus concentrations are higher during significant runoff events. These data suggest that future water quality monitoring programs in Oatka Creek should be designed so that sampling occurs throughout the year and at intervals frequent enough to have data for base flow and high flow periods. Other measures of water chemistry, including pH, conductivity and other ion concentrations, are also included in this report.

A study of trace metals and geochemistry of Oatka Creek waters and sediments was completed in December 2001. This study showed that groundwater sources play a more important role in defining water chemistry in the lower part of the watershed. The trace metal data provide a database that can be used in future efforts to detect inputs of trace metals into Oatka Creek.

Living organisms that have been studied in various parts of Oatka Creek include bacteria, macroinvertebrates, and fish. With a few exceptions, the types of these organisms that are present in Oatka Creek are indicative of the generally good water quality found in the creek.

Human activities affect the water quality of Oatka Creek. Human uses of the creek and watershed are diverse and occur throughout the watershed. Parts of the stream are used for drinking water, fishing, light boating, and aesthetic purposes. Watershed uses and potential impacts of human activities are the major emphasis of Section 3 in the *State Of The Basin Report*. Human population demographics and projections in the watershed are included in that section. The discussion of cultural land uses in the watershed includes potable water supplies, agriculture practices, municipal and industrial effluent discharge into the stream, mining activities and the locations of wells and inactive hazardous waste sites. A land-use map is included. Much of the watershed is rural and agricultural in nature, with light industry and denser pockets of residential areas located in and near the Villages that are in the watershed.

Many sources (organizations and individuals) have provided the information that is incorporated in the *State Of The Basin Report*. They are identified near the beginning of the report.

## **SECTION 1. THE OATKA CREEK WATERSHED**

### **A. INTRODUCTION**

This *State Of The Basin Report* for the Oatka Creek Watershed is being prepared under the guidance of the Oatka Creek Watershed Committee (OCWC). The OCWC was formed in 1998 as an outcome of the Caring for Creeks Conference held in Rochester in February of that year. The formation of the group was guided by representatives from several agencies and concerned citizens. Today, the OCWC consists of representatives and citizens from four counties (Genesee, Livingston, Monroe and Wyoming).

One goal of the OCWC is to facilitate the preparation of a watershed management plan that is accepted and used as a guide for all municipalities and individuals that affect Oatka Creek, it's watershed, and its tributaries. This *State Of The Basin Report* is deemed as the initial step in the preparation of the watershed management plan and will be incorporated as the first chapter in that plan. This report summarizes current available information on the Oatka Creek Watershed. It includes information on the watershed, stream water quality, and the potential effects of humans.

The headwaters of Oatka Creek are located in Wyoming County, south of the Village of Warsaw. Along its length of approximately 58 miles (93 km), it flows north through several towns and villages, until it "turns" east just north of the Village of LeRoy and ultimately reaches the Genesee River just east of the Village of Scottsville. The segment from the headwaters to LeRoy is sometimes referred to as the Upper Oatka and the segment from LeRoy to the Genesee River as the Lower Oatka. Several small tributaries empty into Oatka Creek including Pearl Creek (Wyoming Co.), Mud Creek (Genesee Co.), White Creek (Genesee Co.), and Spring Creek (Livingston and Monroe Co.) (for tributary location, see Map A, Appendix VI).

The watershed of a stream can be defined as all of the land area that will eventually drain into that stream. The boundaries of the Oatka Creek watershed are shown in Map B (Appendix VI). The watershed encompasses approximately 215 square miles (557 km<sup>2</sup>). The watershed is mainly rural and agricultural in nature. However, Oatka Creek does flow through several villages including Warsaw, Wyoming, LeRoy and Scottsville (see Map B, Appendix VI). These regions have locally dense human populations, industries, and other characteristics typical of larger, urban environments.

Human activities and uses of the creek and watershed are diverse and occur throughout the watershed. Parts of the stream are used for drinking water, fishing, light boating, and aesthetic purposes. Human practices in the watershed such as farming, residential living, and recreational activities will affect water quality in Oatka Creek. Watershed uses and potential impacts of human activities will be the major emphasis of Section 3 in this report.

## **B. BEDROCK GEOLOGY**

The bedrock geology of the Oatka Creek watershed is complex and variable. The different formations and types of bedrock are shown in Map C (Appendix VI). A major distinction in the bedrock geology can be made between the Upper and Lower Oatka. From the headwaters in Wyoming County to LeRoy, the bedrock consists of primarily shales and limestone from several geological groups (e.g. Hamilton, Genesee, Sonyea, West Falls). Downstream of the Village of LeRoy, the stream flows over the Onondaga limestone. In fact, just north of LeRoy, some stream water flows underground from a point upstream of Buttermilk Falls and reemerges from springs located downstream of Buttermilk Falls. The watershed in this region of the Lower Oatka is primarily limestone, Akron dolomite, gypsum, and some shale.

The different bedrock types along Oatka Creek affect the water quality along the length of the creek. These will be discussed in the water quality section (Section 2) of this report.

Many rural households and municipalities use groundwater as a source of potable water. For example, Wyoming and Pavilion use wells for sources of water. However, there are no primary aquifers in the Oatka Creek watershed (see Map D, Appendix VI).

## **C. WETLANDS**

Wetlands are important ecological units. They provide unique habitats and breeding areas for a variety of living organisms that could not survive in drier regions. Wetlands also serve as "sinks" for excess water, sediment and nutrients that flow into them. The locations of the various wetlands in the Oatka Creek watershed are shown in Map E (Appendix VI).

The largest continuous wetland is located along a segment of Oatka Creek just north of the Village of Wyoming in the towns of Middlebury and Covington (Wyoming County). Most of the other wetland areas are smaller and fragmented. They typically occur along stretches of the smaller tributaries that feed Oatka Creek. They are located throughout the watershed, although a significant portion of these small wetland areas is located in the Pavilion township.

## **D. NATURAL RESOURCES IN THE WATERSHED**

The Oatka Creek watershed contains many natural resources used by humans. Water is used for drinking, bathing, washing, recreation, agriculture, and industry. Oatka Creek is also used for fishing, boating, hiking and other recreational activities. The watershed supports a number of native plants and animals, some of which are used for food for humans (e.g. deer). There are a number of mining industries (e.g. limestone), and small wells (e.g. natural gas) in the watershed as well. Section 3 of this report summarizes the cultural impacts of humans in the watershed

A wide variety of plants, animals and other organisms live in the Oatka Creek Watershed. The New York Natural Heritage Program maintains an ongoing inventory of rare plants and animals native to New York State. A list provided by the NYSDEC includes several species of plants living in the Oatka Creek watershed that are considered rare, threatened, or endangered. Also, there are some unique ecological communities listed. In an effort to protect these plants and communities, the NY Natural Heritage Program discourages the publication of information on these organisms, including type and location. Therefore, they will not be listed in this report at this time.

A much larger, general list of plants and animals found in the Oatka Creek watershed should be compiled and included in future works on the watershed. In this report, some plants and animals will be described in later sections.

The aesthetic value of Oatka Creek is difficult to summarize and quantify. A variety of people enjoy the many aspects of the stream and the land around it. Larger landmarks like Buttermilk Falls and Oatka Creek Park, along with smaller scenic views in the villages and towns from Warsaw to Scottsville, provide aesthetic appeal to thousands of residents that live in the watershed and to the many more that visit.

## **E. RELATIONSHIPS TO STATE AND REGIONAL PROGRAMS**

### **1. NYSDEC Priority Waterbodies Lists**

The Division of Water of the New York State Department of Environmental Conservation maintains a Waterbody Inventory and Priority Waterbodies List (PWL) for the waters of New York State. This includes a statewide database of specific waterbodies that categorizes general water quality and the effects of water quality on water uses. The Waterbody Inventory/PWL is used to provide baseline assessments of water quality, focus program activities, maintain a consistent and objective inventory/evaluation of water quality problems and issues, record water quality history, and monitor progress of the efforts/programs of the Division of Water.

Waterbodies are classified with terms that reflect the degree of severity of water quality problems. The following is a list of these terms and the corresponding descriptions taken from a NYSDEC publication. (The terms are listed from the most severe water quality problems to least severe).

Precluded (P) - "frequent/persistent water quality, or quantity, conditions and/or associated habitat degradation prevents all aspects of waterbody use"

Impaired (1) - "Occasional water quality, or quantity, conditions and/or habitat characteristics periodically prevent the use of the waterbody." Or,

"Water uses are not precluded, but some aspects of water use are limited or restricted." Or,

"Waterbody uses are not precluded but frequent/persistent water quality or quantity, conditions discourage the use of the water body". Or,

"Support of the waterbody uses additional/advanced measures of Treatment"

Stressed (S) - "Waterbody uses are not significantly limited or restricted, but occasional water quality, or quantity, conditions and/or associated habitat degradation periodically discourage the use of the waterbody".

Threatened (T) - "Water quality currently supports waterbody uses and the ecosystem exhibits no obvious signs of stress. However, existing or changing land use patterns may result in restricted use or ecosystem disruption". Or, "Water quality currently supports waterbody uses and the ecosystem exhibits no obvious signs of stress, however monitoring data reveals a declining trend in water quality which, if it continues, would result in use impairment." Or, "The waterbody is a highly valued resource and no water quality problem exists, but the water body is a highly valued resources and deemed worthy of special protection and consideration."

Oatka Creek is listed on the Region 8 New York State Department of Environmental Conservation 1996 and 1993 Priority Waterbodies Lists (PWL). Waterbodies are listed by county and the list includes segments of Oatka Creek in Genesee, Monroe and Wyoming Counties. The following is a synopsis of the information found there:

	<b>Oatka Creek Wyoming County (1993)</b>	<b>Oatka Creek Genesee County (1996)</b>	<b>Oatka Creek Monroe County (1996)</b>
Segment ID	0402-0029	0402-0031	0402-0027
Segment type	River	River	River
Segment size	7.0 mi	17.4 mi.	10.5 mi.
Class	A, C(T)	BT,C	B(TS)
Primary Use	Bathing	Fish propagation	Fish propagation
Affected			
Severity	Stressed	Threatened	Threatened
Documentation	-	Poor	Poor
Primary pollutant	Silt (sediment)	Silt (sediment)	Silt (sediment)
Primary Source	Urban Runoff	Agriculture	Agriculture

Additional information on the Monroe County segment of the stream includes the following (as listed):

- other use impairment: fish survival – threatened – poor documentation
- other types of pollutants: oxygen demand, metals, salts, nutrients, pathogens
- other sources of pollutants: private, CSO'S, industrial, acid rain, de-icing agents, municipal, urban runoff, stream bank erosion
- resolvability: issue needs study and management plan

The NYSDEC is working to produce an updated PWL in 2002 that will include Oatka Creek.

## 2. New York State Unified Watershed Assessment Report (UWA)

The 1998 federal Clean Water Action Plan commits funding to individual states for water quality restoration projects. The plan requires each state to prepare a Unified Watershed Assessment (UWA). The NYSDEC has completed this task and the report can be reviewed at the following website:

<http://www.dec.state.ny.us/website/dow/uwa/uwarpt98.htm>

The Oatka Creek watershed is not considered as a singular watershed in the report. However, the Genesee River Watershed is included in the report and divided into upper and lower watersheds. The Oatka Creek watershed is a sub-watershed of the Lower Genesee and any protective and restorative strategies developed for the Lower Genesee may include the Oatka Creek watershed.

The Lower Genesee River Watershed (HUC - 04130003) is in Category 11 in the UWA report. The report describes Category 11 as:

"Watersheds meeting goals, including those needing action to sustain water quality. New York has 22 watersheds in this category."

The schedule outlined in the UWA report states that the development of restorative and protective strategies for the Lower Genesee was scheduled to be initiated in the fiscal year beginning April 1, 2001.

## 3. Rochester Embayment Remedial Action Plan, Stage 1, 1993

The Genesee River watershed is a major focus in the Rochester Embayment study and there are several references to its tributaries, including Oatka Creek, in the report. Oatka Creek is listed several times in a list of "Genesee Basin Impairments", although specific locations on Oatka Creek are not provided. These "impairments" include:

- impaired recreational uses due to eutrophication, undesirable algae, and other aquatic plants
- stream and riverbank erosion/sedimentation
- reduced aesthetic quality (due to rotting-algae)
- loss of fish and wildlife habitat
- degradation of fish and wildlife populations
- degradation of zooplankton and phytoplankton (Garbutt region specifically mentioned)
- restricted public access to creek (debris from 1991 ice storm listed as a major cause)

The report lists some general factors producing the above impairments. However, the factors are not specific for Oatka Creek. Of those listed, stream and riverbank erosion, agricultural runoff, and sedimentation may be factors important in the Oatka Creek watershed.

#### 4. Wyoming County Local Working Group

The Wyoming County Local Working group is made up of representatives from many groups and organizations in Wyoming County. The Oatka Creek watershed has been designated as Wyoming County's #2 priority area by the Local Working Group. Some of the concerns regarding the Oatka Creek watershed outlined by the group include stressed or threatened drinking water supplies, fish survival and propagation, bathing and aesthetics. In conjunction with Genesee County, the group applied for funding through the Environmental Quality Incentives Program (EQIP) for the fiscal year 2000. The funding was to be used for establishing comprehensive nutrient management plans and to institute best management practices within the watershed. That application was denied, but the Wyoming County Local Working Group was planning to reapply for funding.

The Wyoming County Soil and Water Conservation District is implementing a wellhead protection program for Pavilion. This project includes an area in the Oatka Creek watershed. This project is being funded (approximately \$98,000) through the Agricultural Non-point Source Pollution And Abatement Program.

**SECTION 2. OATKA CREEK – WATER QUALITY**

**A. WATER DISCHARGE**

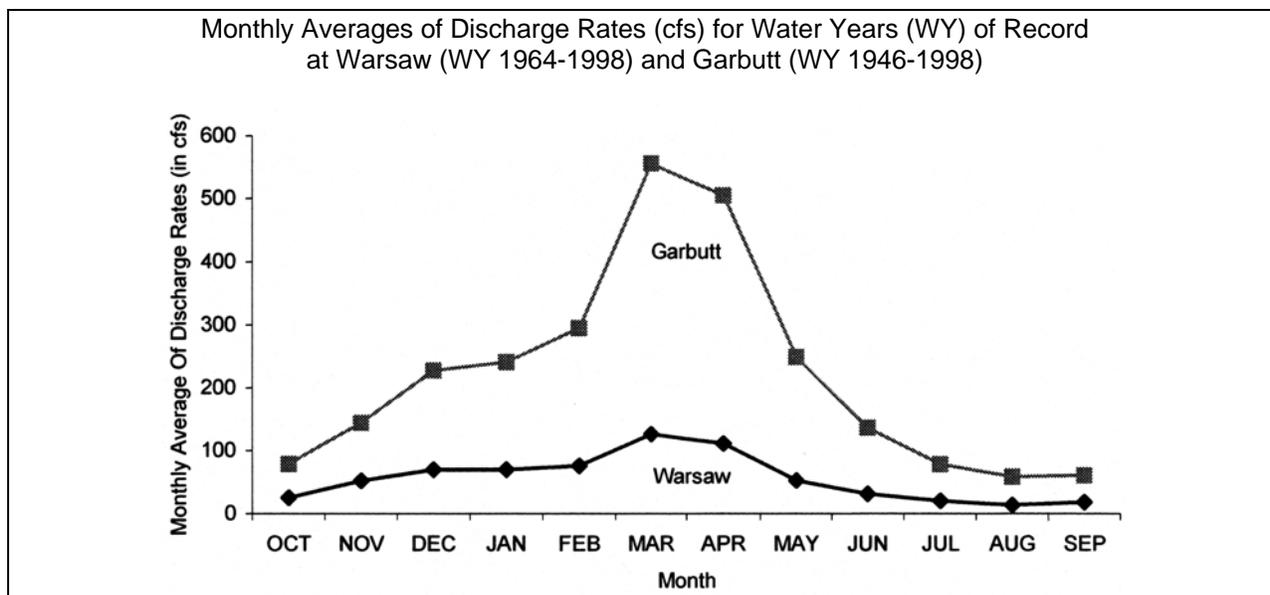
The United States Geological Survey (USGS) maintains two continuous water discharge monitoring stations on Oatka Creek (for location, see Map A, Appendix VI). Daily mean flows recorded at the station located in Warsaw (Wyoming County) from water year 1964 to present and daily mean flows recorded at the station located in Garbutt (Monroe County) from water year 1946 to present are available. The USGS considers a water year to run from October to September. Therefore, water year 1998 (WY 1998) would include data from October 1997 through September 1998.

Discharges, or flow rates, collected at these two stations in water years 1997 and 1998 can be found in Appendix 1. Table 1 shows that, on average, both of these years had higher than average annual mean flows at both stations.

**Table 1.** Annual mean discharge rates in 1997 and 1998 compared to the average for years of record at Warsaw (WY 1964 -1998) and Garbutt (WY 1946-1998).

	Annual Mean Discharge Rates (cubic feet per second)		
	WY 1997	WY 1998	Average for Years of Record
Warsaw	65.8	83.3	55.5
Garbutt	263	313	219

The annual mean discharge rates do not reflect the seasonal variation in flow rates that typically occur in Oatka Creek. The average monthly discharge rates summarized in Figure 1 show that flow rates increase dramatically in March and April and then decline steadily to monthly lows in August through October. Flow rates at Warsaw range from between 21% to 36% of the flow rates at Garbutt. The percentage is lower during the high runoff periods of March and April, indicating that the watershed between Warsaw and Garbutt contributes a greater fraction of water during higher flow periods.



**Figure 1.** Monthly averages of discharge rates (cfs) for water years (WY) of record at Warsaw (WY 1964-1998) and Garbutt (WY 1946-1998).

The data in Figure 1 have been averaged for all of the water years on record through 1998. Therefore, the averages do not show the daily variation in flow rates within one year. Figures that show daily mean discharge rates for water years 1997 and 1998 can be found in Appendix 1. These figures show that daily discharge rates can increase dramatically within a 1-2 day period; especially during the winter and spring months. However, heavy summer rains can also cause flow rates to increase quickly. For example, in July, 1998, discharge rates increased from a daily mean of 71 cfs on July 7 to a daily mean rate of 2050 cfs on July 8. This increase was also seen at Garbutt where rates rose from 347 cfs on July 7 to 3070 cfs on July 10. Discharge rates also decrease dramatically in the days following a significant runoff event. The dramatic variability in discharge rates is also reflected in the minimum and maximum daily discharge rates recorded at Warsaw and Garbutt in water years 1997 and 1998 (Table 2).

**Table 2.** Minimum and maximum daily mean discharge rates (cfs) recorded at Warsaw and Garbutt for water years 1997 and 1998.

Station	1997		1998	
	Minimum Daily (cfs)	Maximum Daily (cfs)	Minimum Daily (cfs)	Maximum Daily (cfs)
Warsaw	4.6 (Aug. 8)	471 (Feb. 27)	7.1 (Sep. 6)	2050 (Jul. 8)
Garbutt	40 (Aug. 11)	1430 (Mar. 1)	38 (Sep.29)	5820 (Jan. 9)

## **B. WATER QUALITY – PHYSICAL AND CHEMICAL CHARACTERISTICS**

Data in this section have been taken from the following sources:

Dowling, 1999, Sources of Trace metals in Oatka Creek, New York State, A Progress Report to the Oatka Creek Watershed Committee

U.S. Geological Survey, 1997, 1998. Annual Discharge and Water Quality Reports. Water quality data compiled by the Monroe County Health Dept.

RIBS report, dated 12-03-91. RIBS (Rotating Intensive Basin Studies) - a statewide surface water monitoring program conducted by NYSDEC. The information in this report is mostly from the study done 1989 -1990.

NYSDEC - unpublished sources.

### 1. Temperature and Dissolved Oxygen

The RIBS program monitored Oatka Creek water temperatures at Garbutt from March through the first week of November in 1989 and 1990. Data were collected approximately one day a month between 9:00 and 11:00 am. In general, water temperature was coldest in March (2-4 C°, or 36-39 F°), warmed to its highest temperatures from late June through September (15-19 C°, or 59-66 F°), and cooled to 10 C° (50 F°) by the beginning of November. While these data reflect seasonal water temperature changes in Oatka Creek, they do not reflect short-term fluctuations (i.e. daily changes) or temperature differences between different sites along Oatka Creek.

The NYSDEC Region 8 personnel began a study in 1999 to monitor daily temperature fluctuations in Oatka Creek from May through September. Preliminary findings suggest that water temperature fluctuates between 10-15 F° on a daily basis. Water temperatures rose to daily maximums of between 75-80 F° on only a few days in July and August. Otherwise, temperatures generally ranged between 55-75 F° during the time period.

As part of his macroinvertebrate studies, Sutton (1995) measured water temperature at three different locations of the lower Oatka Creek; just north of Buttermilk Falls, Garbutt, and the Rt. 251 bridge in Scottsville (see Sutton, 1999 report for exact site locations). He also measured water temperature in Spring Creek. He found that, on the sampling days in 1992 and 1993, water temperature was always lower at Garbutt and Scottsville than the upstream site. This may have reflected the influence of colder water entering Oatka Creek from Spring Creek. On all sampling days, Spring Creek always had colder water temperatures compared to the upstream site on Oatka Creek. However, the time of day that Sutton recorded water temperature at each site is not clear, and this could have resulted in at least some of the difference in site temperatures he recorded.

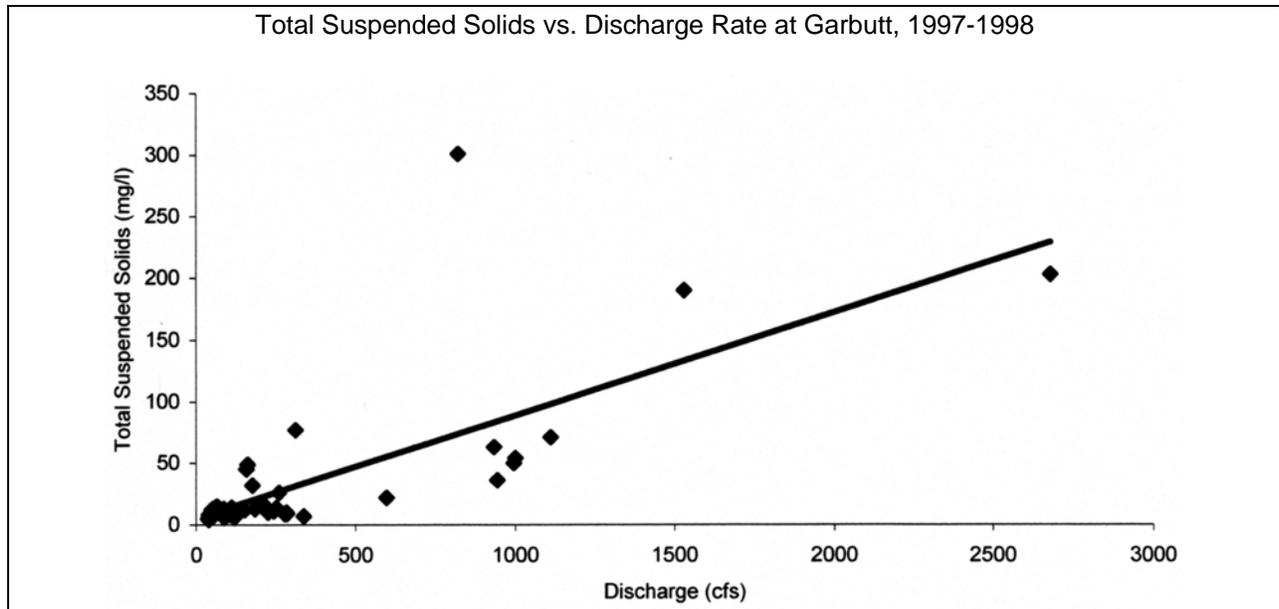
Colder water holds more dissolved oxygen. Therefore, water temperature is one factor that affects dissolved oxygen content. The RIBS 1991 report shows that dissolved

oxygen concentrations ranged from 8.0 to 11.6 mg/l on sampling dates in 1989-1990 (March - October) at Garbutt. Similarly, Sutton (1995) reported dissolved oxygen levels between 8.0 and 11.9 at his sample sites, although trends between upstream and downstream sites were not apparent. These values indicate adequate amounts of oxygen for organisms to live. They do not indicate the presence of pollutants with a high oxygen demand. However, further analyses of these data to determine percent oxygen saturation levels may prove interesting. For example, the highest dissolved oxygen concentration in the RIBS data set was recorded on August 16, 1989. The dissolved oxygen concentration was 11.6 mg/l on a day when the water temperature was also very warm (18.6 C°). Since warmer water usually holds less oxygen, this suggests an unusually high level of oxygen in the water on that day. In fact, water at 18.6 Co will hold approximately 9.4 mg/l when 100 % saturated with oxygen. The oxygen concentration of 11.6 mg/l suggests a "supersaturation" with oxygen (approximately 124% saturation). The additional oxygen may have been produced by algae and plants carrying out photosynthesis in the creek.

## 2. Solids and Turbidity

### a. Solids - suspended

Suspended solids were measured in Oatka Creek (Garbutt) beginning in 1998 by the Monroe County Environmental Health Laboratory. Only a few samples were taken before May 1, 1998, after which data were collected much more frequently. Suspended concentrations ranged from 301 to under 3 mg/l. In general, reported concentrations were less than 50 mg/l. Many of the higher suspended solid concentrations were recorded during periods of higher flow (see Figure 2). Statistical analysis showed a moderate correlation between discharge rate and suspended solids in 1998 (correlation coefficient,  $r^2 = 0.52$ ). In other words, as shown by the trend line, suspended solids in Oatka Creek tended to increase during periods of high flow events. This type of pattern suggests that runoff of suspended solids from diffuse, non-point sources in the watershed is an important component of the elevated levels of suspended solids in Oatka Creek during these peak flow events. It appears that erosion in the watershed occurs at higher rates during these high flow events.



**Figure 2.** The relationship between total suspended solids and flow rate measured at the Garbutt sampling site in Oatka Creek, 1997-1998. The trend line shows that, in general, the waters of Oatka Creek at Garbutt contain more suspended solids during periods of high flow events. This suggests that erosion in the watershed occurs at higher rates during these high flow events.

Monthly samples collected through the RIBS program at the Garbutt site in 1989 and 1990 showed similar suspended solid concentrations during sampling periods in those years (approximately March through October). Concentrations ranged from 2 mg/l to 66 mg/l, but were under 30 mg/l most of the time. These data do not appear very different from the 1998 data. The highest concentration of 66 mg/l was recorded on the day of highest flow for that sampling program. However, the monthly sampling schedule did not provide enough suspended solid data during high flow events (as were available from the 1998 sampling program).

The 1998 study also measured volatile suspended solid concentrations. This can be considered a measure of the organic matter in the suspended solid matter. Volatile suspended solids ranged from approximately 10-25% of total suspended solids, indicating that most of the suspended solids were inorganic in nature.

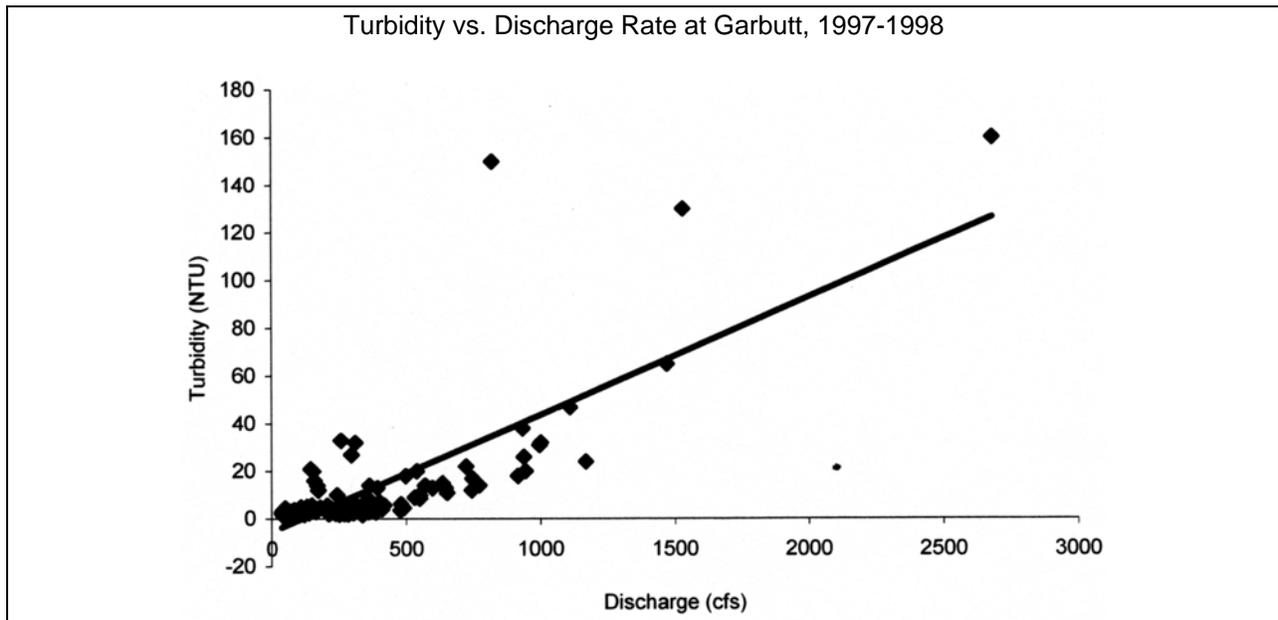
**b. Turbidity**

Turbidity is a measure of water clarity. Turbidity levels in Oatka Creek water were measured at the Garbutt sampling station in 1997 and 1998. They ranged from very low values of less than 1 NTU to relatively higher values of over 20 NTU. The highest recorded value was 160 NTU in July, 1998 during a period of very high water flow rates, presumably as a result of an extensive precipitation event. The trend line in Figure 3 shows that there is a positive relationship between flow rates and water turbidity ( $r^2 = 0.59$ ). This suggests that, in general, the waters of Oatka Creek at Garbutt are more

turbid during periods of high flow. More intense water runoff events in the watershed result in greater levels of solids in Oatka Creek and the water becomes more turbid during these periods.

The 1989-1990 RIBS study reported monthly turbidity readings similar to those in 1997-1998. Only one value was over 20 NTU - a turbidity of 51 NTU was recorded in April, 1989, during a relatively high flow period.

Turbidity can be affected by suspended solids in the water or by smaller, dissolved materials as well. The following section describes dissolved solid concentrations in Oatka Creek.



**Figure 3.** The relationship between water turbidity and flow rate measured at the Garbutt sampling site in Oatka Creek, 1997-1998. The trend line shows that, in general, the waters of Oatka Creek at Garbutt are more turbid during periods of high flow.

### c. Dissolved Solids

Dissolved solids made up a large percentage of the total solid concentrations reported in the 1989 and 1990 RIBS study at Garbutt. This percentage ranged between 79-99% during the sampling periods. Concentrations of dissolved solids ranged from 280 mg/l to 1057 mg/l. These concentrations were described as "an area of concern" in the RIBS report generated from the 1989-1990 study.

It is likely that this dissolved material was mostly inorganic in nature, since the percentage of the volatile solids (or organic) in the total solid fraction was low. In general, the percentage of volatile solids in the total solids ranged from 12% to 21%. One sample did have a volatile solid percentage of 28% in May, 1990.

The dissolved solid data were collected approximately once a month during the RIBS sampling program. Therefore, it is difficult to correlate dissolved solid concentrations with water discharge rates as was done with the suspended solids data. However, these data, along with the 1998 suspended solids data, suggest that a large percentage of the solids in Oatka creek are dissolved, especially during base flow periods. Also, most of these solid materials appear to be inorganic in nature.

### 3. Nutrient/Mineral/Ion Concentrations

The chemical composition of freshwaters is affected by many variables including climate, geology, watershed characteristics, living organisms, and time (e.g. season). This often makes it difficult to compare values from streams or lakes from one region with those from another region. As Cole (1979) indicates, there is no ideal average for inland waters and any average that is calculated depends on the results used and how the computations were determined. The following sections describe water chemistry data for Oatka Creek. General trends and interpretations of the data will be indicated where possible. Nitrogen, chloride and sulfate concentrations were all below the standards established by the New York State Department of Environmental Conservation (see [www.dec.state.ny.us/website/regs/703.htm](http://www.dec.state.ny.us/website/regs/703.htm); phosphorus and calcium standards were not available at that site).

#### a. Nitrogen

Nitrogen is an important nutrient found in all living organisms. It is a necessary for the formation of proteins and has many other functions in microbes, plants, and animals. It is required for the healthy growth of plants and is a major component of most fertilizers. It is found in dead organic matter, including yard wastes, animal wastes and human sewage. Nitrogen (N) exists in many forms in the environment. These include ammonia ( $\text{NH}_3$ ), nitrite and nitrate ( $\text{NO}_x$ ), and many organic forms.

Three forms of nitrogen were measured at Garbutt in 1997 and 1998. Fluctuations in ammonia, nitrite + nitrate, and total Kjeldahl nitrogen can be found in figures in Appendix II for these years.

Ammonia levels were greatest during the winter months and spiked briefly in early June, 1998. Concentrations generally fluctuated at values less than 50  $\mu\text{g/l}$  but were closer to 100  $\mu\text{g/l}$  at some times. RIBS data collected from March through November in 1989 and 1990 showed similar concentrations in ammonia levels although concentrations were as high as 120  $\mu\text{g/l}$  during the summer and fall of 1990. These values are within normal ranges for freshwaters.

Nitrite + nitrate ( $\text{NO}_x$ ), levels ranged between 1000 and 3000  $\mu\text{g/l}$  in 1997 and 1998 and were generally higher during the winter months. Similar values were reported for 1989 and 1990 (RIBS data). The higher values in the winter months may be expected because of increased runoff from the watershed and because nitrogen uptake by plants is usually slower during the winter months. Nitrate concentrations were also measured

at several sites along Oatka Creek from Pavilion to Scottsville on three different days (in 9/98, 11/98, 2/99; see Dowling report, Appendix III). These data did not appear to suggest large differences in nitrate concentration at different sites in Oatka Creek.

Total Kjeldahl nitrogen (TKN) data collected in 1989 and 1990 showed concentrations below 500 µg/l on all sampling days. However, the more continuous monitoring in 1997 and 1998 revealed that levels of this nitrogen form often rose above 500 µg/l. This seemed to occur during periods of higher water flow. The two highest TKN concentrations were 1400 µg/l in January, 1998 and 1800 µg/l in July, 1998. Both of these time periods were during high flow events at Garbutt, although the July peak in nitrogen concentration seemed to increase a day or two before water flow reached its peak at Garbutt.

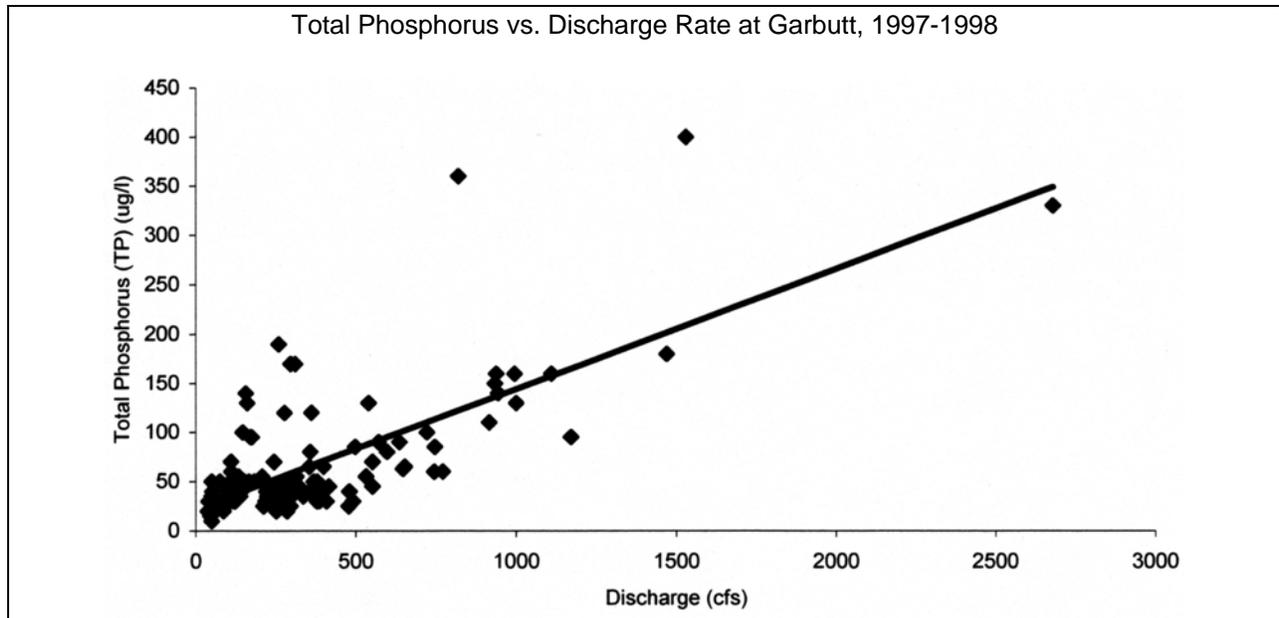
#### b. Phosphorus

Phosphorus is an important element necessary for plants and animals. It is found in many of the same sources just described for nitrogen. For example, phosphorus is a common plant nutrient and another important component of soil and fertilizers. Enrichment of a stream with too much phosphorus could result in excess algae and plant growth.

Total phosphorus concentrations were measured at Garbutt in 1997 and 1998. Trends and fluctuations in phosphorus concentrations are shown in Appendix II. Total phosphorus concentrations were often below 50 µg/l. However, on several occasions, phosphorus concentrations were two to three times that level. There were also a couple of relatively high concentrations - the highest was 400 µg/l in January, 1998. The higher levels of total phosphorus seemed to be correlated with periods of high flow. Also, the higher phosphorus concentrations appeared to be a result of increased particulate phosphorus because soluble reactive phosphorus - did not increase in the same manner (see Appendix II).

Figure 4 shows the relationship between flow rates (discharge) and total phosphorus concentrations in creek water. The trend line shows that total phosphorus concentrations are greater in Oatka Creek during periods of high flows. These data suggest that larger amounts of phosphorus enter Oatka Creek from non-point sources in the watershed during high runoff events.

Total phosphorus concentrations recorded in 1989 and 1990 (RIBS) were below 100 µg/l with the exception of one sampling day (146 µg/l in April, 1989). However, samples were only taken once a month in this study from March through the beginning of November. It is likely that this sampling schedule may have missed the high flow events detected in the near continuous sampling program in 1997 and 1998. It seems clear that any further studies on phosphorus and other nutrient levels should make every effort to collect data during base flow and high flow events.



**Figure 4.** The relationship between total phosphorus and flow rate measured at the Garbutt sampling site in Oatka Creek, 1997-1998. The trend line shows that total phosphorus concentrations are greater in Oatka Creek during periods of high flows.

#### c. Sulfate

Sulfate ( $\text{SO}_4$ ) concentrations measured at Garbutt in 1997 and 1998 are summarized in Appendix II. Concentrations are generally highest in the summer months and lower during the winter and spring when water flow is higher. This suggests that there is not a large amount of sulfate entering the creek during high runoff events. It also indicates that groundwater may be a constant, primary source of sulfate and that concentrations become diluted during these times of high surface water flow.

It appears that underlying bedrock is a significant source of the sulfate in Oatka Creek. The Dowling Report (Appendix III) suggests that sulfate concentrations are much greater downstream of Buttermilk Falls than they are in upper portions of the stream. This is likely due to the large amounts of gypsum ( $\text{CaSO}_4$ ) found in the bedrock of the lower Oatka. The waters in the upper Oatka contain less sulfate. Therefore, sulfate concentrations at Garbutt would be expected to be lower when more water was flowing to that point in the creek from the upper regions of the watershed (winter and spring).

#### d. Chloride

Chloride concentrations at Garbutt fluctuated very little during the 1997-1998 sampling periods (see Appendix II). Concentrations were generally between 40 to 60 mg/l. This suggests that more chloride entered the creek with increased runoff and water flow since a dilution effect is not seen. Sources of this chloride are not clear. Chloride concentrations did not appear to vary greatly from Pavilion to Scottsville in 1999 (see Dowling Report, Appendix III).

#### e. Calcium

Calcium (Ca) concentrations were not measured in the 1997-1998 study. The only calcium data available are from the Dowling study (Dowling et al., 2001) which measured concentrations on 3 different days in 1998 and 1999 at several sites downstream from Pavilion. The data show that concentrations of this substance are much greater downstream of Buttermilk Falls. Similar to the sulfate differences, this is likely due to the different types of bedrock found in this region. Larger amounts of gypsum ( $\text{CaSO}_4$ ) and limestone ( $\text{CaCO}_3$ ) are found in the lower regions of the watershed, downstream of Buttermilk Falls (see Appendix III).

#### 4. pH, Hardness, Conductivity

These parameters of water quality are measures of different ion fractions dissolved in the water. These data were determined from some of the monthly samples collected during the 1989-1990 RIBS study. Table 3 provides the number of samples used, the range of each parameter, and the average value for the samples used.

**Table 3.** pH, Total Hardness and Specific Conductivity in Oatka Creek in 1989-1990 (RIBS data).

Parameters	Units	#of samples	Low-hi	Average
PH	std. Units	20	7.1-8.7	7.8
Total Hardness	mg/l	11	193-731	431
Sp. Conductivity	umho/cm	2	1200-1247	1224

The pH of a substance is used as an indicator of the acidity or alkalinity of a substance. In general, substances with a pH of 7.0 are considered "neutral", pH below 7.0 is acidic and pH above 7.0 is alkaline (or basic). The average pH of Oatka Creek waters was slightly alkaline. The pH range was typical of surface waters in this region that are in watersheds with substantial amounts of limestone in the bedrock and soils. Buffering agents found in limestone soils can minimize the potential effects of acid deposition or runoff into surface waters.

Total hardness is a measure of the concentration of primarily calcium and magnesium salts in water. The average total hardness of 431 mg/l indicates that Oatka Creek does have a relatively high degree of "hardness" at the Garbutt site.

Specific conductivity is a parameter that reflects the ion concentration in water and is an indicator of salinity. The average specific conductance of 1224  $\mu\text{mho/cm}$  suggests a high concentration of ions in Oatka Creek waters. Note that only two samples were recorded in this study, making it difficult to draw any conclusions.

## 5. Metals

Water and sediment samples were collected four different days in 1998 and 1999 from over 20 sites in Oatka Creek waters between Rock Glen and Scottsville (see Dowling et al., 2001, in Appendix III). Samples were also collected from some tributaries (including Spring Creek, Mud Creek, and "unnamed" tributaries).

The concentrations of most metals were similar at different sites along the length of the creek and were at low, baseline concentrations. Exceptions to this were strontium, manganese, copper, lead and cadmium. Strontium concentrations were higher in the lower Oatka (downstream of Buttermilk Falls) seemingly due to higher concentrations of this metal in the sediment and groundwater there. Similarly, the greater concentrations of magnesium downstream of Buttermilk Falls is likely due to the dolomite commonly found in the bedrock in that region of the watershed. The sample collected in September, 1998 at the site near the Wheatland Center Road bridge revealed elevated levels of copper, lead, and cadmium. Higher concentrations of these metals may be due to outside inputs such as vehicle emissions, although the research group was not able to discern this from their study. Later samples resulted in lower concentrations of these metals (Dowling et al., 2001).

The 1989-1990 RIBS study also measured the concentration of several metals at the Garbutt site at monthly intervals. The metals measured were aluminum, cadmium, copper, iron, lead, manganese, mercury, nickel and zinc. The RIBS report suggested that iron concentration was the only one "of concern" in the water column. The study also measured the concentration of these metals in the bottom sediments at Garbutt. Samples were collected on August 16, 1989 and August 22, 1990 and concentrations of cadmium, copper, lead, nickel and zinc were all found to be above "background levels for assessment criteria", although the meaning of this was not clear in report.

## 6. Organics

Several organic substances were measured in monthly water samples collected during the RIBS study at Garbutt in 1989 and 1990. Of those tested, chloroform was detected once and trichloroethylene was frequently detected. These substances were always detected at levels below the "criteria assessment". The study suggested that the trichloroethylene levels may have been a result of a trichloroethylene spill that occurred in the region in the early 1970's.

Bottom sediments from Oatka Creek at Garbutt were also studied for the presence of organic substances in the RIBS study. Samples were collected once in August, 1989 and once in August, 1990. PCB's were detected at levels "near" its reporting limits. Pesticides (including lindane, aldrin, endrin, BHC and DDT) were also measured for in bottom sediments but none were detected.

## C. BIOLOGICAL DATA

The presence, abundance, and diversity of living organisms can be used as an indication of the overall "health" of a stream. These organisms play important roles in food chains, energy flow, decomposition, and nutrient cycles in aquatic ecosystems.

There appears to be limited data available on the living communities in Oatka Creek. The available information is organized according to the major groups of living organisms.

### 1. Bacteria (Coliform)

Bacteria are important organisms commonly found in aquatic ecosystems. They are important in decomposition, food chains and some are photosynthetic. Certain types of bacteria are used as indicators of water quality and possibly pollution. Coliform bacteria are a group of bacteria that are often used as one type of indicator. Fecal coliform bacteria live in the digestive tracts of homeothermic animals, including birds and mammals. Therefore, they are used as an indicator of fecal material in a body of water.

The monthly samples collected during the 1989 and 1990 RIBS program were assayed for total coliform and fecal coliform populations. Total coliform levels ranged from 96 to 8200 per 100 ml. The RIBS report suggested these levels were a "borderline parameter of concern". The fecal coliform levels ranged from 10 to 1600 per 100 ml. These data suggest that there is fecal material in the stream, although the source and significance of that material is unclear. These levels are all under the fecal coliform criteria for secondary contact recreation (e.g. boating, fishing). It is recommended that swimming be stopped if the average of five equally spaced fecal coliform samples collected over a 30-day period is greater than 200 per 100 ml. Since samples were collected only once a month in the RIBS study, it is difficult to assess the fecal concentrations measured on that basis. The five highest fecal coliform levels reported were 750 per 100 ml or greater and reported in monthly samples collected in April, 1989, and March, April, May and June of 1990, perhaps suggesting an increase of fecal coliform in the creek during higher runoff events.

### 2. Benthic Macroinvertebrates

Benthic macroinvertebrates are small animals that live in the sediments (benthos) of a body of water. These organisms are often immature forms of insects and other animals that spend their adult life on land. Other aquatic invertebrates may spend their entire life cycle in the stream. In either case, they are an important component of food webs and nutrient cycles in streams. The benthic macroinvertebrate community is often used to assess the health of a stream. For example, many species can be classified as pollution intolerant or pollution tolerant. Also, the abundance and diversity of invertebrate groups living in the benthic region of a stream can be used.

The RIBS study in 1989 and 1990 sampled the benthic macroinvertebrate community at Garbutt on three different days (5/24/89; 8/2/89; 6/27/90). A summary of the data can be found in Appendix IV. In general, pollution intolerant species such as mayflies, stoneflies and caddisflies were found. However, the overall number of invertebrate species present was lower than expected. The indices used to evaluate the data produced an overall assessment for Oatka Creek at Garbutt as "slightly impacted" (scale ranges from non-impacted to severely impacted). The RIBS report suggested the results did not represent a major impairment.

A series of benthic macroinvertebrate studies were carried out by William L. Sutton (in cooperation with the NYSDEC) in the 1990's. Specifically, 3 sites in Oatka Creek and one site in Spring Creek were sampled in the Fall and Spring of 1992, 1993, and 1997. The purpose of the first two years was to establish a baseline set of data so that future changes in water quality may be detected in follow-up studies, such as was carried out in 1997. The 3 sites that were sampled on Oatka Creek in each year were: Oatka Trail between Mumford and the Blue Hole, Garbutt, and Scottsville below Route 251. This series of samples on Oatka Creek revealed similar results to the 1989-1990 RIBS study. In general, the indices used by Sutton suggested a status for Oatka Creek that was nonimpacted, slightly impacted, or moderately impacted depending on location and sampling date. A list of the organisms identified in the 1997 study can be found in Appendix IV. The general conclusion of this study was that, based on benthic macroinvertebrates, the water quality of lower Oatka Creek was similar to the "slightly impacted" assessment of the 1989-1990 RIBS study.

The Sutton study also sampled a site in Spring Creek. The biotic indices used by Sutton did not clearly indicate a status for Spring Creek, although Sutton reported that the indices were, in general, "favorable".

### 3. Fisheries

The lower Oatka Creek supports a "Blue-Ribbon" trout fishery. Brown trout dominate the fishery although a few brook trout may be found in the stream as well. Evidence suggests that a "wild" trout fishery exists in a portion of lower Oatka Creek between Bowerman Road and Wheatland Center road. In addition, the DEC stocks brown trout in the stream on a regular basis. Near the confluence with the Genesee River, other game species may be found as well including northern pike, largemouth bass, smallmouth bass, and, seasonally, walleye.

The NYSDEC has instituted a multi-year study of the brown trout fishery in the lower Oatka Creek to, in part, examine the effects of special fishing regulations that are in the process of being reviewed. The DEC began an annual fall ("post-season") electrofishing survey in 1998. It will continue for a total of six years. Eight stations along Oatka Creek are being used in the study (the sites are from Route 36 in Mumford to Bowerman road). Results from 1998 and 1999 reveal a productive brown trout population. In 1998, brown trout biomass averaged approximately 30 lbs/acre and the 1999 survey revealed

a brown trout biomass of approximately 41 lbs/acre. According to DEC personnel, these values are indicative of the productive nature of the Lower Oatka Creek.

The DEC is also conducting a Creel Survey along the lower Oatka Creek in an effort to gauge fishing pressure. Parameters such as fishing time and number of fish caught are part of the survey.

Brown trout are stocked several times a year at various locations in the lower Oatka Creek. Recently a "float stocking" technique has been used to disperse fish along greater stretches of the creek. Numbers of fish stocked per year vary. In 1998, a total of 6,950 fish were stocked during three different stocking events. Most of those fish were between 9.0 and 9.5 inches in length (5,300 fish) while others were between 13.5 and 15.0 inches in length (1,650 fish).

## **SECTION 3. HUMAN POPULATION, USE, AND IMPACT**

### **A. DEMOGRAPHICS**

Every person living in the watershed affects the quality of the watershed and Oatka Creek. Therefore, it is important to recognize population centers and number of individuals found throughout the watershed. Human population sizes and trends in the towns and villages located in the Oatka Creek watershed are shown in Table 4.

It is important to remember that the data in Table 4 are for entire towns and villages. Many of the towns and villages listed are only partially in the watershed. For example, the entire villages of LeRoy and Warsaw along with most of the townships of Pavilion, LeRoy, and Warsaw are in the watershed (see Map B, Appendix VI). Conversely, the towns of Bergen, Castile, and Wethersfield have only a small corner of their respective township in the Oatka Creek Watershed. However, the populations of these "surrounding" communities are also significant because they represent numbers of people that live very close to the watershed.

According to the 1990 census data, the greatest numbers of individuals are concentrated in the villages of LeRoy and Warsaw. The towns of LeRoy and Wheatland have the highest township populations. Also, the LeRoy and Wheatland townships are projected to grow modestly over the next 30 years (see Table 4). This probably reflects their closer proximity to the Rochester metropolitan area compared to the other communities in the watershed.

Table 5 shows the population sizes of the four counties that include part of the Oatka Creek watershed. Genesee and Wyoming counties contain much larger regions of the Oatka Creek watershed than do Livingston or Monroe counties. These data include some of the human population densities of nearby communities that are not in the Oatka Creek watershed but whose inhabitants may use the resources there. The county figures also indicate some potential sources of future human population growth in the watershed. Overall, significantly higher human populations are located nearer the northern end of the watershed than the southern end.

**Table 4.** Human population sizes, trends, and projections for towns and villages located (at least partially) in the Oatka Creek Watershed. Data obtained from the Genesee Finger Lakes Regional Planning Council (GFLRPC).

TOWN/VIL.	HISTORICAL POPULATION				PROJECTED POPULATION			
	1960	1970	1980	1990	2000	2010	2020	2030
Bergen (T)	1,032	1,263	1,592	1,691	1,813	1,809	1,799	1,788
Bethany (T)	1,569	1,978	1,876	1,808	1,813	1,809	1,799	1,788
Caledonia (T)	1,150	1,505	1,846	2,179	2,381	2,459	2,524	2,578
Caledonia (V)	1,917	2,327	2,188	2,262	2,363	2,386	2,404	2,420
Covington (T)	827	923	1,057	1,216	1,380	1,403	1,419	1,431
Castile (T)	839	1,351	1,413	1,570	1,635	1,665	1,687	1,702
Gainesville (T)	937	969	998	1,096	1,141	1,156	1,169	1,179
LeRoy (T)	2,117	2,873	3,119	3,202	3,362	3,545	3,714	3,876
LeRoy (V)	4,662	5,118	4,900	4,974	5,180	5,194	5,203	5,215
Middlebury (T)	890	989	1,054	1,054	1,095	1,111	1,125	1,139
Orangeville (T)	633	820	1,103	1,115	1,184	1,221	1,215	1,275
Pavilion (T)	1,721	2,122	2,375	2,327	2,428	2,452	2,469	2,480
Perry (T)	1,167	1,304	1,556	1,528	1,593	1,629	1,659	1,687
Scottsville (V)	1,863	1,967	1,789	1,912	1,933	1,937	1,940	1,944
Stafford (T)	2,005	2,461	2,508	2,593	2,534	2,567	2,594	2,617
Warsaw (T)	1,150	1,102	1,455	1,512	1,583	1,612	1,635	1,655
Warsaw (V)	3,653	3,619	3,619	3,830	3,809	3,799	3,790	3,781
Wethersfield (T)	650	674	674	794	870	881	890	897
Wheatland (T)	1,848	2,298	3,108	3,181	3,310	3,410	3,493	3,564

Note: Population sizes for towns do not include village populations in those towns.

**Table 5.** Human population sizes, trends, and projections for counties located (at least partially) in the Oatka Creek Watershed. Data obtained from the Genesee Finger Lakes Regional Planning Council (GFLRPC).

COUNTY	HISTORICAL POPULATION				PROJECTED POPULATION			
	1960	1970	1980	1990	2000	2010	2020	2030
Genesee	53,994	58,722	59,400	60,600	61,628	62,170	62,635	63,048
Livingston	44,053	54,041	57,006	62,372	66,513	67,760	68,783	69,651
Monroe	586,387	711,917	702,238	713,968	727,856	735,708	742,150	747,612
Wyoming	34,793	37,688	39,895	42,507	44,361	44,818	45,183	45,283

## B. LAND USE PATTERNS

Land use patterns in the watershed need to be continuously evaluated. However, some general information is available at this time. An important and most recent addition to the land use database is the land use map developed in 2002 by Dr. James Zollweg (SUNY Brockport) (Map H, Appendix VI). This land use map is based on information originally compiled in the USGS Land Use/Land Cover database and now part of the EPA BASINS project GIS data set. This information suggests that most of the land in the watershed (73.8%) is agricultural and/or idle. Some small industry is found in the watershed, primarily in/near the Villages of Warsaw, Wyoming, LeRoy, Caledonia, and Scottsville. Residential centers are also found in these villages. Rural households are found throughout the watershed. Regarding natural habitats, the percentage of forest habitat in the watershed is 21.6%. However, most of these forested areas are small and fragmented. Wetlands are also small and fragmented in the watershed and constitute less than 1% of the watershed (according to data used for this land use map, MAP H,

Appendix VI; also see MAP E, Appendix VI). Indeed, the fragmentation of natural habitats appears to be common throughout the watershed (Map H, Appendix VI).

Another source of information for land use in Genesee and Wyoming counties is an EQIP (Environmental Quality Incentives Program) grant proposal submitted by those counties for the year 2000 (it was not funded). The proposal focused on agriculture in these counties and lists the following breakdown for land use in the portion of the Oatka Creek watershed in Genesee and Wyoming counties:

	TOTAL
Total Land (acres):	124,630
Cultivated Cropland (acres):	62,710
Pastureland (acres):	38,500
Forest Land (acres):	21,000
Farms (number):	112
Barnyards (number):	90
Animal Units (approx. number):	23,000
Unmanaged Livestock –	7.5
Access to Streams (miles):	

According to the proposal, a percentage of the agricultural land mentioned needs treatment and the proposal was seeking funding for that. The proposal also mentioned some other land use issues including a reduction in riparian cover on streams due to extension of farmland into these areas and a need for improved land applications of manure, fertilizers, and pesticides. The proposal also stated the condition in wetland areas as poor due to siltation resulting from erosion.

Similar types of information on agriculture in Livingston and Monroe counties are needed along with more specific information on land use practices in the entire watershed.

### **C. POTABLE WATER**

#### **1. Oatka Creek**

Oatka Creek is used as a potable ("drinkable") water supply by the Village of Warsaw. A water filtration plant treats the water before it is sent to residents of the village. There are not any other municipal water supply systems that use Oatka Creek waters. However, there are other potable water supplies within the Oatka Creek watershed.

#### **2. Lake LeRoy - Mud Creek Subwatershed**

The Village of LeRoy uses a small reservoir, Lake LeRoy, located on Mud Creek (a tributary of Oatka Creek). The reservoir was built in 1915 and is located in the southeastern corner of Genesee County (latitude: 42052'00" N; longitude: 77058'35" E). The reservoir has a surface area of approximately 59 acres (23.8 hectares), a maximum

depth of 25 ft (7.8 m) and an average depth of 10.5 ft (3.2 m). Daily water use ranges seasonally from approximately 700,000 gallons per day to occasionally over 1,300,000 gallons per day in summer months.

The Village of LeRoy has had a reservoir and watershed management program since 1985. Several modifications have been made in the reservoir and treatment plant to improve drinking water quality. Similarly, a watershed management program was initiated in an effort to reduce loading of nutrients and sediments to the reservoir from the highly agricultural watershed. The LeRoy Watershed Advisory Committee (LeWAC) was formed in an effort to promote watershed land use improvements. LeWAC was made up of local officials, technical specialists from village, town, county, and federal agencies, and local citizens and landowners. The group was successful in implementing a number of best management practices on the farms in the watershed. For more details on the watershed management program, see "Watershed Evaluation And Management For Lakes LeRoy And LaGrange" (T. Tatakis, 1990, unpubl.).

Lake LeRoy serves as a settling basin for nutrients and sediment that enter it from the headwaters of Mud Creek. These materials probably remain in lake LeRoy and do not flow downstream toward Oatka Creek. The water level in the reservoir is usually below the top of the spillway except in the late winter and spring months. At those times, water from the headwater regions of Mud Creek and from Lake LeRoy will flow downstream in Mud Creek and, ultimately, to Oatka Creek.

### 3. Wells

The remaining potable drinking water supplies in the watershed are all groundwater. They include the following municipal water supply systems:

- Wyoming (Village) Public Water Supply
- Pavilion Water District #1 (Town)
- Caledonia (Village)

In addition, there are numerous private and public wells that are used for drinking water. In Genesee and Wyoming Counties, there are approximately 1230 private and 65 public wells (data from EQIP grant proposal).

Finally, it should be noted that potable water supplies in this region are currently in a state of change, primarily in Genesee and Livingston counties. This is because a plan is currently being developed to provide many of the communities in these regions with potable water from the Monroe County Water Authority within the next few years.

### **D. FISHING**

The lower Oatka Creek downstream of Buttermilk Falls is a popular brown trout fishery. Biological information and management practices concerning this fishery are provided in Section 2 of this report.

The NYSDEC introduced a new special regulations section in the year 2000. It included a "No Kill" zone between Union Street and Wheatland Center Road. The NYSDEC is conducting a multi-year study to examine the effects of these regulation changes. It includes annual fish surveys and a creel census. There are several areas along the Lower Oatka that include public fishing rights (PFR's).

Spring Creek, a tributary of Oatka Creek in Livingston County, also supports a brown trout fishery that is actively used by sportsman. It enters Oatka Creek just upstream of the Route 36 bridge.

**E. SPDES PERMITS FOR MUNICIPAL AND INDUSTRIAL DISCHARGES**

Oatka Creek receives effluent from several municipalities and industries in the watershed. The State Pollutant Discharge Elimination System (SPDES) regulates the discharge of wastewater into ground or surface waters in New York State. A SPDES permit contains a set of requirements that must be met. The requirements are based on both the nature of the effluent and the receiving waters. The following is a list of Municipal Wastewater Treatment Facilities that release effluent into Oatka Creek (from NYSDEC):

Municipality Design	Flow (mgd)
• Warsaw STP	0.65
• LeRoy (Village) Wastewater Treatment Plant	1.0
• Scottsville (Village) STP	0.65

Two industrial/commercial SPDES permits that allow discharges over 0. 1 million gallons per day (mgd) into Oatka Creek waters are:

Facility Name	Design Flow (mgd)
• Caledonia State Fish Hatchery (effluent into Spring Creek)	3.15
• Lapp Insulator Div.	1.4

**F. DE-ICING PRACTICES**

Road de-icing is a common practice in the Oatka Creek Watershed. Villages, towns, counties, and New York State all spread a variety de-icing substances that could eventually runoff and affect ecological communities in Oatka Creek and the watershed.

Municipalities in the Oatka Creek watershed use a variety of de-icing agents including sand, salt, calcium chloride, "Majic", and "Ice Ban". The GFLRPC has specific information available for some of the municipalities in the Oatka Creek watershed

including road miles treated, tons of de-icers used, and storage facilities. This information is compiled in Table 6.

**Table 6.** De-icing information for some municipalities working in the Oatka Creek watershed. Note that the values in the table are for the entire municipality and not only for portions of that municipality in the Oatka Creek watershed. Data obtained from the GFLRPC.

Town/Vil.	De-icer Types	Ratio used	Paved miles deiced	Tons applied '96 - '97	Tons applied '95 - '96	Storage Facility	Storage address
LeRoy (T)	sand, salt	2:1	69	1929	2861	Open	LeRoy
Middlebury (T)	Salt, CaCl <sub>2</sub>	100% salt, CaCl <sub>2</sub> below 20OF	67.5	2056	2489	Enclosed	Sherman Ave., Wyoming
Caledonia (T)	Salt and sand, Majic	1:1	68	700	800	Open	
NYS DOT region 4	Salt and sand, CaCl <sub>2</sub> , other	varies	2794	69,950	60,000	Enclosed	several
Wheatland (T)	Salt and sand, CaCl <sub>2</sub> , Ice ban	2/3 sand 1/3 salt, or 100% salt or either used with Ice ban and/or CaCl <sub>2</sub>	70.5	1456.57		Open/ Enclosed	1822 ScottsMum. Rd., Scotts.
Covington (T)	Salt, CaCl <sub>2</sub>		44	829	919	Enclosed	7083 Court Rd. Pavilion
Scottsville (V)	Salt and sand, Ice ban	3:1	6	80	92	Enclosed	389 ScottsMum. Rd.
Genesee Co.	Salt, sand	2:3	20	760	1052	Enclosed	153 Cedar St., Batavia
Pavilion (T)	Salt, sand	2:1	61.5	1100	1000	Open	
Warsaw (V)	Salt, sand	2:1	12.23	250	250		
Caledonia	Salt, sand	2:3	10	45	0	Open	Jones Hall, Rt 36 S, Caledon.

## G. MINES AND WELLS

All of the information in this section was obtained from the GFLRPC (Genesee Finger Lakes Regional Planning Council).

The location of mined lands in the Oatka Creek Watershed can be found in Map F (Appendix VI). Sand and Gravel mines are the most common. Limestone and marl mines are also present. There are three limestone mines and they are all located in the Town of LeRoy. The two marl mines are also found in the Town of LeRoy. All other mines shown in Map F (Appendix VI) are sand and gravel mines.

There are approximately 290 oil, gas, and solution mining wells in the Oatka Creek Watershed. The location of these wells is shown in Map G (Appendix VI). These wells

can be grouped into the following well types (percentage is the relative frequency of that well type in the watershed):

- Gas Development (57%)
- Brine (24%)
- Dry Hole (11 %)
- Dry Wildcat (4%)
- Other (4%) – includes gas wildcat, gas extension, storage, disposal and stratigraphic

Map G (Appendix VI) shows that many of these wells are located in the towns of Pavilion (many of these are gas development wells) and Middlebury (many of these are brine wells).

#### **H. INACTIVE HAZARDOUS WASTE SITES**

Table 7 summarizes the inactive hazardous wastes sites in the Oatka Creek watershed according to the NYSDEC as of April, 2002.

The Lehigh Valley Railroad derailment that occurred in 1970 has been mentioned earlier in this report. The trichloroethylene (TCE) in the ground water has resulted in contaminated wells in the area. A project is currently underway to provide potable water to residents in the affected area.

The NPL status refers to the presence of the site on the National Priorities List. The NYSDEC describes Class 2 and Class 3 sites as follows:

- Class 2: Significant threat to the public health or environment – action required.
- Class 3: "Does not present a significant threat to the public health or the environment action may be deferred."

**Table 7.** Inactive Hazardous Waste Sites In The Oatka Creek Watershed. (from NYSDEC, April, 2002; "RP" = Responsible Party)

Site Name	Site number	Town/Village	County	Class	Status
Lehigh Valley Railroad derailment	8-19-142	LeRoy	Genesee	2	Remediation project in progress
Lapp Insulator Company	8-19-017	LeRoy	Genesee	2	Remedial Investigation/ Feasibility Study begun by RP 8/01
Jones Chemical	8-26-003	Caledonia	Livingston	2	Order for Remediation by RP under negotiation
ETE Sanitation and Landfill	9-61-005	Gainesville	Wyoming	2	Order for remediation by RP under negotiation
Robeson Industries	9-61-008	Castile	Wyoming	2	Order signed for remediation by RP
Warsaw Village Landfill	9-61-005	Warsaw	Wyoming	3	Closure prior to regulation under 360

# APPENDIX I. WATER FLOW RATES

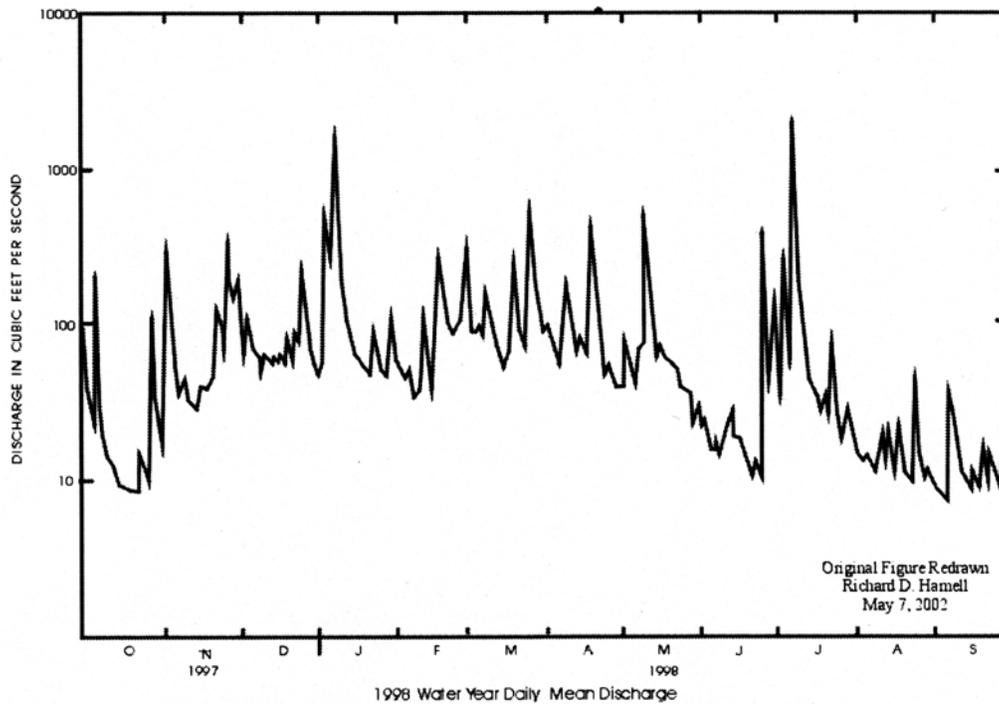
(from USGS data)

04230380 Oatka Creek At Warsaw, NY

Statistics Of Monthly Mean Data For Water Years 1964 - 1998, By Water Year (WY)

MON	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	25.3	51.9	69.7	69.4	75.6	126	111	52.4	31.3	20.1	13.6	18.3
Max	76.7	131	130	234	235	228	185	129	165	145	86.8	166
(WY)	1978	1986	1978	1979	1976	1979	1996	1984	1989	1998	1992	1977
Min	2.76	5.09	17.2	15.1	22.5	49.2	33.2	16.9	6.36	2.52	2.36	1.81
(WY)	1965	1965	1965	1981	1980	1981	1995	1995	1965	1965	1965	1964

Summary Statistics	For 1997 Calendar Year		For 1998 Water Year		Water Years 1964 - 1998	
Annual Total	23073.3		30392.6			
Annual Mean	63.2		83.3		55.5	
Highest Annual Mean					83.3	1998
Lowest Annual Mean					29.6	1965
Highest Daily Mean	754	Feb. 27	2050	Jul. 8	2050	Jul. 8, 1998
Lowest Daily Mean	4.6	Aug. 10	7.1	Sep. 6	1.0	Aug. 1, 1965
Annual Seven-Day Minimum	5.2	Aug. 26	8.4	Aug. 31	1.4	Jul. 26, 1965
Annual Runoff (cfsm)	1.62		2.13		1.42	
Annual Runoff (inches)	21.95		28.92		19.29	
10 Percent Exceeds	138		156		124	
50 Percent Exceeds	40		49		29	
90 Percent Exceeds	6.9		11		5.0	



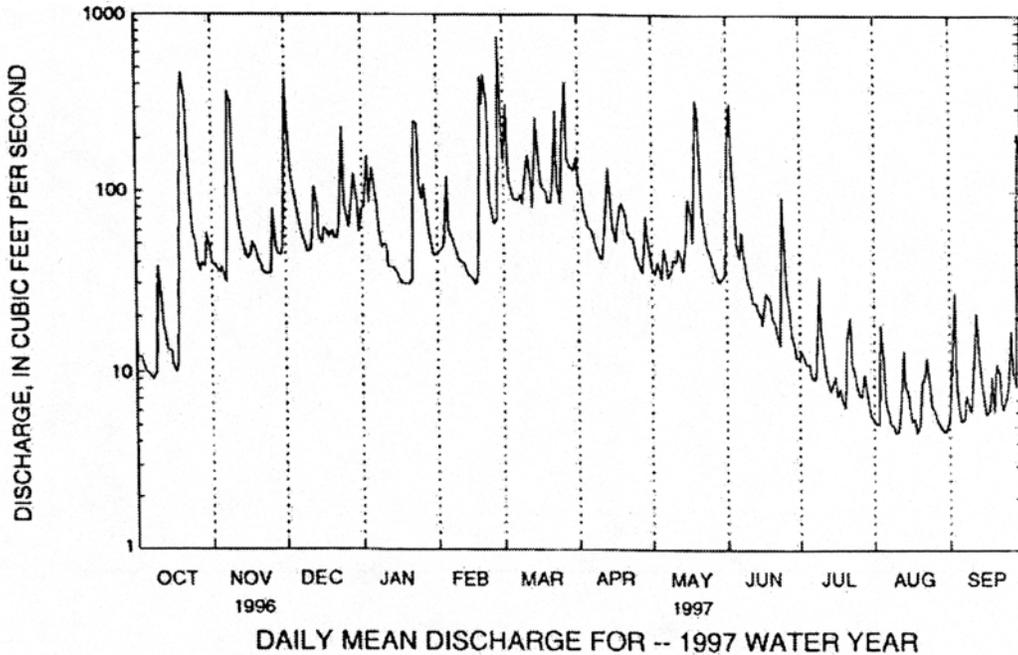
Water Flow Rates – continued  
04230380 Oatka Creek At Warsaw, NY – continued

Summary Statistics	For 1996		For 1997		Water Years	
	Calendar Year		Water Year		For 1966 - 1997	
Annual Total	29610.7		24021.1			
Annual Mean	80.9		65.8		54.7	
Highest Annual Mean					73.8	1997
Lowest Annual Mean					29.6	1965
Highest Daily Mean	1700	Jan 19	754	Feb 27	1700	Jan. 19, 1996
Lowest Daily Mean	4.2	Sep 4	4.6	a	1.0	Aug. 1, 1965
Annual Seven-Day Minimum	4.8	Aug 30	5.2	Aug 26	1.4	Jun. 26, 1965
Instantaneous Peak Flow			1570	Feb 27	4010 b	June 23, 1973
Instantaneous Peak Stage			5.51	Feb 27	9.75	June 23, 1973
Instantaneous Low Flow			4.1	c	0.90	Aug. 1, 1965
Annual Runoff (cfsm)	2.07		1.68		1.40	
Annual Runoff (Inches)	28.17		22.85		19.00	
10 Percent Exceeds	179		140		123	
50 Percent Exceeds	44		41		29	
90 Percent Exceeds	8.7		6.9		4.9	

a. Aug. 10, 19.

b. From rating curve extended above 1.770 ft<sup>3</sup>/s on basis of slope-area measurement of peak discharge.

c. Aug. 11, 19, 20.

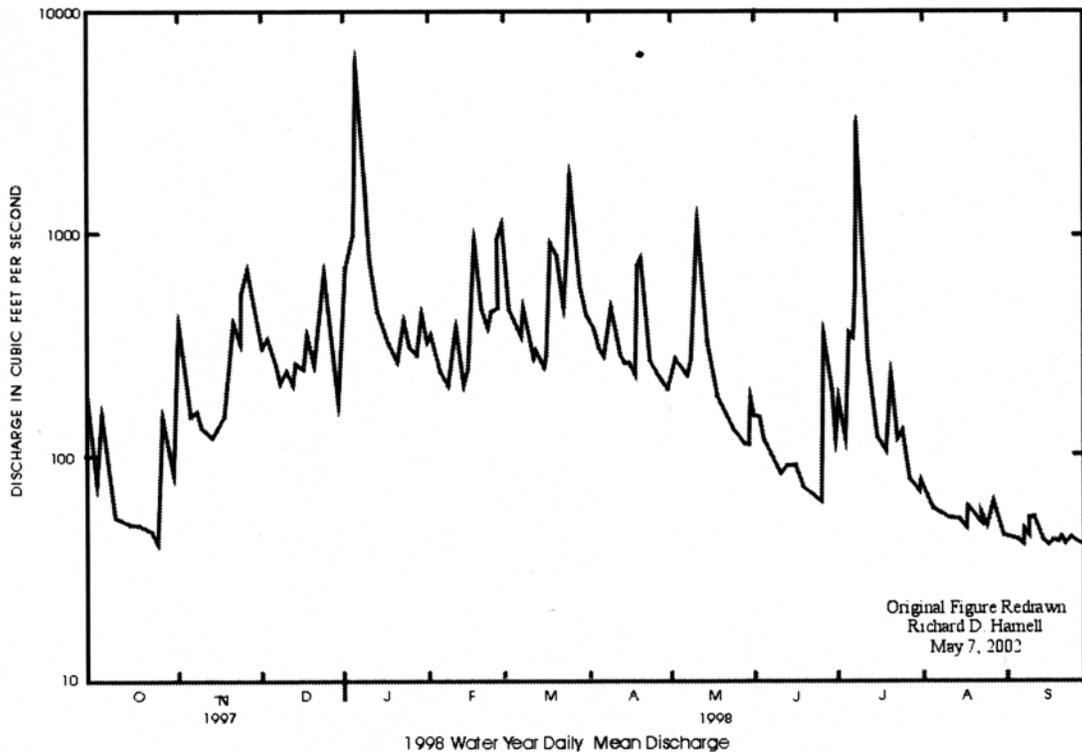


Water Flow Rates – continued  
04230500 Oatka Creek At Garbutt, NY

Statistics Of Monthly Mean Data For Water Years 1946 - 1998, By Water Year (WY)

MON	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	78.7	144	228	241	295	556	505	249	136	78.3	58.4	60.7
Max	400	567	798	881	868	1048	1069	581	760	355	294	748
(WY)	1978	1986	1978	1998	1976	1956	1947	1984	1989	1998	1992	1977
Min	18.0	17.2	20.1	22.9	33.4	244	117	99.7	45.6	31.8	22.5	19.2
(WY)	1966	1965	1961	1961	1958	1965	1946	1995	1949	1965	1965	1965

Summary Statistics	For 1997 Calendar Year		For 1998 Water Year		Water Years 1946 - 1998	
Annual Total	87434		114184			
Annual Mean	240		313		219	
Highest Annual Mean					371	1978
Lowest Annual Mean					117	1965
Highest Daily Mean	1430	Mar. 1	5820	Jan. 9	6500	Mar. 31, 1960
Lowest Daily Mean	38	Sep. 6	38	Sep. 29	13	Oct. 30, 1966
Annual Seven-Day Minimum	39	Sep. 4	39	Sep. 24	14	Oct. 26, 1966
Annual Runoff (cfsm)	1.20		1.56		1.09	
Annual Runoff (Inches)	16.26		21.24		14.85	
10 Percent Exceeds	541		610		520	
50 Percent Exceeds	180		218		110	
90 Percent Exceeds	42		46		30	



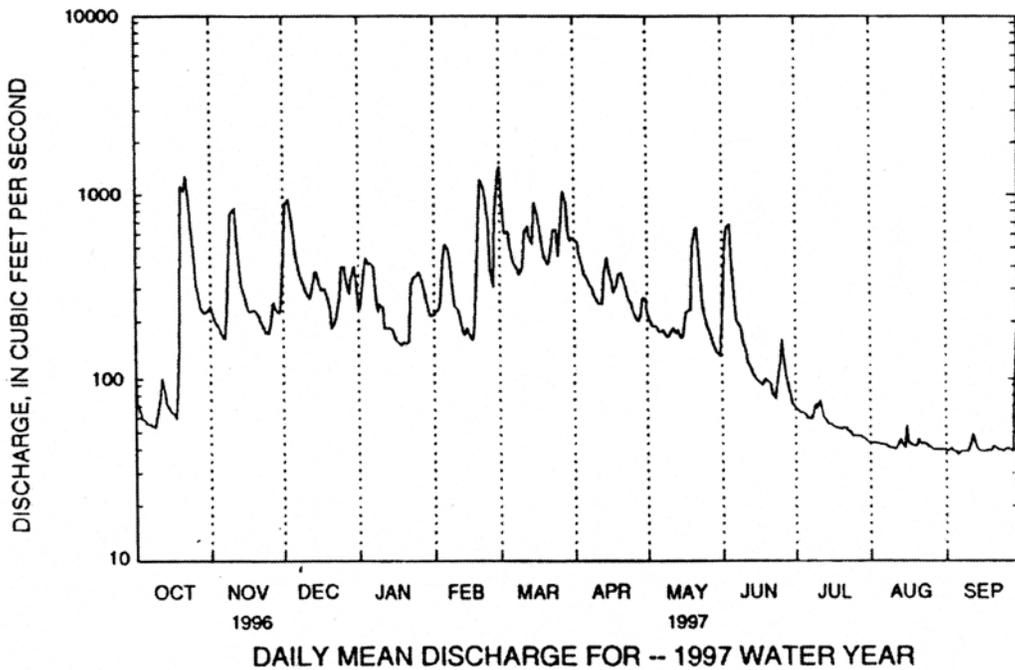
Water Flow Rates – continued  
04230500 Oatka Creek At Garbutt, NY - continued

Statistics Of Monthly Mean Data For Water Years 1946 – 1997, By Water Year (WY)

MON	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	78.7	141	226	229	294	554	508	248	136	73.0	58.6	61.1
Max	400	567	798	505	868	1048	1069	581	760	249	294	748
(WY)	1978	1986	1978	1993	1976	1956	1947	1984	1989	1972	1992	1977
Min	18.0	17.2	20.1	22.9	33.4	244	117	99.7	45.6	31.8	22.5	19.2
(WY)	1966	1965	1961	1961	1958	1965	1946	1995	1949	1965	1965	1965

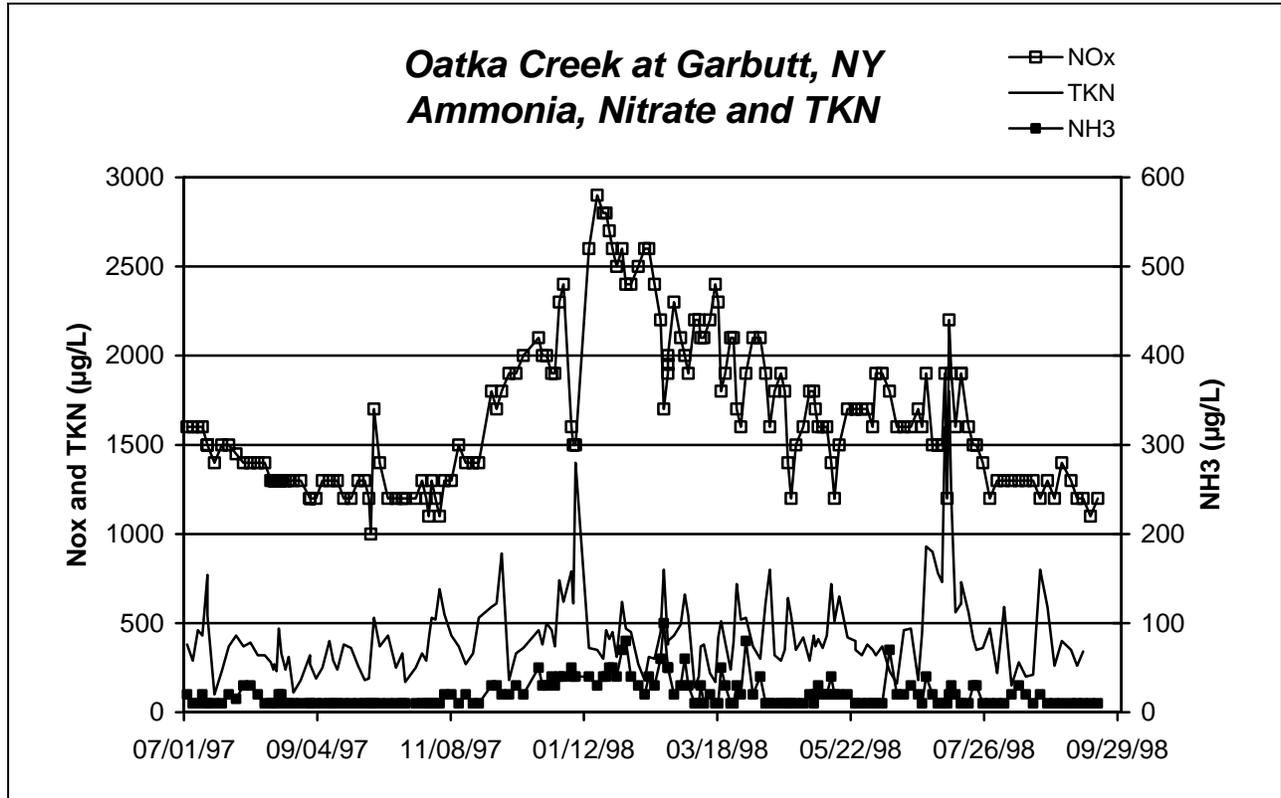
Summary Statistics	For 1996 Calendar Year		For 1997 Water Year		Water Years 1946 - 1997	
Annual Total	120664		96027			
Annual Mean	380		263		217	
Highest Annual Mean					371	1978
Lowest Annual Mean					117	1965
Highest Daily Mean	2520	Jan. 20	1430	Mar. 1	6500	Mar. 31, 1960
Lowest Daily Mean	50	Sep. 10	38	Sep. 6	13	a
Annual Seven-Day Minimum	52	Sep. 6	39	Sep. 4	14	Oct. 26, 1966
Instantaneous Peak Flow			1650	Mar. 1	7050	Mar. 31, 1960
Instantaneous Peak Stage			5.34	Mar. 1	8.64	Mar. 31, 1960
Instantaneous Low Flow			38	b	3.3	c
Annual Runoff (Cfsm)	1.65		1.32		1.08	
Annual Runoff (inches)	22.44		17.86		14.73	
10 Percent Exceeds	734		607		518	
50 Percent Exceeds	228		199		110	
90 Percent Exceeds	62		42		30	

a Oct. 30, 31, Nov. 1, 1996.  
b Sep. 5, 6, 7, 9, 19, 17.  
c Sep. 11, 12, 1958.

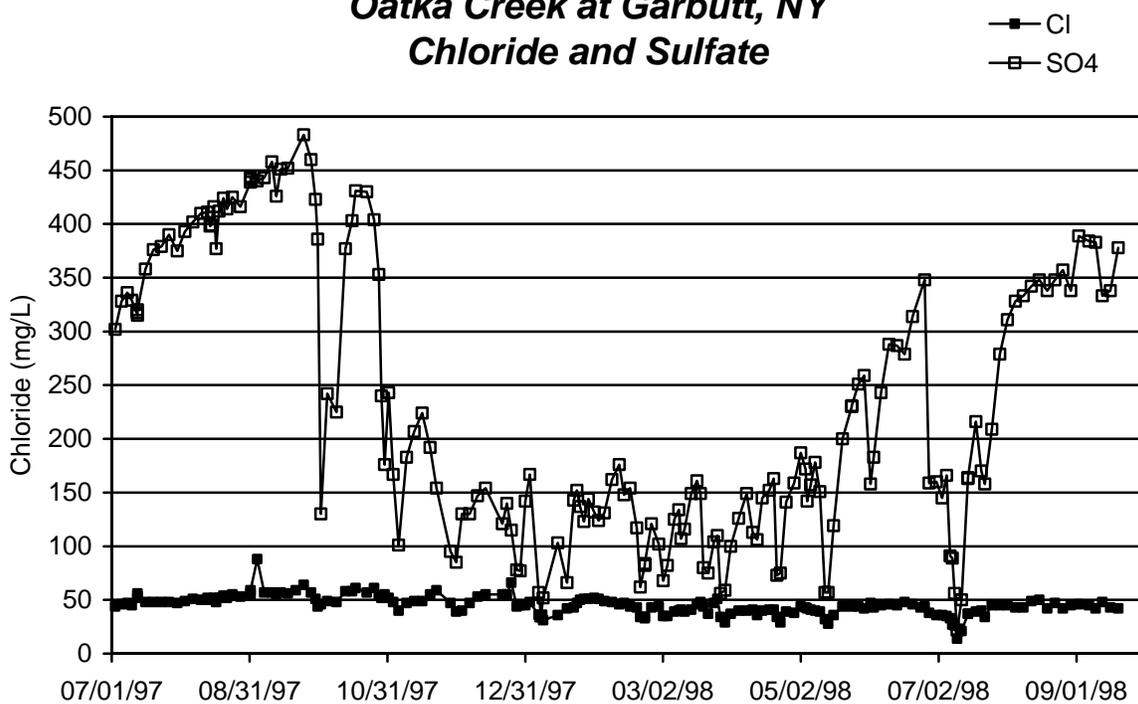


## APPENDIX II. WATER QUALITY DATA

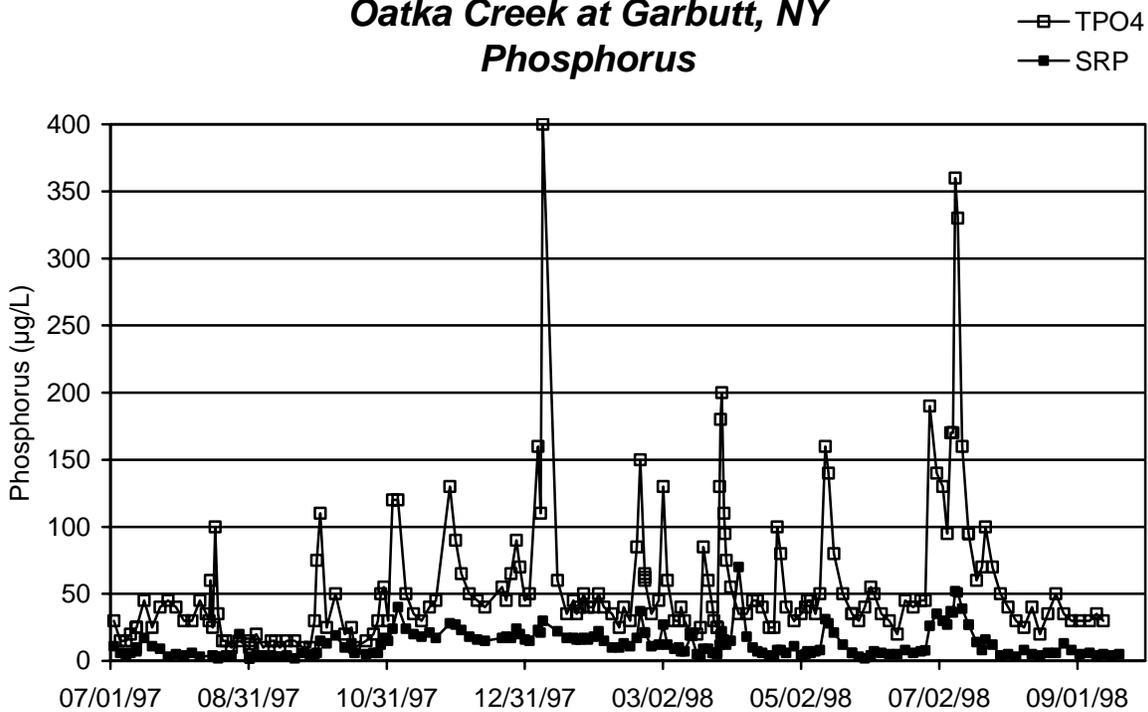
The data on the following pages are water quality data collected by the Monroe County Health Department at the Garbutt station.



**Oatka Creek at Garbutt, NY  
Chloride and Sulfate**



**Oatka Creek at Garbutt, NY  
Phosphorus**



## **APPENDIX III. GEOCHEMISTRY OF OATKA CREEK**

### Geochemistry of Oatka Creek, New York State Executive Summary

C. B. Dowling, M. J. Renz, A. G. Hunt, and R. J. Poreda  
Department of Earth and Environmental Sciences

This investigation on Oatka Creek was initiated by the growing concern of local residents about the condition of their watershed. The purposes of this study were to characterize the geochemistry of Oatka Creek, determine any regional geologic effects on the water chemistry, and observe any anthropogenic effects on Oatka Creek and its watershed. Water and sediment samples from Oatka Creek were collected and analyzed over a three-year period (1998-2000). The creek water was measured for major ions and trace elements to determine baseline levels and identify any significant deviations from the baseline. Sediment extraction experiments were performed to clarify the role of cation exchange and adsorption/desorption reactions in controlling the trace metal concentrations in the surface waters.

The headwaters of Oatka Creek are in Wyoming County, south of Rock Glen. The creek flows north into Genesee County until LeRoy where the creek suddenly begins flowing easterly. Oatka Creek then flows through Livingston County and into Monroe County where it joins the Genesee River at Scottsville. Oatka Creek experiences flow separation during the summer and part of the fall. During the dry season (summer and fall) the creek is a losing stream; it loses water to the ground for a period of time. The water then reappears as seeps and springs between Buttermilk Falls and the Perry Road Bridge. During these dry periods, the creek can be divided into the upper and lower watersheds. The upper watershed is from Rock Glen to the bend in Oatka creek (north of LeRoy) and the lower watershed is from the bend to Scottsville. Oatka Creek has significant groundwater input throughout the lower watershed. During the wetter periods, Oatka Creek flows continuously over its creekbed.

The geology of the Oatka Creek watershed plays an intricate role in the water chemistry of the creek. The major geologic units are limestone ( $\text{CaCO}_3$ ), dolostone ( $(\text{Ca}, \text{Mg})\text{CO}_3$ ), gypsum ( $\text{CaSO}_4$ ), evaporites ( $\text{NaCl}$ ,  $\text{KCl}$ ), sandstones ( $\text{SiO}_2$ ), and shales ( $(\text{Na}, \text{K})\text{AlOSi}$ ). The majority of the major ions (e.g. Na, K, Mg, Ca, Cl,  $\text{SO}_4$ ,  $\text{HCO}_3$ ) and trace metals measured in ground and surface waters are found naturally in the environment from the weathering of bedrock. During the dry season, the lower watershed (Perry Road Bridge to Scottsville) is sulfate dominated and has a noticeable influx of groundwater. The upper watershed (Rock Glen to LeRoy) is dominated mainly by precipitation with little groundwater influence. Groundwater discharge into the creek and seasonal changes in the water volume of the creek affects the dissolved ion and metal concentrations in the surface water of Oatka Creek. In the wet season (winter and spring), there is no longer a dramatic difference in ion concentrations between Rock Glen and Scottsville since the groundwater signature is diluted by the extra precipitation and runoff.

A combination of natural sources (such as precipitation and weathering of bedrock and sediments) and anthropogenic inputs (such as sewage effluent or air pollution) will contribute to the dissolved trace metal concentrations in the water. Over the three years that this study has taken place, there has been no continuous deviations observed in the dissolved trace metals of the samples. There is very little trace metal input from precipitation. Trace metals readily adsorb onto sediment surfaces so, through desorption/adsorption reactions, the creekbed sediments could be a possible source of trace metals in the creek water. As shown by the data, the sediments of Oatka Creek are a sink for trace metals from anthropogenic and natural sources. However, as the water chemistry demonstrates, the trace metals on the sediments are not being remobilized and reintroduced into the water.

Any future research projects can use this study as a guide as well as a good comparison tool since the data establish the baselines for the major ions and trace metals of Oatka Creek. These data sets also provide a good starting point for examining the effects of trace metals on the food chain. Even though the Oatka Creek is relatively pristine, local communities and governments in the Oatka Creek watershed need to make educated decisions on the future development of towns, recreational facilities, and land-use laws to ensure the continuing high quality of the Oatka Creek Watershed.

## APPENDIX IV. MACROINVERTEBRATE TAXA

Macroinvertebrate Taxa Collected From  
Oatka And Spring Creeks In 1997  
(present in 100 organism subsamples)  
From Sutton, 1999

SITE	OATKA		GAR BUTT		SCOTTSVILLE		SPRING CREEK	
SITE #	1		3		4		2	
Month Sampled	May	Sept	May	Sept	May	Sept	May	Sept
<b>OLIGOCHAETA</b>								
LUMBRICINA - unidentified				1			3	
Tubificidae - unidentified								
Without Capilliform Setae						1		7
With Capilliform Setae								1
<b>MOLLUSCA</b>								
Sphaeriidae								
<i>Pisidium</i>	1				1			
<b>CRUSTACEA</b>								
ISOPODA (Asellidae)								
<i>Caecidotea</i> sp.		4						4
<b>AMPHIPODA (Gammaridae)</b>								
<i>Gammarus fasciatus</i>	2	11	1	9	2	32		
<i>G. pseudolimnaeus</i>		12		1		4	27	77
<b>DECAPODA (Cambaridae)</b>								
<i>Orcnectes propinquus</i>			1					
Unidentified Cambaridae						2		
<b>EPHEMEROPTERA</b>								
Baetidae								
<i>Baetis tricaudatus</i>			2	2	3		7	6
Heptageniidae								
<i>Stenonema vicarium</i>		5	3	3	3	4		
Ephemerellidae								
<i>Ephemerella subaria</i>		12	1	13		3		
<i>E. rotunda/invaria</i> gr.	48		67	28	69		50	1?
<i>E. sp.</i>					4			
Caenidae								
<i>Caenis</i> sp.						2		
<b>PLECOPTERA</b>								
Perlidae								
<i>Agnetina capitata</i>	1		4		2			
<b>COLEOPTERA</b>								
Elmidae								
<i>Optioservus</i> sp.	4	14	4	7	4	4		
<i>Promoresia</i> sp.	2			2				
<i>Stenelmis</i> sp.	1		2		3			

Macroinvertebrate Taxa Collected From  
Oatka And Spring Creeks In 1997 – continued  
(present in 100 organism subsamples)  
From Sutton, 1999

SITE	OATKA		GAR BUTT		SCOTTSVILLE		SPRING CREEK	
SITE #	1		3		4		2	
Month Sampled	May	Sept	May	Sept	May	Sept	May	Sept
<b>MEGALOPTERA</b>								
Corydalidae								
<i>Nigronia</i> sp.						1		
Sialidae								
<i>Sialis</i> sp.						1		
<b>TRICHOPTERA</b>								
Rhyacophilidae								
<i>Rhyacophila</i> sp.							3	
<i>R. melita</i> .			1	1	1			
<i>R. fuscula</i>				1				
Hydropsychidae								
<i>Cheumatopsyche</i> sp.	2	14		7	2	2		
<i>Eukiefferiella devonica</i> gr.							3	
<i>Orthocladus obumbratus</i>	3						1	
<i>O. (Eurothocladus)</i>	1							
<i>O. sp.</i>					1		1	
Chironominae Subfamily								
<i>Microtendipes pedellus</i> gr.			1			4		
<i>Microtendipes</i> sp.	1							
<i>Dicrotendipes fumidus</i>		3						
<i>Micropsectra</i> sp.						1		
<i>Phaenopsectra dyari</i> .						4		
<i>Polybedilum convictum</i> .	1							
<i>P. aviceps</i>			1					
<i>Paratanytarsus dimorphus</i>	1							
<i>Rheotanytarsus exiguus</i> gr.	1							
<i>Nilothauma babyi</i>						1		
<i>Stempellinella</i> sp.			3					
Unidentified Chironomidae						1	2	

Macroinvertebrate Taxa – continued  
RIBS, 1989-1990; Data summary

**STREAM NAME:** Oatka Creek (OATK)

**DRAINAGE:** 04

**SITE LOCATION:** Garbutt

**DEC:** fishing access area

**SAMPLING METHOD:** Traveling kick

**STATION ID:** 04021204

	SAMPLE DATE		
	05/24/89	08/02/89	06/27/90
	<i>Dominant Species</i> % Contribution, Tolerance, Common Name	<i>Dominant Species</i> % Contribution, Tolerance, Common Name	<i>Dominant Species</i> % Contribution, Tolerance, Common Name
1	<i>Ephemereilla, invaria</i> 44, intolerant, mayfly	<i>Cricotopus, trifasc</i> 22, facultative, midge	<i>Cricotopus, trifasc</i> 33, facultative, midge
2	<i>Baetis, brunnei</i> 23, intolerant, mayfly	<i>Caenis, sp.</i> 20, facultative, mayfly	<i>Polypedilum, convict</i> 10, facultative, midge
3	<i>Orthoclad, obumbrat</i> 9, facultative, midge	<i>Tvetenia, vitracie</i> 11, facultative, midge	<i>Optioservus, trivitt</i> 10, intolerant, beetle
4	<i>Promoresia, elegans</i> 2, intolerant, beetle	<i>Baetis, brunnei</i> 11, intolerant, mayfly	<i>Thien'myia, gr-, spp</i> 7, facultative, midge
5	<i>Gammarus, sp.</i> 2, facultative, scud	<i>Baetis, flavistr</i> 9, intolerant, mayfly,	<i>Baetis, sp.</i> 6, facultative, mayfly,

Genus and species names are abbreviated here to accommodate format. Complete names are reported elsewhere. For description of tolerance: intolerant = not tolerant of poor water quality; facultative = occur over a wide range of water quality; tolerant = tolerant of poor water quality.

% Contribution Of Major Groups, Rounded (Number Of Taxa In Parentheses)			
Chironomidae (midges)	16 (8)	38 (5)	61 (9)
Trichoptera (caddisflies)	0 (0)	15 (5)	8 (3)
Ephemeroptera (mayflies)	70 (4)	40 (3)	9 (3)
Plecoptera (stoneflies)	1 (1)	1 (1)	1 (1)
Coleoptera (beetles)	6 (4)	4 (2)	12 (2)
Oligochaeta (worms)	2 (1)	0 (0)	3 (1)
Others	5 (3)	2 (2)	6 (5)
TOTAL	100 (21)	100 (18)	100 (24)
SPECIES RICHNESS	21	18	24
NUMBER OF INDIVIDUALS	100	100	100
BIOTIC INDEX	3.16	5.5	5.59
EPT VALUE	5	9	7
PERCENT MODEL AFFINITY	70	77	57
OVERALL ASSESSMENT	slightly impacted	slightly impacted	slightly impacted

## APPENDIX V. GLOSSARY

### TERMS AND ACRONYMS USED IN THIS REPORT

**AESTHETIC** – involves the beauty and appreciation of something, including nature and art

**AQUIFER** – groundwater, or water underground. Humans tap into this resource with wells.

**BEDROCK GEOLOGY** – the physical and chemical make-up of the rock underlying the soil in a region.

**BENTHIC MACROINVERTEBRATES** – animals, including immature forms of insects, that live in the sediments (benthic region) of streams, lakes and rivers. Often used as indicators of water quality

**COLIFORM BACTERIA** – a particular group of bacteria used as indicators bacteria in bodies of water.

**EQIP** – Environmental Quality Incentives Program

**EUTROPHICATION** – the increase in plant growth in a body of water over time, It is a direct result of the increase in nutrients, sediment and organic matter that may accumulate in a body of water over time. It is a natural process that occurs slowly; human activities often accelerate the rate at which it occurs (called cultural eutrophication).

**GIS** – Geographical Information System

**GFLRPC** – Genesee Finger Lakes Regional Planning Council

**ION** – an atom or small molecule that has a charge (either positive or negative) associated with it. Many inorganic substances dissolved in water exist as ions (e.g. chloride, nitrate)

**INORGANIC** – chemical substances that do not contain carbon (an exception is carbon dioxide). Phosphates, nitrates, and water are examples.

**MGD** – million gallons per day

**NYSDEC** – New York State Department of Environmental Conservation

**OCWC** – Oatka Creek Watershed Committee

**ORGANIC** – a chemical substance is carbon based. They may occur naturally (e.g. proteins, fats) or are man-made (e.g. pesticides).

**pH** – an index used to determine whether a substance is an acid or a base. Substances with a pH less than 7.0 are considered acids while those above 7.0 are considered bases. A pH of 7.0 is considered neutral (pure water has a pH of 7.0).

**PHOTOSYNTHESIS** – a process that occurs in plants. They capture light energy from the sun and convert it into "food" (sugars). These organisms do not have to ingest their "food" – they can make their own organic molecules (e.g. sugars)

**PHYTOPLANKTON** – small, microscopic plant-like organisms that live in the water column of lakes, rivers and streams. They are green and carry out photosynthesis. Algae are an example.

**POINT SOURCE POLLUTION** – pollution that originates from a single, identifiable source (e.g. a pipe)

**PWL** – Priority Waterbody List

**RIBS** – Rotating Intensive Basin Survey; conducted **by NYSDEC**

**RIPARIAN COVER** – vegetation found along the bank of a stream or river

**SPDES** – State Pollutant Discharge Elimination System

**USGS** – United States Geological Survey

**UWA** – (NYS) Unified Watershed Assessment Report

**WATERSHED** – all of the land area that drains into a specific body of water.

**WETLANDS** – land that remains flooded or has specified moisture content in its soil for a certain period of the year. Swamps and marshes are examples. These unique areas are often very productive, and are important reservoirs of water.

## **APPENDIX VI. MAPS**

The following pages include the maps referred to in this report.

Map A – Major Tributaries of Oatka Creek; USGS Station Sites (prepared by Richard D. Hamell, Monroe Community College)

Map B – Oatka Creek Watershed Boundary (from GFLRPC)

Map C – Bedrock Geology of the Oatka Creek Watershed; geology "key" precedes map (from GFLRPC)

Map D – Primary Aquifers in the Oatka Creek Watershed (from GFLRPC)

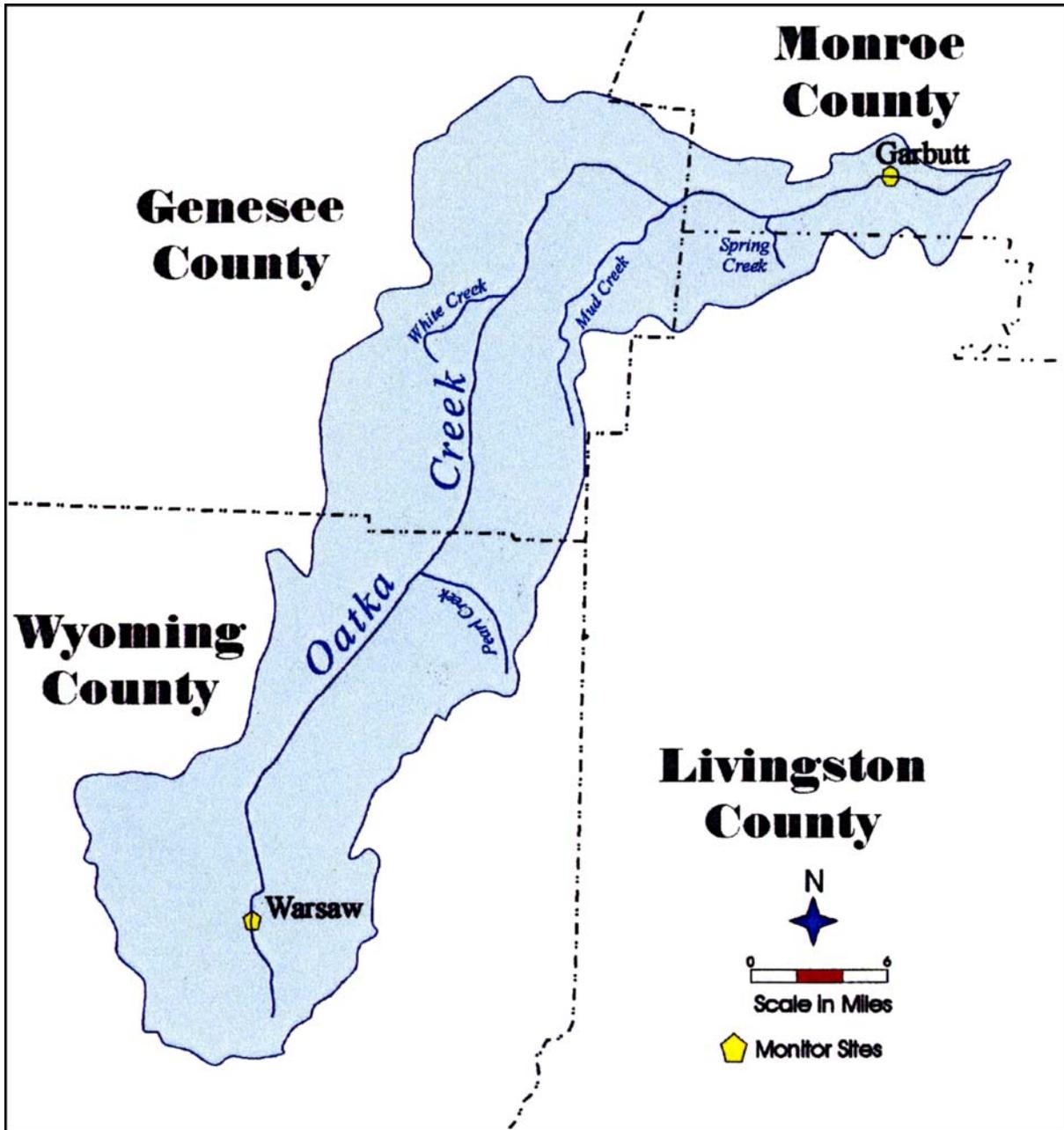
Map E – Wetlands in the Oatka Creek Watershed (from GFLRPC)

Map F – Mined Lands in the Oatka Creek Watershed (from GFLRPC)

Map G – Wells in the Oatka Creek Watershed (from GFLRPC)

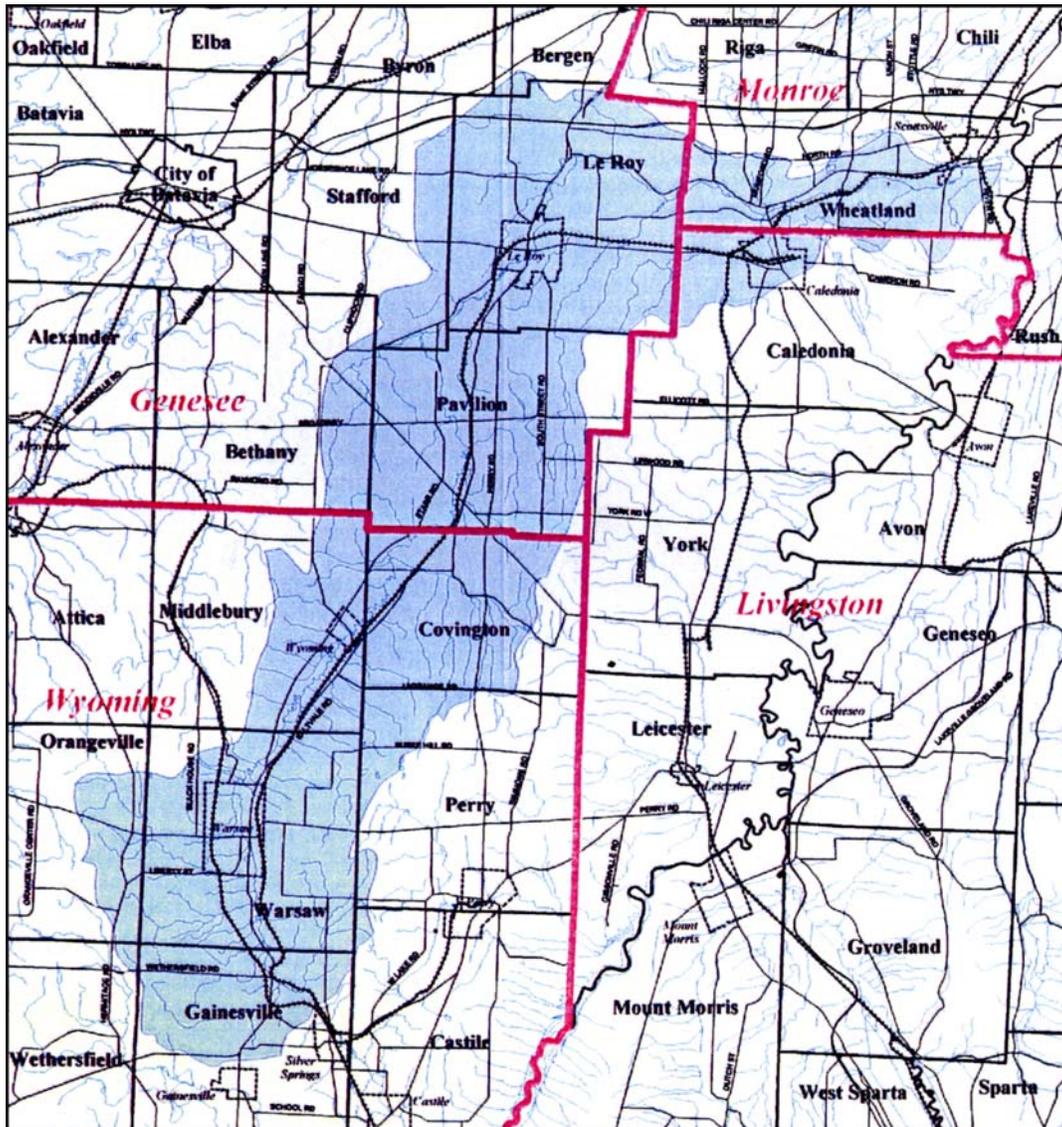
Map H – Land Use in the Oatka Creek Watershed (prepared by Dr. James Zollweg, SUNY Brockport)

**MAP A – MAJOR TRIBUTARIES OF OATKA CREEK  
MAJOR TRIBUTARIES OF OATKA CREEK; USGS STATION SITES  
(PREPARED BY RICHARD D. HAMELL, MONROE COMMUNITY COLLEGE)**



Redrawn from Base Map: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
Richard D. Hamell, May 10, 2001; Revised April 28, 2002.

**MAP B – OATKA CREEK WATERSHED BOUNDARY  
(FROM GFLRPC)**



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
New York State Department of Transportation, June 1999.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

**MAP C – BEDROCK GEOLOGY OF THE OATKA CREEK WATERSHED  
GEOLOGIC SYMBOL KEY (FROM GFLRPC)**

**BEDROCK GEOLOGY MATERIALS**

**CANADAWAY GROUP**

 Dcy Machias Formation

**JAVA GROUP**

 Dj Hanover Shale

**WEST FALLS GROUP**

 Dwf Angola Shale

 Dwn Nunda Formation

 Dwg Wet Hill Formation

 Dwr Lower Beers Hill

**SONYEA GROUP**

 Ds Cashaqua Shale

**GENESEE GROUP AND TULLY LIMESTONE**

 Dg West River Shale

**HAMILTON GROUP**

 Dhld Ludlowville Formation

 Dhmr Marcellus Formation

 Dhsk Skaneateles Formation

**ONONDAGA LIMESTONE AND TRISTATES GROUP**

 Dob Onondaga Limestone

**AKRON DOLOSTONE & COBLESKILL LIMESTONE & SALINA GROUP**

 Sab Akron Dolostone

 Scv Camillus Shale

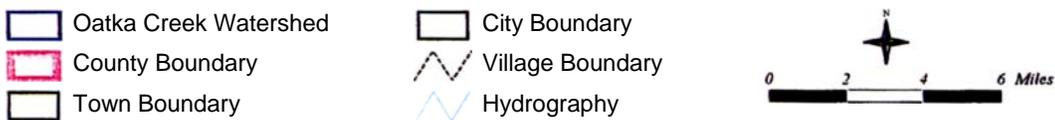
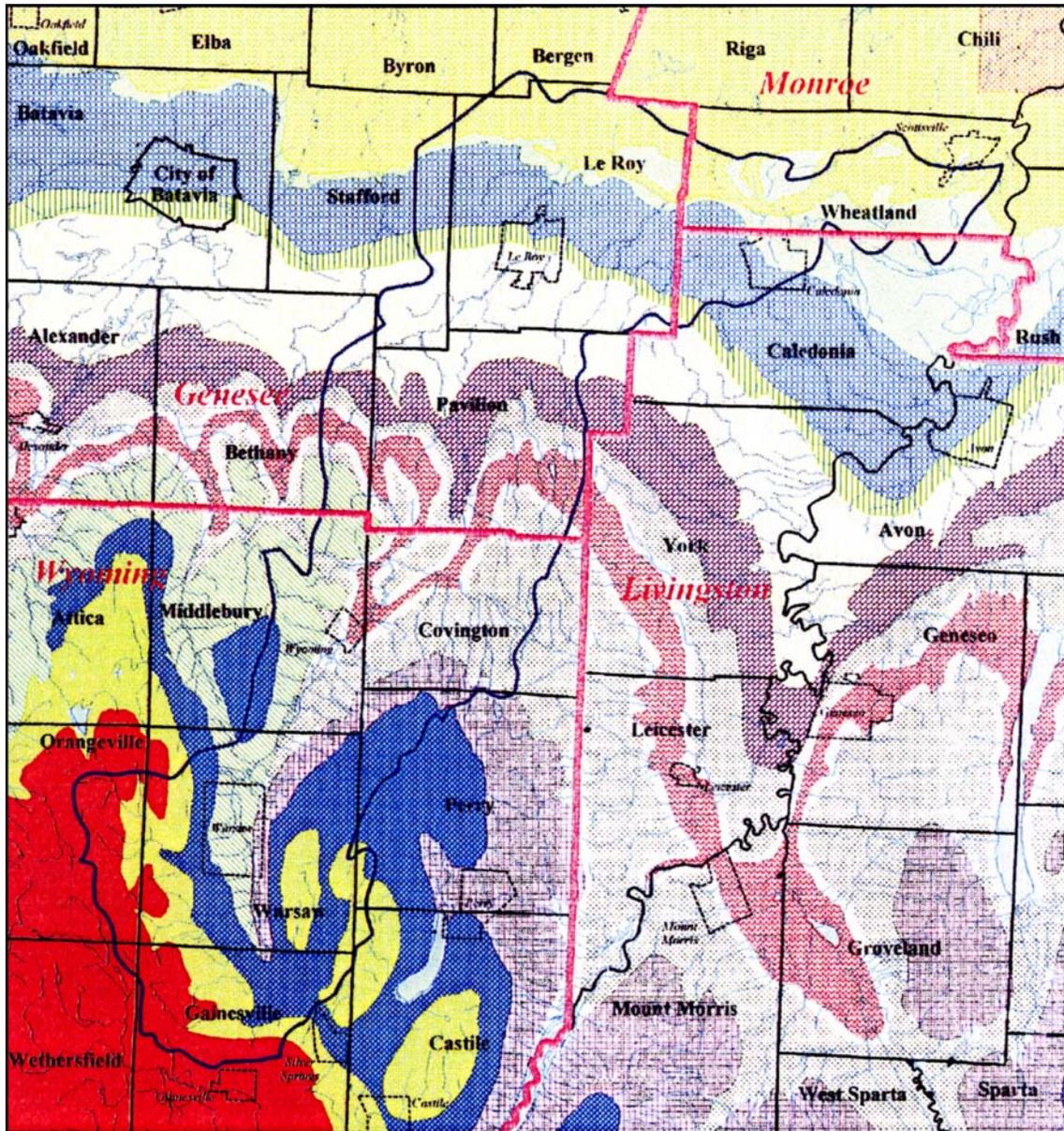
 Sv Vernon Formation

 h2O Water

Source: New York State Geological Survey, 1999.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

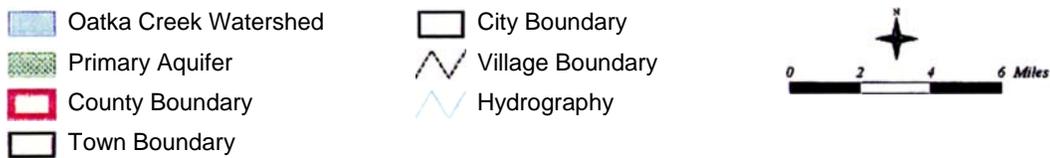
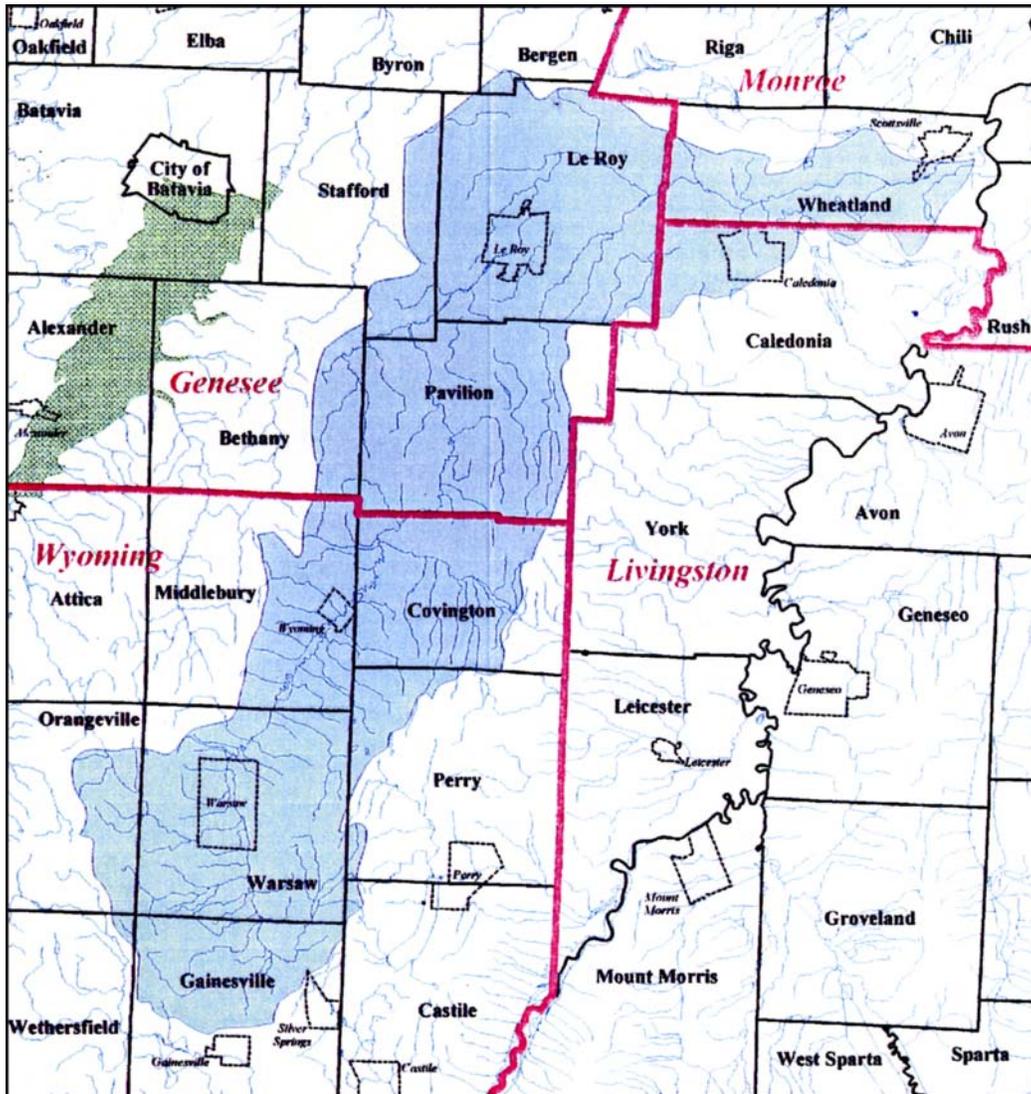
**MAP C – BEDROCK GEOLOGY OF THE OATKA CREEK WATERSHED  
(FROM GFLRPC – SEE KEY ON PREVIOUS PAGE)**



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
 New York State Geological Survey, 1999.  
 New York State Department of Transportation, June 1999.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

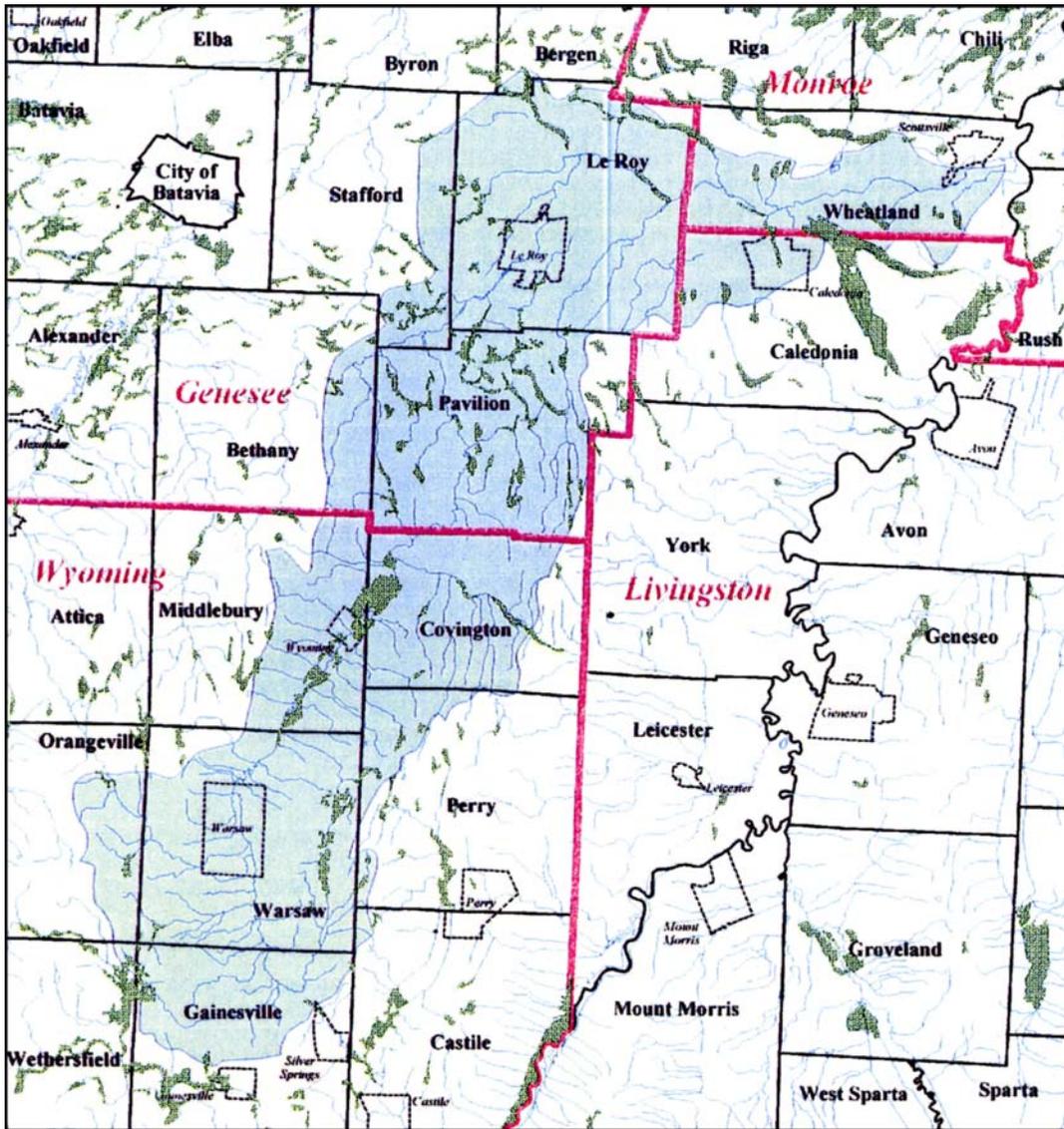
**MAP D – PRIMARY AQUIFERS IN THE OATKA CREEK WATERSHED  
(FROM GFLRPC)**



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
 New York State Department of Environmental Conservation, July 1997.  
 New York State Department of Transportation, January 1994.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

**MAP E – WETLANDS IN THE OATKA CREEK WATERSHED  
REGULATORY FRESHWATER WETLANDS (FROM GFLRPC)**



- Oatka Creek Watershed
- Wetlands
- County Boundary
- Town Boundary

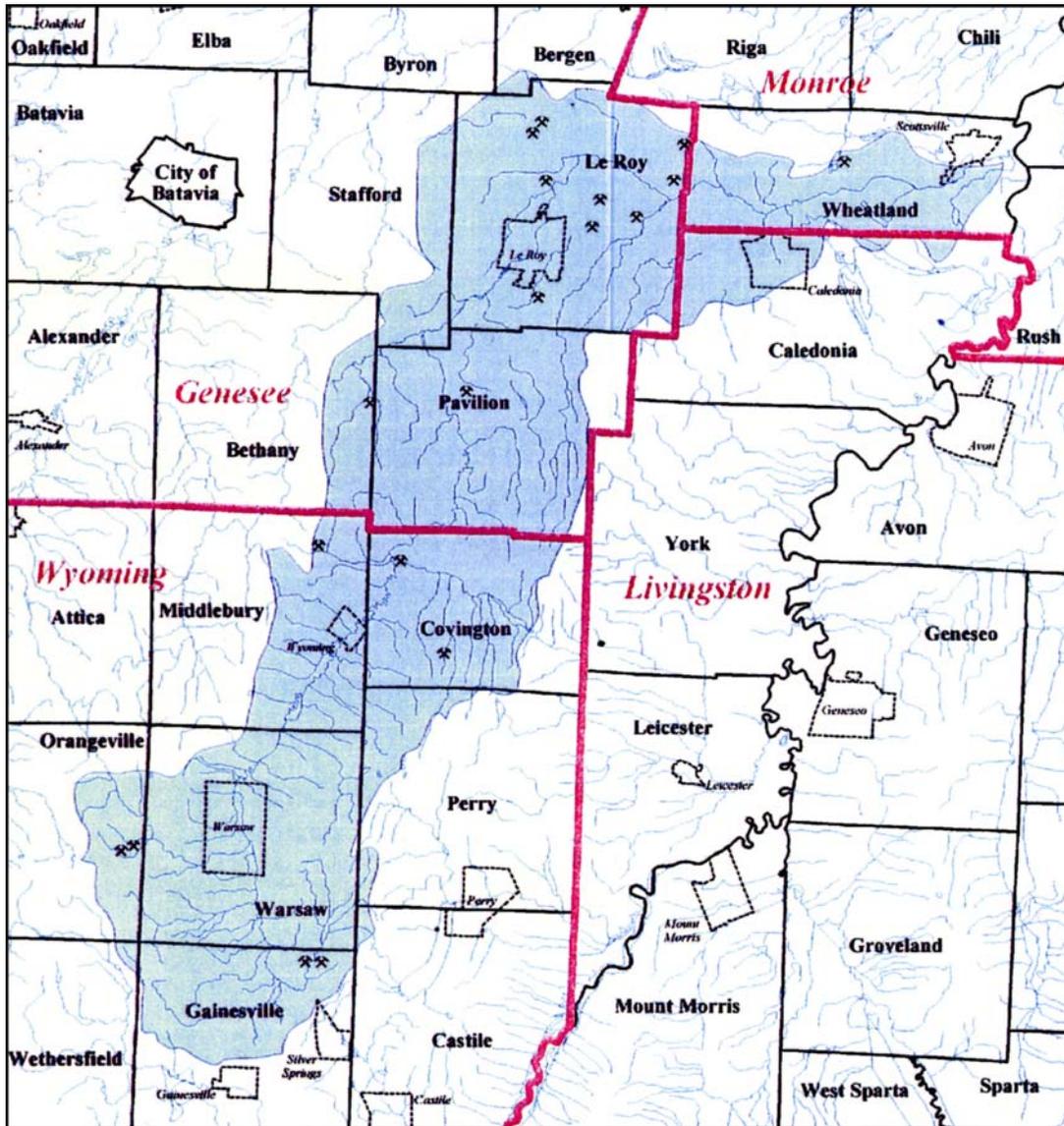
- City Boundary
- Village Boundary
- Hydrography



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
 New York State Department of Environmental Conservation, July 1997.  
 New York State Department of Transportation, June 1999.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

**MAP F – MINED LANDS IN THE OATKA CREEK WATERSHED  
(FROM GFLRPC)**



- Oatka Creek Watershed
- Mines
- County Boundary
- Town Boundary

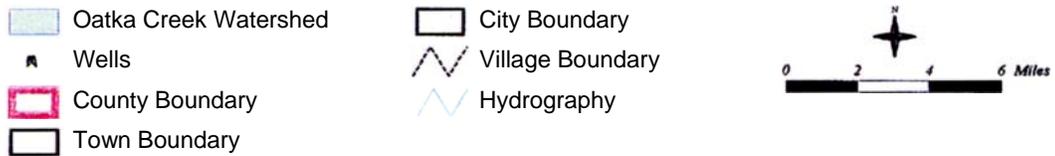
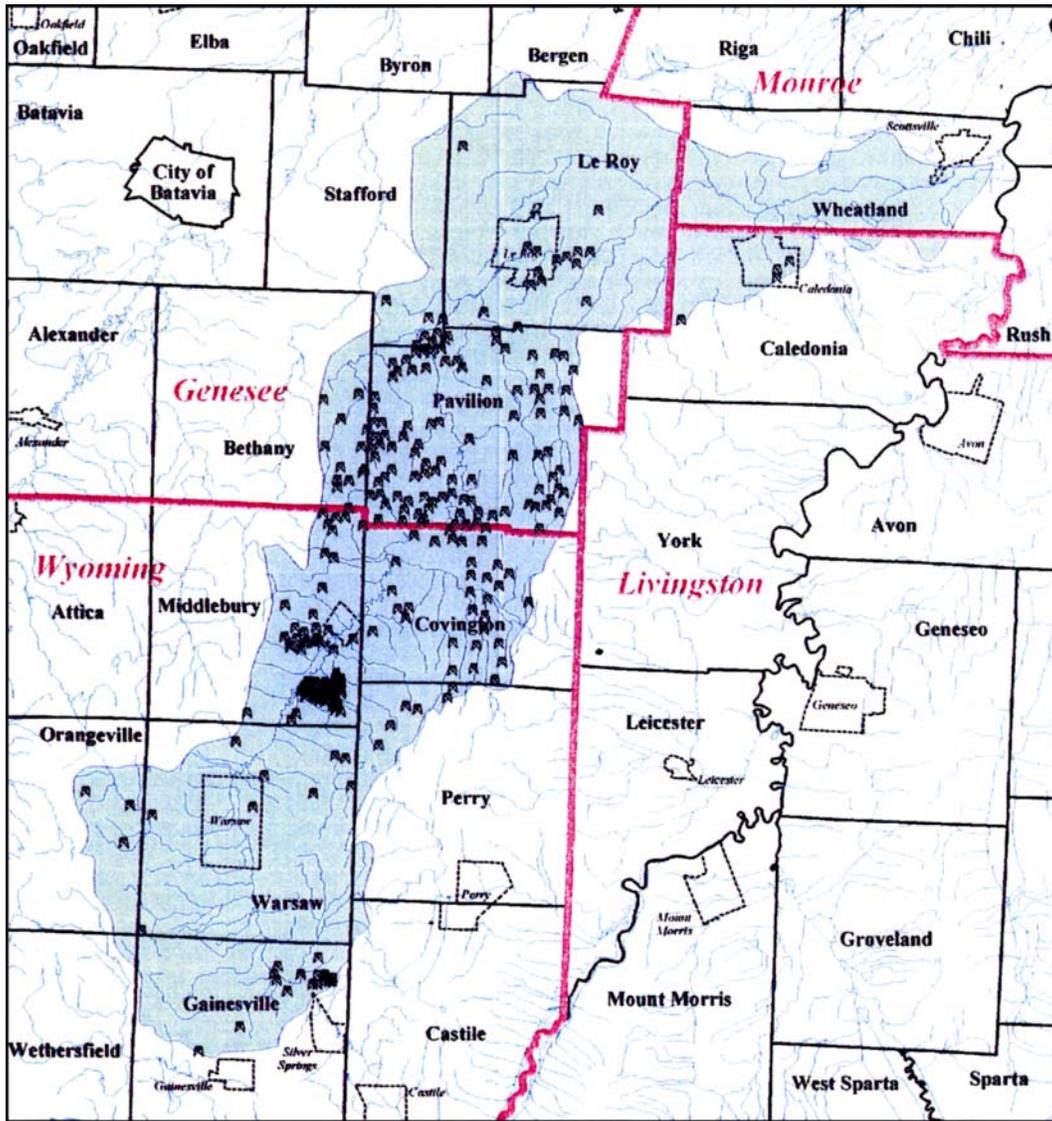
- City Boundary
- Village Boundary
- Hydrography



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
 New York State Department of Environmental Conservation, Division of Mineral Resources, 1999.  
 New York State Department of Transportation, January 1994.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

**MAP G – WELLS IN THE OATKA CREEK WATERSHED  
OIL, GAS, AND SOLUTION MINING WELLS (FROM GFLRPC)**



Source: Hydrologic Watershed Unit Map, US Department of Agriculture, 1980.  
 New York State Department of Environmental Conservation, Division of Mineral Resources, 1999.  
 New York State Department of Transportation, June 1999.

Prepared by Genesee/Finger Lakes Regional Planning Council, February 2000.

**MAP H – LAND USE IN THE OATKA CREEK WATERSHED  
(PREPARED BY DR. JAMES ZOLLWEG, SUNY BROCKPORT)**

