The Lake Champlain Basin

Basin Description

The Lake Champlain Basin drains the area between the Adirondack Mountains in northeastern New York State and the Green Mountains in Vermont. The long, narrow Lake Champlain empties into the Richelieu River at its northern end where its waters then flow into Canada and the Saint Lawrence River. The drainage area covers about 8,234 square miles, just over 3000 (37%) of which lies in New York State; 56% of the drainage basin lies in Vermont and 7% in Quebec, Canada. Within New York State the basin drainage area includes most of Clinton County, large parts of Essex County, and portions of Franklin, Warren and Washington Counties.

The Lake Champlain Basin is sparsely populated with considerable forested lands. Within New York State, forests cover over 60% of the Basin. Topography ranges from the wilderness of the High Peaks of the Adirondack Mountains to heavy agricultural areas of the Lake Plain Lowlands. The population of the entire Lake Champlain Basin totals over 600,000 people. The western (New York) portion of the Lake Champlain Basin is home to 175,712 (2000) year-round residents; there is also a significant seasonal population increase due to recreation and tourism during the summer months. The largest and only significant population centers in New York are Glens Falls/Queensbury (39,795) – a portion of which falls outside the basin – and Plattsburgh (30,006). The remaining population is rural or located in smaller villages such as (Saranac lake (5,041), Danamora (4,129), Lake Placid 2,638), and Rouses Point (2,277). Burlington and Rutland are the largest population centers in Vermont.

There are about 4,505 miles of rivers and streams and over 450 lakes and ponds. Many of the ponds are too small to be individually assessed, but 130 significant* lake, pond and reservoir waterbody segments (covering 151,593 acres) are included in the Lake Champlain Basin Waterbody Inventory. The larger tributary watersheds in the New York State portion of the Basin include the Ausable River Watershed, with 767 miles of streams (or 17% of the basin total), the Saranac River Watershed (662 miles, 15%), Great Chazy River (544 miles, 12%) and the Boquet River Watershed (532 miles, 12%). Lake Champlain itself, with a surface area of 435 square miles (278,480 acres), is the dominant feature of the watershed, covering about 5% of the entire basin. Within New York State, the lake itself covers 90,704 acres and accounts for about 60% of total lake acres in the basin. Lake George (28,523 acres) is the largest basin lake entirely within New York State and accounts for 19% of basin lake acres. The next largest lakes are Upper Saranac Lake (4,844, 3%), Lower Saranac Lake (2,145, 1%), Lake Placid (1,954, 1%) and Chazy Lake (1,828, 1%).

Water Quality Issues and Problems

With its light population and large tracts of forest wilderness, water quality in the waters of the Lake Champlain Basin is generally good to excellent. The natural resources of the basin draw outdoor enthusiasts from all over the northeast and beyond to the enjoy fishing, swimming, boating, hiking and camping. The most significant water quality problems in the basin impact Lake Champlain itself: fish consumption advisories, excessive nutrient loadings, invasive/exotic plant and animal species and atmospheric deposition. These and other water quality issues in the basin are discussed below.

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* *Significant Lakes* are lakes of 6.4 acres (0.01 square miles) or larger and are included the New York State Lakes Gazeteer.

Fish Consumption Advisories

Although Lake Champlain supports a wide variety of uses, fish consumption of some species is restricted by a NYSDOH health advisory due to PCB and mercury contamination. The advisory recommends eating no more than one meal per month of larger lake trout (over 25 inches) or walleye (over 19 inches). One significant source of PCBs has been sediment in Cumberland Bay; ongoing remediation activities in the bay are expected to reduce this source. Other continuing sources of PCBs to the lake have yet to be identified. The mercury contamination is widely thought to be a result of atmospheric deposition. A number of other waterbodies in the basin have also been issued separate advisories limiting fish consumption due to mercury.

Phosphorus

Elevated phosphorus concentrations result in impacts and threats to public bathing, other recreational uses (swimming, fishing, boating) and aesthetics in Lake Champlain. In 1993 a Water Quality Agreement between New York State, Vermont and Quebec established in-lake total phosphorus criteria. The two states also completed a study to measure point and nonpoint source phosphorus loads to the lake, develop a whole-lake phosphorus budget, and develop a load reduction strategy to attain the in-lake criteria. This study, the Lake Champlain Diagnostic-Feasibility Study, found phosphorus to be at or above the criteria (which ranges from 10-25 ug/l throughout the lake) and, therefore, contributing to excessive algal and vegetative growth in the lake. In 1996, the states agreed to a phosphorus reduction strategy that included specific loading targets for various lake watershed. A joint New York-Vermont Total Maximum Daily Load (TMDL) plan to address phosphorus loadings to the Lake was also established in 2002. Resulting phosphorus reductions are to be met using an appropriate mix of point and nonpoint source actions to be implemented in the watersheds.

Invasive/Exotic Species

Exotic and invasive plant and animal species also increase threats to the lake and other waters of the basin. Zebra mussels are widespread and impact water supplies and crowd out native mussels in many areas. Water chestnut and Eurasian milfoil limit various recreational activities and alter riparian cover. Sea lamprey predation appears to be increasing after some decline following a lake-wide control program. Without further controls the Atlantic salmon and lake trout populations are likely to be significantly affected. Additionally, the presence of alewives in neighboring Lake Saint Catherine pose a threat to larger cold water species. The ability to control many of these exotics is limited, expensive and the long-term success is relatively uncertain.

Acid Rain/Atmospheric Deposition

Low pH attributed to atmospheric deposition/acid precipitation has been documented in many small lakes and ponds in the basin. Such conditions are known to have a significant impact on aquatic ecosystems, impairing and often precluding the propagation and survival of fish in some lakes and ponds. Previous assessments and Priority Waterbodies Lists have included large numbers of smaller (less than 10 acres) lakes and ponds impacted by acid rain/atmospheric deposition. However, with the expansion of the WI/PWL database to accommodate all waterbodies, it was necessary to limit the tracking of individual lakes to those 0.01 square miles (6.4 acres) in size or larger. Although these smaller lakes and ponds are no longer tracked individually, and the lake area affected as a percentage of total lake area in the basin is not that large, acid rain/atmospheric deposition remains a significant water quality issue affecting a large number of waterbodies in the basin.

Excessive Sand and Sediment Loads

High gradient streams erode streambanks and wash sand and silt into and along streams. Roadway runoff from road maintenance activities, including road sanding practices, are also thought to be a contributing source. The sand and sediment fills in gravel spawning beds, decreasing salmonid spawning success, limiting macroinvertebrate production and increasing winter mortality of fish and invertebrates due to loss of escape cover from the effects of anchor ice. Limited natural reproduction of trout and other cold water species has

been documented in a number of reaches and high levels of stream embeddedness are suspected as contributing to the impacts. Excessive sand and sediment loads also contribute to the formation of significant sedimentation deltas at the mouths of many tributary segments. Such deltas can impede recreational boat navigation, restrict fish migration into tributaries and present opportunities for the establishment of non-native aquatic vegetation. Impacts related to sediment deltas are particularly well-documented in Lake George.

Lake Champlain Basin Program

The Lake Champlain Basin Program (LCBP) is a joint federal, state and local initiative to restore and protect Lake Champlain and its surrounding watershed. The states of New York and Vermont, the Province of Quebec, the U.S. Environmental Protection Agency, other federal and local government agencies, and many local groups, both public and private, are partners of the LCBP. Created by the Lake Champlain Special Designation Act of 1990, the LCBP's goal is to work cooperatively to protect and enhance the environmental integrity and the social and economic benefits of the Lake Champlain Basin. The actions of the LCBP are guided by a pollution prevention, control, and restoration plan entitled *Opportunities for Action - An Evolving Plan for the Future of the Lake Champlain Basin*. The Plan was first endorsed in 1996 and it was most recently updated in 2003. The main goals of the Plan include 1) improving water quality throughout the Lake Champlain Basin, 2) protecting the Basin's living natural resources, and 3) preserving and enhancing the region's rich cultural and recreation resources. (http://www.lcbp.org).

The Adirondack Park

The Adirondack Park, which includes portions of the Lake Champlain Basin, was created in 1892 by the State of New York to protect the water and timber resources of the region. Today the Park is the largest publicly protected area in the contiguous United States, greater in size than Yellowstone, Everglades, Glacier, and Grand Canyon National Park combined. The boundary of the Park encompasses approximately 6 million acres, nearly half of which belongs to all the people of New York State and is constitutionally protected to remain “forever wild” forest preserve. The remaining half of the Park is private land which includes settlements, farms, timber lands, businesses, homes, and camps.

Agricultural Activity

Agricultural activity in the Lake Champlain Basin has measurable impacts on aquatic life and recreational uses of some basin waters. Agricultural runoff contributes nutrient and silt/sediment loads to the streams. Poor agricultural management practices, including permitting livestock unrestricted access to streams, improper manure application, intensive cultivated crop lands with little riparian buffer and fertilizer, pesticide application in the absence of approved nutrient/pesticide management plans and a lack of silage leachate control and manure or milkhouse wastewater treatment facilities can have significant impacts on nearby waters. Various state and local agencies are working with the farming community to address these issues.

Groundwater Resources

Although groundwater resources are not specifically tracked through the WI/PWL, they are considered *Priority Waters* nonetheless. Groundwater provides drinking water for about one-third of the population of New York State and is the source of base flow for most rivers and streams in the state. Management and protection of both the quantity and quality of this resource is critical for protecting public health and is also a key element of surface water quality and wetland management efforts. In the Lake Champlain Basin, the more significant threats to groundwater resources include inadequate on-site wastewater treatment systems, animal feeding operations and pesticide application.

Lake Champlain Basin Water Quality Assessment

The series of charts presented on the following pages provides an overall assessment of water quality conditions in the entire Lake Champlain Basin. For each waterbody type (rivers/streams, lakes/reservoirs and Great Lakes shoreline) the first chart shows the percentage of the miles/acres of waters in the basin that fall into the various water quality assessment categories. The **red** portion of the first pie indicates the percentage of waters characterized as *Not Supporting Uses*. The **purple** portion represents segments with *Minor Impacts/Threats*. Taken together, these categories of waters comprise the *Priority Waterbodies* for that waterbody type. The percentage of miles/acres for the other water quality assessment categories – waterbodies having *No Known Impacts*, *UnAssessed Waters*, and waterbodies with *Impacts Needing Verification* – are shown in **blue**, **light blue**, and **green** respectively.

The second pie chart shows the severity of the most significant use impact or restriction for waters in the two categories that comprise the Priority Waterbodies. The levels of severity are:

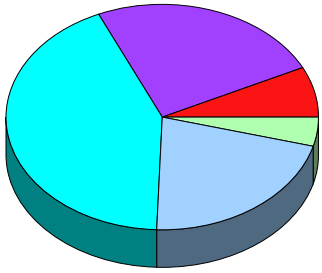
Precluded: waters do not support appropriate uses;
Impaired: waters frequently do not support appropriate uses;
Stressed: waters support appropriate uses, but other water quality impacts are apparent; and
Threatened: waters support uses and have no impacts, but activities threaten future use support.

More detailed descriptions of these levels of severity are outlined in *Appendix A - Assessment Methodology*.

The bar charts indicate the pollutant sources that are most frequently cited as major contributors to the water quality impacts for Priority Waterbodies in the Lake Champlain Basin. The charts reflect the percentage of miles/acres of the total waterbody area on the Priority Waterbodies List where a particular source is listed as a major contributor to the water quality impact. For each source, the color shading of the bar indicates the severity level (*Precluded*, *Impaired*, *Stressed*, *Threatened*) of the most significant water use impact to the waterbody.

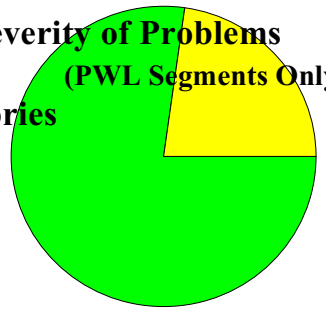
Rivers/Streams

Water Quality Assessment Categories
(for ALL Waters in the Basin)



PWL - Not Supporting Uses
PWL - Other Minor Impacts
No Known Impacts
UnAssessed Waters
Impacts Needing Verification

Severity of Problems
(PWL Segments Only)

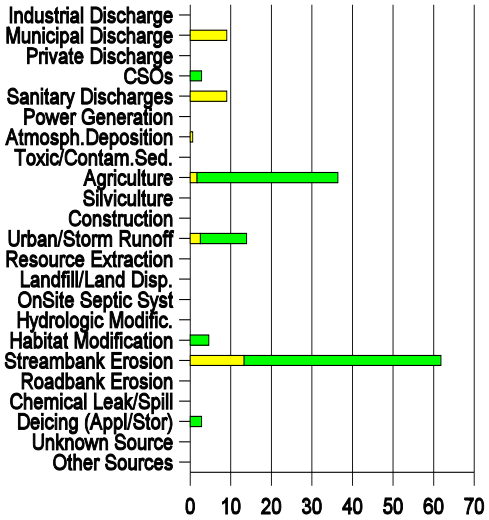


Precluded
Impaired
Stressed
Threatened

Lake Champlain Basin

Total River Miles:	4,502
Total PWL Miles:	1,427

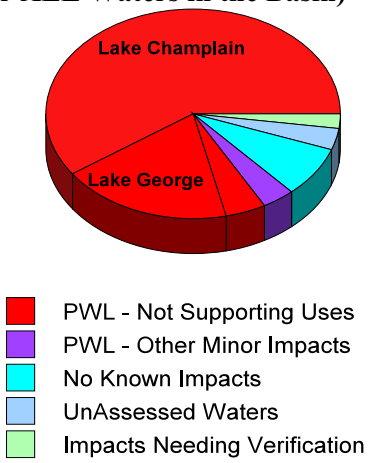
Major Sources of Impact
(PWL Segments Only)



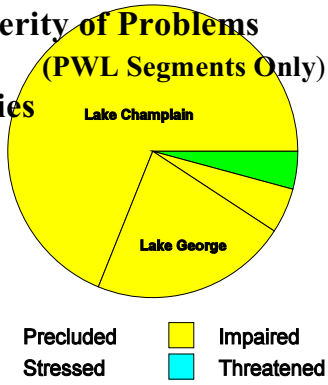
Percent of PWL Waters Affected

Lakes/Reservoirs

Water Quality Assessment Categories
(for ALL Waters in the Basin)



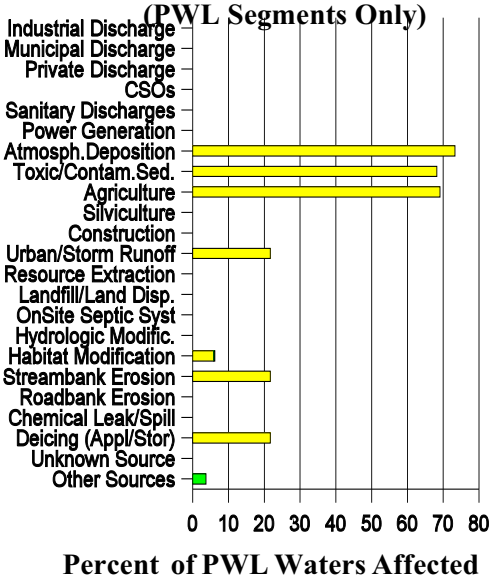
Severity of Problems
(PWL Segments Only)



Lake Champlain Basin

Total Lake Acres:	151,347
Total PWL Acres:	131,225

Major Sources of Impact
(PWL Segments Only)



Basin Water Quality Summary

About thirty percent (30%, or 1,427 miles) of the 4,502 river miles in the Lake Champlain Basin are included on the Priority Waterbodies List as either not supporting uses or having minor impacts or threats to water quality. More than three-quarters (77%) of these Priority Waterbody Listed river miles are considered *Stressed* or *Threatened* waters that fully support appropriate uses but have minor impacts/threats to uses. Only about seven percent (7%) of all basin river miles are *Impaired* and do not fully support appropriate uses.

Sixteen (16) of the 130 separate lake segments in the basin are included on the PWL as having either impaired uses or minor impacts/threats to uses. However these 16 impaired/impacted lakes include a number of larger lake segments (including Lake Champlain itself) and represent about eighty-seven percent (87%) of the total lake acres in the basin. For 13 of these lakes (totaling 125,984 acres, or 83% of basin lake acres) the impacts are such that fish consumption, recreational uses and/or aquatic life support are not fully supported. However over 70% of this impairment is due to phosphorus impairment and/or fish consumption advisories (mercury, PCBs) for which TMDL Plans are in place or hazardous waste remediation is underway.

The most frequently cited sources of impacts affecting water quality in the basin are atmospheric deposition, toxic/contaminated sediments and agricultural activities. These three sources are cited as a major source in about 70% of impaired lake acres in the basin. Atmospheric deposition is a source of both mercury which results in fish consumption advisories, and constituents of acid rain. Toxic/contaminated sediments – largely the result of historic legacy pollutant discharges – are responsible for the impairment to the entire Lake Champlain. The occurrence of agricultural sources reflects the rural character of the basin which includes significant farming regions. Agricultural sources are cited as a major source of the phosphorus impairment in Lake Champlain. Streambank erosion is noted as a significant source of impacts to rivers and streams in the basin. However for the most part streambank erosion results in less severe stresses and threats to water quality, rather than more significant use impairment caused by atmospheric deposition, contaminated sediments and agricultural sources.

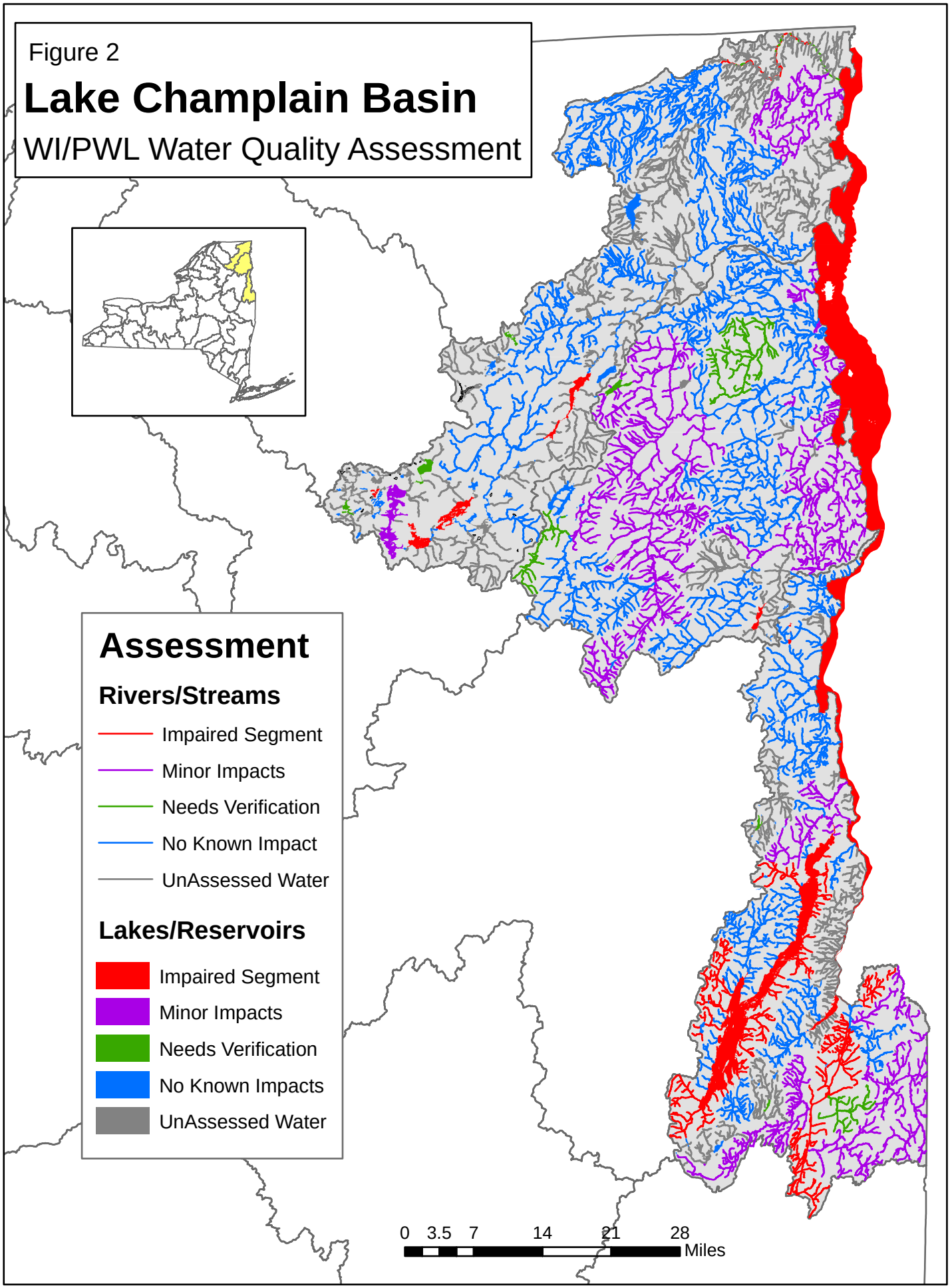


Figure 2
Lake Champlain Basin
WI/PWL Water Quality Assessment
Assessment
Rivers/Streams
Impaired Segment
Minor Impacts
Needs Verification
No Known Impact
UnAssessed Water
Lakes/Reservoirs
Impaired Segment
Minor Impacts
Needs Verification
No Known Impacts
UnAssessed Water
0 3.5 7 14 21 28
Miles

The Lake Champlain Basin
Waterbody Inventory/Priority Waterbodies List

This compilation of water quality information includes individual waterbody *Data Sheets* describing the water quality conditions in the Lake Champlain Basin of New York State. Causes (pollutants) and sources of water quality problems for those waterbodies with known or suspected impacts are also outlined.

The data sheets are presented in hydrologic order, beginning with the most downstream waters and continuing upstream through the basin. Waterbody data sheets are grouped by US Geological Survey Hydrologic Unit Code (HUC) basin and presented as separate sections of this report (see Figure 3). A Waterbody Inventory of the specific waterbody segments in each watershed is included at the beginning of each watershed section.

Data sheets are included for each waterbody that has been assessed; i.e., waterbodies listed as *Impaired Waters* (Not Supporting Uses), Waters with *Minor Impacts*, *Threatened Waters,* waters with water quality impacts *Need Verification*, or waterbodies with *No Known Impact*. *UnAssessed* waterbodies are included in the Waterbody Inventory for each watershed, but because they have not been assessed data sheets for these waters have not been included.

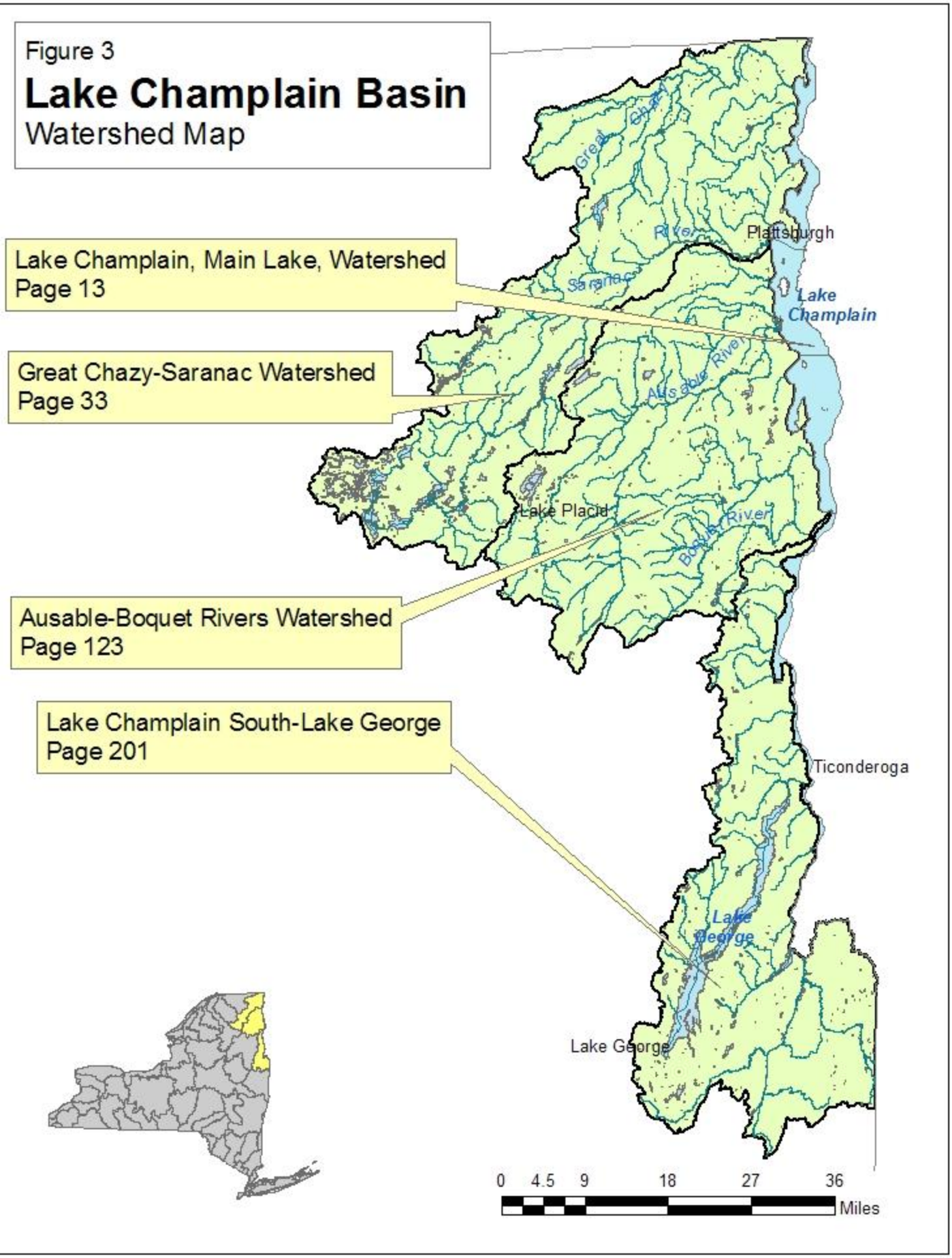
The information outlined on the data sheets includes *Waterbody Location Information*, *Water Quality Problem/Issue Information*, *Resolution/Management Information* and *Further Details*. See *Appendix B – Waterbody Inventory Data Sheet Background Information* for more details about the data sheets.

Note that the assessments in this report reflect the best available water quality information at the time of publication. Water quality information may be added or modified subsequent to the preparation of this edition of the Waterbody Inventory and Priority Waterbodies List. When information is updated, the data sheet for the corresponding waterbody segment is issued with the date of revision. More recently revised data sheets supercede the corresponding waterbody information in this listing.

Following the individual waterbody data sheets in the watershed sections, a *Summary Listing of Priority Waters* provides a brief overview of all *Priority Waterbodies*, i.e., waterbodies listed as *Impaired Waters* (Not Supporting Uses), Waters with *Minor Impacts* and *Threatened Waters*.

Indices of waterbody data sheets by both county and alphabetically by segment name are included as Appendix C and D, respectively.

Figure 3

Lake Champlain Basin

Watershed Map