Eighteenmile Creek

STATE OF THE BASIN REPORT

D E C E M B E R 2 0 0 7

Prepared for:

US Army Corps of Engineers®
Buffalo District

conserving natural resources
for our future
Niagara County Soil and Water Conservation District

Prepared by:

ecology and environment, inc.

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State of the Basin Report

December 2007

Prepared for:

U.S. ARMY CORPS OF ENGINEERS

and

NIAGARA COUNTY SOIL AND WATER CONSERVATION DISTRICT

Prepared by:

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Acknowledgements

The Honorable Louise M. Slaughter, Congresswoman for New York's 28th Congressional district, has demonstrated continuing interest in Eighteenmile Creek and the people that live around it. She secured funding in 2005 and 2006 for the U.S Army Corps of Engineers, Buffalo District to support the completion of this document as well as other Eighteenmile Creek related initiatives. Her involvement with Eighteenmile Creek projects has increased awareness across Niagara County and Western New York of the Eighteenmile Creek watershed and its Area of Concern.

The vast majority of data for the Eighteenmile Creek State of the Basin Report was gathered from various stakeholders. The accuracy and depth achieved in this report would not have been possible without the support and cooperation put forth by the various local, county, state, and federal agencies that have a vested interest in Eighteenmile Creek.

The following organizations contributed data and/or various other resources to this report:

City of Lockport, New York
Ecology and Environment, Inc.
Eighteenmile Creek Remedial Advisory Committee
EPA Region 2
EPA GLNPO
Finger Lakes/Lake Ontario Watershed Protection Alliance
Niagara County Center for Economic Development
Niagara County Department of Health
Niagara County Soil and Water Conservation District
Niagara County Water Quality Coordinating Committee
New York State Department of Environmental Conservation
New York State Canal Corporation
Town of Newfane, New York
United States Army Corps of Engineers, Buffalo District
USDA NRCS
USDA FSA

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1 State of the Basin Report

Introduction

The Eighteenmile Creek State of the Basin Report (SOBR) is compilation of data and an accounting of recent activities that—combined—provide a synopsis of the existing resources within the watershed and the status of the health and integrity of the watershed. The SOBR is a product of study, community involvement, and site-specific projects that have been completed or are in progress within and beyond areas defined by the Eighteenmile Creek Area of Concern (AOC), under the guidance of the Remedial Action Plan (RAP). The RAP is under the direct leadership of the Niagara County Soil and Water Conservation District (NCSWCD).

Persistent environmental contamination is the result of 19th and 20th century industrial success that, combined with the absence of environmental regulation up to the late 20th century, has translated to concerns for human health and the sustainability and integrity of ecosystems and wildlife populations. As this has occurred the importance of biological, social, and economic benefits of functioning and healthy ecosystems is becoming more apparent. The SOBR provides information that can be used to begin an assessment or valuation of ecological resources in a context that quantifies biological, social, and economic benefits.

This report is a broad-based document that summarizes the existing conditions occurring within the Eighteenmile Creek watershed, which will act as an impetus to conduct further data collection and continue the analysis of the biotic communities and abiotic components within the watershed. Ecological associations within aquatic and terrestrial habitats discussed in the report illustrate how contaminants and other stressors are linked to the watershed beyond the current AOC boundary. The report is intended to provide guidance for stakeholders in making decisions and interacting with regional planners and governmental agencies. The SOBR can facilitate consensus about the established goals and objectives of the Eighteenmile Creek AOC RAP among stakeholders and help to establish a recognized vision for the watershed. It is expected that funding opportunities will be available for environmental planning and that remediation and restoration will follow as a result.

Headwaters of the watershed originate in Lockport, New York in northern Niagara County. Eighteenmile Creek has a hydrologic connection to the Erie Canal system west of the city's urban center. The majority of historic environmental studies and investigations have been limited to focusing on the AOC at the extreme northern portion of the drainage basin and its confluence at Lake Ontario. Conversely, this document takes a broader view for describing the resources and environmental problems occurring within the watershed to facilitate the development and implementation of restoration solutions. The recent efforts by NCSWCD, the U.S. Army Corps of Engineers – Buffalo District (USACE – Buffalo District), and others have started a system-wide approach for investigating environmental pollution and ecosystem integrity issues. These activities have also included designing and constructing habitat restoration projects at specific locations, resulting in immediate benefits to wildlife, recreation, and habitat function and diversity. The broad approach of study, analysis, and implementation establishes a template for future study and restoration planning within the basin. A clearer vision is developing among stakeholders of how ecosystem management can lead to successful remediation and restoration.

Background: Origins of AOC Designation. The International Joint Commission (IJC) is an independent bi-national organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions.

Signing of the Great Lakes Water Quality Agreement – 1972

The current bi-national approach and management initiatives within the Great Lakes basin developed from the first Great Lakes Water Quality Agreement (GLWQA) in 1972, which was renewed in 1978. The 1978 agreement has been amended twice and is currently being reviewed by both governments. This treaty expresses the commitment of each country to restore and maintain the chemical, physical, and biological integrity of the Great Lakes basin ecosystem and includes a number of objectives and guidelines to achieve these goals. This agreement identified Eighteenmile Creek as one of 43 original Great Lakes AOCs.

In 1987, a Protocol was signed amending the 1978 Agreement; the aim of the amendment was to strengthen the programs, practices, and technology described in the 1978 Agreement and to increase accountability for their implementation. Timetables for implementing specific programs, including defining and designating AOCs, were set.

Great Lakes AOCs are severely degraded geographic areas within the Great Lakes basin. They are defined by the U.S.-Canada Great Lakes Water Quality Agreement (GLWQA, Annex 2 of the 1987 Protocol) as "geographic areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life." The U.S. and Canadian governments have identified 43 such areas: 26 in U.S. waters and 17 in Canadian waters. (Five connecting river systems are shared between the U.S. and Canada.). The GLWQA, as amended via the 1987 Protocol, directs the two federal governments to cooperate with state and provincial governments to develop and implement RAPs for each AOC (Great Lakes Information Network, http://www.great-lakes.net/envt/pollution/aoc.html).

Since the amendment of GLWQA, Collingwood Harbour in Ontario was the first of these 43 AOCs to be de-listed in 1994. Other AOCs since de-listed include Severn Sound, Ontario (2003) and Oswego, New York (2006).



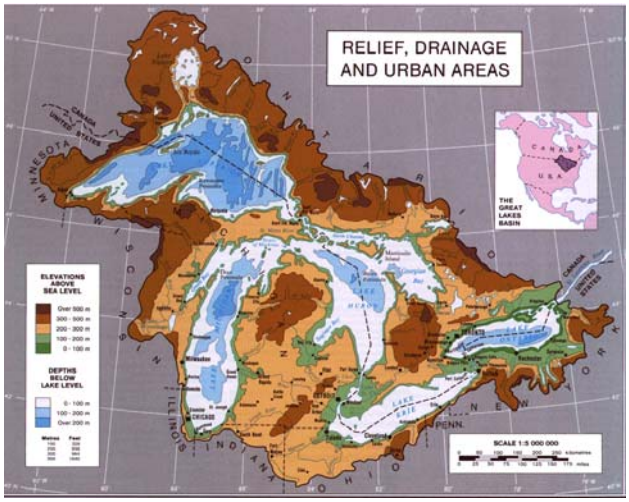
The Importance of Stewardship and Recognition of Values Associated with Healthy Ecosystems

> *Over hundreds of years, millions of people have drawn material and spiritual sustenance from these Lakes. Today, the Basin's residents want to know that their priceless Lakes – in all their quality, quantity and grandeur – will be there for other generations, just as they have been there for them. Of all the world's natural legacies, with what can we compare our Great Lakes?*
>
> *Relative to the management of other world freshwater systems we have been good, but not exemplary, stewards of our lakes. The Lakes today are less polluted than they were decades ago. But toxic, human, animal and industrial wastes, as well as pharmaceuticals and airborne substances, continue to pollute our Lakes. Ongoing urban development, invasive species and climate change present additional challenges. The Lakes' future is uncertain. The time has come to make bold bi-national commitments and to accelerate actions to restore and protect our Lakes. Central to all such commitments and actions, and to achieving the objectives of the United States and Canadian governments' Great Lakes Water Quality Agreement, is an Accountability Framework that is clear, potent and workable.* - Tom Barrett, Mayor of Milwaukee (13th Biennial Report on Great Lakes Water Quality 2006).

The need to restore and protect the waters of the Great Lakes basin is clear. Early detection and identification of biotic and abiotic stressors is a first step in the assessment of biological, ecological, environmental, and recreational impacts. The historic sources of contaminants and their persistence in aquatic systems continue to imperil our communities and biological resources. Ecological risks associated with exposure pathways within human communities and wildlife populations are the primary reason for AOC designations and RAP programming. It is imperative that AOC stakeholders throughout the Great Lakes develop project-scale activities to ad-

dress known point sources of contaminants and to develop achievable remediation and restoration plans.

Eighteenmile Creek and the Great Lakes Drainage Basin



Eighteenmile Creek and the Great Lakes Drainage Basin

The importance of the Great Lakes Basin to those that live around – and well beyond – the Basin arise from issues of scale (e.g., area and volume of freshwater) and the inter-relationships between Basin tributaries and the health and sustainability of tributary watersheds, the communities within those watersheds, and the Great Lakes themselves. The Great Lakes represent approximately 20% of the fresh water supply on the planet and 90% of the fresh surface water of the United States. They are the largest single source of fresh surface water in the Western Hemisphere. Each of the five lakes support world class cold and warm water fisheries, a diverse agricultural sector, and tourism and recreational industries. Eighteenmile Creek is the second most visited fishing destination in the Lake Ontario basin, attracting up to 15,000 anglers annually. A draft study for the USACE shows that one-third of all registered recreational boats in the United States are located in the eight Great Lakes States, where boating brings in $35.6 billion of annual economic activity and supports 246,117 jobs. In addition, U.S. Fish and Wildlife (USFWS) survey data indicate that fishing, hunting, and wildlife-watching generate almost $18 billion in annual revenues in the Great Lakes region (Great Lakes Regional Collaboration Strategy 2005). Resource restoration in the Eighteenmile Creek watershed will enhance opportunities for public access, outdoor recreation, passive wildlife observation, environmental education, and ecotourism.

This report documents the current environmental remediation and restoration projects, which focus on the biological integrity of watershed functions and processes, and the interconnection of these projects to economic development.

Collaboration and Funding for Watershed Approach and SOBR. The SOBR is the product of a collaborative relationship between the USACE – Buffalo District and the Niagara County Soil and Water Conservation District, Eighteenmile Creek AOC RAP.

The USACE – Buffalo District and NCSWCD have been working closely together since 2005 on identifying approaches and solutions for environmental remediation and restoration of the Eighteenmile Creek AOC, conducting outreach efforts with citizens and local, state, and federal agencies, and investigating how best to move the Eighteenmile Creek basin on to a sustainable track for future generations.

Direct funding for the compilation of this document was provided by USACE – Buffalo District. A substantial portion of the report was first initiated by the Niagara County Department of Economic Development, funded by grants from the New York State Department of State and Great Lakes National Program Office and the U.S. Environmental Protection Agency (EPA).

Purpose of Document. As first conceived, the purpose of this document was to describe the existing features, resources, communities, and environmental issues in the Eighteenmile Creek watershed. Once the effort to compile the SOBR was under way, it became clear that this was an opportunity to increase public awareness of the vision of a healthy and sustainable watershed, enhance stakeholder consensus, and create a sense of stewardship.

Community stewardship is not a passive endeavor; rather, it involves an active effort in directing the management and restoration of the watershed today with an eye toward the importance of the resource for generations to come. Stewardship is a critical element for achieving success and realizing the goal of a healthy and sustainable watershed and is a prominent component of the RAP agenda. Program and project development is best achieved when local community stakeholders are participants. Watershed residents derive empowerment and a sense of responsibility when integrated into planning and implementation processes. The success of the Eighteenmile Creek RAP depends upon continuing the current interaction of local, regional, and basin-wide stakeholders in the planning process.

Goals and Objectives.

While it is easy to conceive of a long list of watershed goals and objectives, the following goals and objectives are specific to this document.

Goals

- Increase awareness and interest in the status of environmental contamination within the basin;
- Increase awareness and interest in the social and economic values associated with existing resources and a restored, healthy watershed;
- Promote stewardship of Eighteenmile Creek and associated resources within the watershed;
- Develop a long-term vision for the basin; and
- Translate awareness, stewardship, and vision into active project planning, design, and implementation.

Objectives

- Communicate and summarize AOC RAP and watershed priorities;
- Characterize the social, economic, cultural, historic, and natural resources of the Eighteenmile Creek basin;
- Inform residents within the watershed and others of the recent investigations to track down contaminant sources;
- Summarize recent habitat characterization and initial watershed management efforts;
- Identify recent habitat restoration projects; and

- Provide a document that can act as a catalyst for establishing a watershed agenda and set of priorities.

This document is more than a synthesis of accomplishments and current activities. Rather, it is an evolving document that will inform and empower watershed managers and other stakeholders to achieve their goals. In addition, the SOBR sets the stage for prioritizing the remediation and restoration components of the AOC and RAP agendas associated with project planning. To that end, the SOBR provides a decision support mechanism for future project development strategies based on sound science, achievement, and accountability.

Responsibility and Vision. Indigenous people offer insight into our common environmental fate. The Haudenosaunee Environmental Task Force Position on the Great Lakes was submitted to the Great Lakes Regional Collaboration Strategy for inclusion in their December 2005 report. An excerpt of the Environmental Philosophy of the Haudenosaunee illustrates our common interests and aspirations.

> *Today, we face new environmental issues our ancestors never had to consider. There were no polluting factories, gasoline stations, or human made chemicals like PCBs to harm the environment. Waterways flowed in their natural path. As people of this land we took great care to keep the earth and its waters as pristine as possible, known in the past as common sense, known now as good environmental practices. There was no need for formalized environmental regulations. The challenge before us is finding ways to protect the natural world while preserving our unique relationship in it. (Great Lakes Regional Collaboration Strategy 2005.)*

The vision for the Eighteen-mile Creek watershed involves active stewardship among stakeholders and a commitment to initiating and completing the recovery of impaired aquatic resources, with each success directly contributing to the value of restoring environmental and ecological integrity

within the watershed. Coordinated, long-term recovery activities should be conducted within an open and transparent framework that is:

- Apolitical,
- Interactive,
- Collaborative,
- Measurable, and
- Accountable.

A listing of high-priority projects that will help to attain the vision for Eighteenmile Creek and its watershed is provided in Section 2.

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2 Basin Overview: Current Status and Recent Activities

This section summarizes recent substantive progress toward the characterization of the watershed, identification of contamination sources, and habitat restoration. In conjunction with this work, public awareness of environmental contamination and other watershed issues has also progressed. The success of these recent developments is the result of a strong commitment by a number of partners to improve environmental conditions within the watershed. The initial aquatic habitat restoration project between Burt Dam and Fisherman's Park in 2003 (Phase I), the Environmental Fair in 2004, and the new life in the Eighteenmile Creek AOC RAP under the direction of the NCSWCD have increased awareness of RAP-specific issues and have broadened the discussion from the AOC to the entire watershed.

Confluence of Eighteenmile Creek and Lake Ontario at Olcott Harbor

Basin Restoration Program

A basin-wide restoration program is now under way within the Eighteenmile Creek watershed. The program represents a living and adaptive framework that is (and will be) evaluating many of the variables that contribute to the impaired condition of the creek. Anticipated elements of the program include:

- Further efforts to identify contaminant sources;
- Conducting additional sediment sampling investigations;
- Supplementing and updating the existing watershed database (see description later in this section);
- Identifying projects and establishing priorities;
- Initiating field studies to document details of baseline conditions;
- Conducting investigations of beneficial-use impairments (BUIs) for eventual de-listing as impairments are rectified; and
- Designing and implementing remediation and restoration projects.

The Eighteenmile Creek Restoration Program is a framework for developing solutions for achieving a sustainable and healthy watershed, with an eye toward meeting both short-term and long-term goals.

The watershed restoration program recognizes that the majority of the environmental pollution sources likely occur in the farthest upstream reaches of Eighteenmile Creek and therefore migrate the extent of the stream as it flows northward towards Lake Ontario. This would suggest a high probability for contamination from the Barge Canal to the confluence of the creek with Lake Ontario. Studies conducted through the RAP and by the New York State Department of Environmental Conservation (NYSDEC) have demonstrated that sources of contaminants and biological stressors are located in the upper portions of the watershed and therefore outside the mapped AOC. The same investigations have identified portions of the watershed that contain natural wetland, bottomland, and forested communities that support higher levels of biodiversity and provide wildlife values.

Understanding the source and nature of environmental contaminants is necessary in order to evaluate the potential for human and wildlife exposure to contaminant pathways within the watershed. These data and information are critical to developing remediation and restoration plans that are based on measurable levels of impairment and result in measurable endpoints of lower pollution levels and ecological uplift. A comprehensive investigative process is in place through the RAP coordinator and the NCSWCD to assess biotic and abiotic stressors within the entire watershed and to define appropriate approaches to improve biological integrity within the watershed.

Partners Making a Difference

Many other initiatives outside of the framework of the RAP are focusing on issues of sediment transport, ecological health, recreation and tourism, agricultural and land management practices, habitat restoration, and developing watershed-specific analytical tools. The following agencies and organizations (listed in alphabetical order) have been identified as stakeholders who are currently active in planning, remediation/restoration design, or management within the watershed.

Atlantic States Legal Foundation
Ecology and Environment, Inc.
Eighteenmile Creek Remedial Advisory Committee
Finger Lakes-Lake Ontario Watershed Protection Alliance (FL-LOWPA)
Great Lakes Research Consortium
Great Lakes United
International Joint Commission
Lake Ontario Lakewide Management Plan (LaMP)
Lake Ontario Sportfishing Promotional Council
NYS Canal Corporation
NYS Department of Agriculture & Markets
NYS Department of Environmental Conservation
NYS Department of Health
Niagara County Department of Health
Niagara County Department of Planning & Economic Development
Niagara County Department of Tourism
Niagara County Government
Niagara County Soil & Water Conservation District

Partners for restoration include more than 30 agencies, municipalities, and other groups

Niagara County Water Quality Coordinating Committee
Niagara University's Environmental Leadership Institute
NYS Sea Grant
Sierra Club
State University of New York (SUNY)
Town of Newfane
USACE
USACE - Buffalo District
EPA Region 2
EPA Great Lakes National Programs Office (GLNPO)
USFWS
USFWS - LGLFRO
U.S. Department of Agriculture (USD) Farm Service Agency
USDA Natural Resources Conservation Service
Upstate Freshwater Institute
(U.S. Environmental Protection Agency (EPA) 2007; http://www.epa.gov/glnpo/AOC/eighteenmile.html)

Representative Slaughter has demonstrated continued interest in the restoration of the Eighteenmile Creek watershed

In addition, Representative Louise Slaughter has demonstrated continuing interest in the health and well-being of Eighteenmile Creek and the people that live around it. She secured funding in 2005 and 2006 for the USACE – Buffalo District to support efforts for implementing the Eighteenmile Creek aquatic habitat restoration initiatives and the creation of an interactive pollutant generator/discharge database. Representative Slaughter has voiced her concern over the status of the Great Lakes and their tributaries and the need to muster and sustain efforts to remediate environmental pollution and restore natural ecosystems. Her recognition and involvement in watershed projects has helped to increase awareness across Niagara County and Western New York of the environmental challenges that remain and the value of clean water and natural resources within the Eighteenmile Creek watershed.

The IJC identified 43 AOCs, 31 in the U.S. and 12 in Canada

Eighteenmile Creek was designated an AOC by the IJC in 1985. The Eighteenmile Creek RAP was prepared by NYSDEC and the Eighteenmile Creek Remedial Action Committee (RAC) in 1997 in response to a recommendation by the Water Quality Board of the IJC that RAPs be prepared for the 43 AOCs within the Great Lakes basin. Industrial and municipal discharge practices, pesticides, and waste disposal caused poor water quality and sediment contamination in the creek (NYSDEC 1997).

Five substances or classes of substances were identified as occurring in creek sediments that could have detrimental and disruptive effects on the natural systems within the AOC and Lake Ontario and are the causes of the listed BUIs (see below). These contaminants include but are not limited to:

- Polychlorinated biphenyls (PCBs);
- Mercury;
- Dioxins and furans;
- Dieldrin;
- Mirex;
- DDT;
- Lead; and
- Copper.

A variety of contaminants have been identified as occurring in Eighteenmile Creek sediments, which have contributed to the listing of 7 BUIs.

Sediments contaminated with these substances have contributed to the restrictions of fish and wildlife consumption, degradation of benthic organisms, and restrictions on dredging activities in the AOC. It is also suspected that these contaminated sediments may adversely affect fish and wildlife populations, increase frequency of fish tumors, and increase the prevalence of bird and animal deformities or reproductive problems.

Eighteenmile Creek flows from the south and discharges through Olcott Harbor into Lake Ontario, approximately 18 miles east of the mouth of the Niagara River (NYSDEC 1997). As originally identified, only a small portion of the watershed was designated an AOC by the IJC. The AOC includes Olcott Harbor at the mouth of the creek and extends upstream to the farthest point at which backwater conditions exist during Lake Ontario's highest monthly average lake level. This point is located just downstream of Burt Dam, approximately 2 miles south of Olcott Harbor. This portion of the watershed is a unique canyon habitat, created during the last glaciation of the region, that attracts recreational boaters, birders, and waterfowl hunters.

As RAP Coordinator, NCSWCD has appealed to the GLNPO to expand the Eighteenmile Creek AOC boundaries.

In historic RAP documents, the current boundary of the AOC was defined as the "impact" area and the upper watershed as the "source" area. However, a summary report, *Inclusion of Upstream Sources into the Boundary of the Eighteenmile Creek Area of Concern* (April 2007), provided to the Great Lakes National Program Office (GLNPO), recommended that Burt Dam and upstream areas, the Newfane Dam and upstream areas, a stretch of Eighteenmile Creek near the intersection of the creek and Plank Road, the Eighteenmile Creek Corridor between the New York State

Barge Canal and Harwood Street in Lockport, and a portion of the Erie Barge Canal in Lockport be included in the AOC (NCSWCD 2007) . If the GLNPO agrees with the expansion of the AOC boundary, it will allow the further characterization and assessment required for remediation of contamination in the upper watershed from GLNPO-directed funding sources.

Contaminant source identification remains a critical element for developing a watershed-based approach to remediation.

Pollution Sources. Questions regarding the specific sources of continuing contamination and their locations continue. Known and suspected pollution sources in the Eighteenmile Creek watershed include the New York State Barge Canal (i.e., the Erie Canal), industrial and municipal wastewater discharges, inactive hazardous waste sites, bottom sediments, and combined sewer overflows (CSOs). These contribute to the occurrence and persistence of contaminants (listed above) in the environment today. It is suspected that DDT, dieldrin, PCBs, and dioxins likely contribute to bird and animal deformities and reproductive problems; PCBs and dioxins contribute to restrictions on fish and wildlife consumption; PCBs and metals contribute to degradation of benthos and dioxins; and metals contribute to dredging restrictions. Recent sampling investigations indicated that sediment contamination occurs well above Burt Dam in Lockport. Further studies will be needed to locate the point and non-point sources of contamination and the extent of contamination below Lockport to Burt Dam and below. The USACE – Buffalo District has prepared a Draft Sediment Investigation Upstream of the Eighteenmile Creek AOC. Given the on-going investigations by NYSDEC and NYSDOH near the Flintkote Plant, the USACE draft plan focuses on an approach for sampling sediments at various locations upstream of Burt Dam. The draft plan in located in Appendix A. Related NYSDEC and RAP investigations are described later in this section and in Section 6.

The mission of the RAP is to restore the chemical, physical, and biological integrity within the AOC.

Purpose and Goals of the RAP. The mission of the RAP is to restore the chemical, physical, and biological integrity of the ecosystem in the Eighteenmile Creek AOC in a manner that reflects communities' concern for the preservation and protection of the waterway. Specific goals of the RAP are the protection and enhancement of human health, fish and wildlife, aesthetics, recreation, and the economy of the AOC. Swimming and aquatic life have been established as the best uses of Eighteenmile Creek, according to New York State Stream Classification System. The RAP is

designed to restore these uses where they have been impaired and to move toward the reduction of all sources of pollutants (NYSDEC 1997 and NYSDEC 2001a).

The RAP mission is to be accomplished through the remediation and discontinuance of conditions causing impairment of beneficial uses. The Great Lakes Water Quality Agreement Annex 2 (Annex 2) lists fourteen possible water use impairments and NYSDEC assigns a best use classification for stream segments. In addition, specific concerns and goals for the Eighteenmile Creek AOC were identified by the public and the RAC. Finally, the RAP must be consistent with Great Lakes Water Quality Agreement requirements regarding the amounts and persistence of toxic contaminants.

Beneficial Use Impairments. Of the 14 possible BUIs listed in Annex 2, three potential use impairments have been identified in the Eighteenmile Creek AOC. Additionally, one is likely to be "impaired" and three other use impairments are of "unknown" status due to inadequate supporting information. A goal of the RAP is to resolve the known impairments and determine the status of unknown impairments to these uses. The potential BUIs and the respective status for each are provided in Table 2-1.

Changes in RAP Direction. As of January 1, 2005, the NCSWCD assumed the role of coordinator of Eighteenmile Creek's RAP. This was made possible by funding from the EPA GLNPO. NCSWCD is currently funded through 2011. NCSWCD also assists the Eighteenmile Creek RAC by facilitating quarterly meetings and providing staff for implementing the RAP. Priorities for Eighteenmile Creek continue to include tracking down possible sources of PCBs and other contaminants, identification and assessment of contaminated sediments present throughout the creek, and the assessment of BUIs that remain classified as "unknown" and "likely." The Eighteenmile Creek corridor and Olcott Harbor provide important riparian and aquatic habitat for cold and warm water fish and for threatened species such as the Blanding's Turtle, which has been identified in the AOC. The area between Burt Dam and Lake Ontario is a destination for sport fishermen, attracting approximately 12,000 to 15,000 anglers annually, most evident during fall salmon runs. For

NCSWCD assumed direction of the RAP in 2005 and has been funded through 2011.

Table 2-1 Great Lakes Water Quality Agreement Use Impairments for the Eighteenmile Creek AOC

1.	**Restrictions on Fish and Wildlife Consumption - Impaired** New York State Department of Health advisories exist for consumption of fish, turtles, and waterfowl for Eighteenmile Creek. Eighteenmile Creek is divided into two segments with regard to fish consumption advisories. The area below Burt Dam is populated by fish that migrate from Lake Ontario; therefore, the Department of Health advisory for Lake Ontario extends into this area. The advisory is based on PCBs, mirex, and dioxins. No American eel, channel catfish, carp, lake trout, chinook salmon, rainbow trout, white perch, coho salmon over 21", or brown trout over 20" should be eaten from this area. In addition, no more than one meal per month of white sucker, coho salmon under 21", and brown trout under 20" should be eaten. No fish of any species should be eaten from the portion of Eighteenmile Creek above Burt Dam due to PCB levels in fish. Statewide Department of Health advisories exist for consumption of snapping turtles (due to PCB contamination) and mergansers (due to contamination with PCBs, mirex, chlordane, and DDT). No more than two meals per month of all other waterfowl are also advised.
3.	**Degradation of Fish and Wildlife Populations – Unknown** Data on the degradation of fish and wildlife populations in Eighteenmile Creek are not currently available. This issue will be investigated in 2007.
4.	**Fish Tumors and Other Deformities – Unknown** Data on fish tumors or other deformities in Eighteenmile Creek are not currently available. This issue will be investigated in 2007.
5.	**Bird or Animal Deformities or Reproductive Problems - Likely** Many piscivorous animals, including birds and mammals, have access to Eighteenmile Creek. Because NYSDEC wildlife criteria for contaminant concentrations in adult fish flesh are exceeded for many substances in fish samples from Eighteenmile Creek and contaminants in the creek include those known to bio-accumulate and cause deformities or reproductive failures, deformities or reproductive problems are likely to occur in animals that have access to the creek. Substances likely to cause these issues include PCBs, DDT and metabolites, dioxins, and dieldrin. This issue will be investigated in 2007.
6.	**Degradation of Benthos - Impaired** Based on sediment toxicity analysis, sediment toxicity studies, and inventories of benthic organisms conducted by the NYSDEC and USACE between 1977 and 1994, Eighteenmile Creek was rated as moderately impacted with regard to benthic organisms. Impairment is likely due to contamination with PCBs and metals.
7.	**Restrictions on Dredging Activities - Impaired** Based on multiple sediment sampling studies conducted by NYSDEC and the USACE from 1977 to 1994, restrictions have been placed by NYSDEC and the EPA on disposal of sediments dredged from Olcott Harbor. Dredging restrictions are based on sediments contaminated with chromium, copper, cyanides, lead, manganese, nickel, zinc, and dioxins.

Source: EPA: http://www.epa.gov/glnpo/AOC/eighteenmile.html#Beneficial_

these reasons, additional priorities for Eighteenmile Creek include habitat creation and restoration as well as improved fishing and recreation access.

Both the public and RAC members have expressed interest in goals to improve aesthetics; habitat enhancement; human health related to contaminated fish, ducks, and turtles; human health with regard to recreational contact; and control of contaminated sediments from historic and existing pollution sources.

The Eighteenmile Creek RAC is collaborating with the NCSWCD to determine suitable and attainable de-listing targets for the AOC using criteria released by the IJC. A critical element in achieving de-listing status is to be able to focus on the fact that the AOC is affected mostly by the area upstream of the AOC and the backwater conditions of Lake Ontario. At the very least, de-listing BUI will need to be synonymous with the attainable goals of both of these sources.

Eighteenmile Creek RAP Report Card. NCSWCD recently published the 2006 Eighteenmile Creek AOC Report Card assessing the overall health of the watershed by assessing successes, current conditions, and goals for improving the quality of the watershed. The report card divides the various issues confronting the watershed into six categories with each category having two to three indicators (see below and report card on next page). The indicators are scored to show degree or relative progress. The categories and indicators include:

- Water Quality
  - Overall water quality in the creek
  - Quality of storm water entering the creek
- Contamination
  - Contaminated sediments in the creek
  - Spills, discharges, and leaching of contaminants
- Fish and Wildlife
  - Restoration of fish and wildlife habitat
  - Fish and wildlife diversity and populations
  - Contaminant levels in fish and wildlife
- Public Access and Recreation
  - Public access to the creek and adjacent areas
  - Aesthetics of the creek and adjacent riparian areas
- Remedial Action Plan (RAP)
  - RAP management
  - RAC management
- Environmental Education
  - Public awareness/appreciation of the creek
  - Environmental stewardship

REPORT CARD

The Eighteenmile Creek Area of Concern Report Card was created by the Eighteenmile Creek Remedial Advisory Committee (RAC). **The purpose of this Report Card is to give a brief overview of the health, improvements and current conditions of Eighteenmile Creek during 2006.** The Eighteenmile Creek Watershed includes – main branch of Eighteenmile Creek, Gulf Creek Tributary, East Branch of Eighteenmile Creek (Red Creek), and augmented flow from the NYS Erie Barge Canal.

Scientific data and research that was referenced during the development of this Report Card can be found at the Area of Concern website:

WWW.EIGHTEENMILERAP.COM

This Report Card offers six "indicators" related to the creek's overall health. They are: 1) Water Quality; 2) Contamination; 3) Fish & Wildlife; 4) Public Access & Recreation; 5) Remedial Action Planning; and 6) Environmental Education & Public Involvement.

Each indicator has been further divided into several "sub-categories" to assess how specific concerns are being addressed. Each sub-category has been assigned a **letter grade** based upon past successes, current health and conditions, and trends over the past 10 years. The last column identifies action steps or immediate concerns to be addressed in order to meet restoration targets for the Area of Concern. This Report Card will be updated annually.

TRENDS	GRADING
↑ Conditions Improving	A Excellent
↔ Conditions Unchanged	B Good
↓ Conditions Worsening	C Fair
	D Poor
	F Failure

	CATEGORIES	GRADE	SUCCESSES & IMPROVEMENTS	CURRENT CONDITIONS	TREND	STEPS NEEDED FOR PROBLEM RESOLUTION
WATER QUALITY	Overall Water Quality in the Creek	C	• Primary sources impacting water quality have been identified as industrial facilities, municipal practices and contaminated sediments. • Funding acquired to conduct a storm water outfall inventory.	• Using NYS DEC standards, the AOC is classified as a Class B/C stream. Upstream of the AOC is Class D. • A NYS DEC study indicated that no parameters exceeded water quality standards in the water column.	↑	• Existing contamination sources must be remediated. • Measures must be taken to prevent future contamination occurrences. • A dynamic water quality monitoring and protection program must be coordinated for the entire watershed. • A trackdown of all possible sources must be implemented.
	Quality of Stormwater Entering the Creek	C	• The Western New York Stormwater Coalition was established in 2003. • The City of Lockport has made progress eliminating 20 of 32 Combined Sewer Overflows. • Funding has been secured to implement several water quality related Best Management Practices on farms within the watershed.	• Runoff from a storm event could affect water quality in the creek. • The City of Lockport is currently investigating their remaining 12 Combined Sewer Overflows to ascertain the percentage of flow during a rain event, if any.	↔	• Routine monitoring of stormwater discharges for physical and chemical parameters must be initiated. • An overall assessment of the effects of stormwater and wastewater discharge on Eighteenmile Creek may need to be pursued.
CONTAMINATION	Contaminated Sediments in the Creek	D	• A sediment investigation was completed downstream of the FlintKote plant site. • Sampling was conducted in the creek and the Barge Canal to further assess the levels of PCBs and other contaminants present. • A supplemental investigation of Flintkote, Upson Park, White Transportation, and United Paperboard is scheduled for 2007.	• Sediments in the AOC exceed NYS standards for a variety of contaminants, including PCBs, lead, etc. • Contaminated sediments behind the Burt Dam & remnants of the Newfane Dam, within the NYS Barge Canal, and in the area of the Flintkote Plant Site, affect the health of the AOC. • A scope of work has been completed that aims to assess creek sediments from Stone Road to Burt Dam.	↑	• Funding for a full scale sediment investigation, assessing sources of contamination, extent of contamination and options for removal must be secured. • Utilize the USEPA's Legacy Act to remediate the present contamination. • Complete the supplemental investigation of the Flintkote site, Upson Park, United Paperboard, and White Transportation. • Unknown sources of contamination need to be identified.
	Spills, Discharges & Leaching of Contaminants	D	• 1 site currently under a FUSRAP investigation. • Several potential sources of contamination have been identified in the City of Lockport. • A watershed based pollutant generator database has been developed.	• 5 remaining sites still have the potential to negatively affect the AOC. • Unknown Non-point source discharges have a negative impact on the creek.	↔	• Completion of stormwater outfall mapping and sampling project. • Complete the remediation of all Inactive Hazardous Waste Sites in the watershed. • Establish an illicit discharge detection program for all priority outfalls..
FISH AND WILDLIFE	Restoration of Fish & Wildlife Habitat	B	• 100% of funds secured for a wetland and in-stream habitat restoration project for the spring of 2007. • Baseline habitat characterization completed.	• Existing habitat influenced by restricted flow over the Burt Dam. • Majority of habitat protected by steep banks in the AOC.	↑	• Complete phase II of habitat restoration project & define additional opportunities for specific restoration measures. • Develop the protocol by which to monitor the success of the restoration. • Protect existing critical in-stream and riparian habitat within the AOC.
	Fish & Wildlife Diversity & Populations	C	• 100,000+ fish stocked by NYS DEC in 2006. • Funding has been acquired for a fish & wildlife population assessment. • Angler survey completed in 2006 by USACE.	• The AOC is identified as a known location of the Blanding's Turtle, a NYS threatened species and a federal species of concern. • Various invasive plant species inhabit the AOC, but none occur in dominant numbers.	↔	• Assess results of fish and wildlife population study. • An invasive species management plan based on Integrated Pest Management (IPM) is required to address overall restoration of the AOC. • Continue with creating and enhancing AOC habitat.
	Contaminant Levels in Fish & Wildlife	D	• Funding has been acquired for a fish contaminant study to be completed in 2007. • Funding has been acquired for a fish tumor assessment to be completed in 2007.	• Fish consumption advisories exist for the AOC and the watershed above the Burt Dam. • Contaminants in the sediments of the AOC are extremely bio-accumulative.	↔	• A study assessing contaminant levels in birds and wildlife is needed. • A food web study assessing contaminant trends is required in the AOC. • An assessment of bird/animal deformities in the AOC is needed. • Upstream sources and contaminated sediments require remediation.
PUBLIC ACCESS & RECREATION	Public Access to the Creek & Adjacent Areas	B	• The funding for Phase II of the Habitat Restoration Project will increase angler access to the creek by creating a fisherman access wall. • The creek is recognized as a great place to visit by canoeing and recreational groups.	• Majority of AOC is secluded by steep banks not accessible for recreation. • The AOC is accessible for anglers, canoe launching, and general recreation activities. • Olcott Harbor is accessible for fishing and recreation.	↔	• Fishermen's Park can be enhanced with additional recreation access. • Additional Fishing access points should be identified and enhanced downstream and upstream of Fisherman's Park. • Coordinate with the Greenway Commission to discuss options for the Eighteenmile Creek watershed.
	Aesthetics of the Creek & Adjacent Riparian Areas	B	• The Soil & Water Assessment Tool (SWAT) model has been developed to address non-point source pollution through proper land use planning. • Improvements to Fisherman's Park have included a conservation seeding over barren areas and a general clean-up of the AOC.	• Various debris including, litter, logs, and other floatables are conveyed over the Burt Dam. • A large majority of the flow in the creek originates from the City of Lockport Waste Water Treatment Plant. • The Town of Newfane routinely polices a portion of the AOC for litter and other debris.	↔	• Establish annual AOC clean sweep days for Fishermen's Park, properties adjacent to the creek and all public land in the watershed. • Educate and encourage recreational users of the creek to "Pitch-In" and promote a healthy ecosystem. • Work with landowners to preserve and enhance existing riparian areas adjacent to the creek. • Continued storm water education and outreach to various communities in the watershed.
REMEDIAL ACTION PLAN	RAP Management	B	• The Niagara County Soil & Water Conservation District has secured funds to support 5 additional years of AOC oversight. • Various grants are continually being applied for and acquired to progress initiatives of the RAP.	• The RAP is being included with ongoing watershed management planning. • AOC Report Cards are being issued annually. • A State of the Basin Report is being complied for 2007.	↔	• Annual status reports for the RAP and occasional updates should be completed. • Additional grants funds should be applied for and acquired, including the U.S. EPA Legacy Act.
	RAC Management	B	• The Remedial Advisory Committee continues to assist in identifying and updating priorities for Remedial Action Plan implementation activities and advise with social and economic impacts of RAP implementation.	• The RAC is comprised of a diverse group of original members and representatives from newer interests. • The RAC meets quarterly to discuss various initiatives of the RAP and to explore new opportunities in assisting with delisting the Area of Concern.	↔	• The RAC should implement written Rules, Guidelines & Participant Responsibilities. • Develop de-listing criteria and targets for all impaired beneficial uses by December 31, 2008. • Continued assessment of the Beneficial Use Impairments is paramount.
ENVIRONMENTAL EDUCATION	Public Awareness/ Appreciation of the Creek	A	• An angler survey was completed in the AOC which assessed angler awareness of a fish consumption advisory and the economic value of the fishery. • The 2005 Report Card reached the hands of 5000+ stakeholders.	• The creek is home to numerous tours and classes led by various entities, including the U.S. Army Corps of Engineers. • Despite the high levels of PCBs and other contaminants found in fish flesh, 12,000 anglers use the creek annually.	↑	• Increased media attention regarding the state of our natural resources. • An informational campaign should commence for the watershed and the AOC, especially during the planning stage of an overall Watershed Management Plan. • Keep stakeholders informed about progress with the RAP and the AOC.
	Environmental Stewardship	B	• The Marsh Monitoring Program attracted 50+ individuals interested in Eighteenmile Creek environmental stewardship. • An AOC Clean Sweep is scheduled for 2007.	• There is a limited amount of participation from the public with regards to RAP/AOC planning. • Town of Newfane hosts an annual Environmental Fair which educates children about water protection.	↑	• Establish a stewardship campaign that engages stakeholders with activities including AOC Clean Sweep Days, education days and outreach events. • Partner with sportsmen clubs and residents to promote stewardship.

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Eighteenmile Creek RAP Implementation. Implementation of the Eighteenmile Creek RAP is a continuous process that includes periodic updates and improvements as knowledge of the BUIs, contaminant sources, and the effectiveness of remedial actions increases. As discussed here, the direction of NCSWCD, the USACE – Buffalo District, NYSDEC, and other stakeholders is to continue to operate under the broader definition of AOC restoration by examining baseline conditions and contamination issues on a watershed level. As funding allows, the RAP will follow this expanded approach to investigate, design, and implement remedial and restoration solutions. Remedial actions and restoration projects will be evaluated and coordinated as they relate to de-listing BUIs and making progress toward restoring portions of the watershed. Within the AOC and watershed, the studies and assessments mentioned above will continue to be priorities. These include fish and wildlife consumption restrictions, habitat creation, sediment investigations, and contaminant track-downs.

An overall strategy for attaining ecological and environmental health will involve watershed scale analyses

Other Recent Developments, Programs, and Projects within the Basin

The following text in this section provides an overview of programs and projects that have been completed or are ongoing within the Eighteenmile Creek watershed. These activities represent a broad range of pro-active efforts to plan and implement sustainable management, remediation, and restoration throughout the watershed.

Niagara County Agricultural Land and Natural Resource Programs

Several funding opportunities are available to preserve and enhance agricultural land and/or environmental features within the Eighteenmile Creek watershed through the NCSWCD, the Natural Resources Conservation Service (NRCS), and the USDA Farm Service Agency (FSA).

- One notable program s the Agricultural Environmental Management (AEM) Program. The AEM program began in Niagara County in 1998 and has expanded each year. The program involves inventorying farms in the watershed to identify BMPs and technical and financial assistance needed to reduce non-point source pollution from farms. This program began in 2005 in the Eighteenmile Creek watershed and specific farms of concern have been targeted for improvements to protect water quality (Niagara County AEM Partnership 2005). In 2007, three projects are scheduled to start on farms to reduce non-point source pollution: constructing a silage leachate control system, a barnyard runoff system, and a milk center waste system. Funding for these projects was awarded to NCSWCD by the New York States Agricultural and Non-Point Source Abatement Program.

Low Flow Collection Pad for a Silage Leachate Treatment System

- Several other projects have enhanced the environmental quality of Niagara County agricultural land. These include three Environmental Quality Incentives Program (EQIP) contracts in the watershed. EQIP is a NRCS program and offers financial and technical assistance to implement structural BMPs on agricultural land. An EQIP program funded in 2006 will implement water quality BMPs on a dairy farm in the Eighteenmile Creek watershed. The USDA Agricultural Management Assistance (AMA) program also funded one contract in the watershed in 2004. AMA funds projects to build and improve water management and irrigation structures, plant vegetation to improve water quality, and implement integrated pet management practices, sediment and erosion control practices, and organic farming transition (Niagara County AEM Partnership 2005).

Barnyard Management – Heavy Use Area Protection

- The NRCS Wetland Reserve Program (WRP) has created 22 acres of wetland in the Eighteenmile Creek watershed since 2003. The WRP works to develop wetlands to protect water quality and provide wildlife habitat in areas such as high risk agricultural lands located in floodplains. The program requires property easements to protect created wetlands from future development. The Wildlife Habitat Incentive Program (WHIP) has also been successful in the watershed and has been used to restore 30 acres of grassland at three sites since 2001. The NRCS WHIP program provides assistance to private landowners to increase wildlife habitat on their land.

Additional programs were implemented in the watershed in 2006 under the FSA's Conservation Reserve Enhancement Program (CREP) and the NRCS's Conservation Security Program (CSP) and Conservation Reserve Program (CRP). (Digiacomo 2007).

Baseline Characterization – Habitat

- The Niagara County Department of Economic Development (June 2004) Qualitative Habitat Characterization within Eighteenmile Creek Watershed reported on a qualitative sampling program of aquatic and terrestrial communities and fish sampling and stream classification results (see Section 7 of this document for more details).

A number of projects, investigations, and studies have been completed over the past 5 years, ranging from baseline characterization studies and modeling to remedial investigations, watershed planning, and habitat restoration.

Baseline Characterization – BUI Investigation

- The State University of New York (SUNY) Brockport Department of Biological Sciences studied the plankton community in the Eighteenmile Creek AOC. The results of the plankton study establish that the plankton use indicator is not impaired. A presentation by the author, Dr. Joseph Makarewicz, was provided to the Eighteenmile Creek RAC in 2002. This study was funded by a grant from the EPA – GLNPO.

Baseline Characterization – BUI Investigation

- A BUI investigation began in spring 2007, with field surveys continuing through the summer. The field work included surveys at selected locations for mammals, amphibians, birds, and fish occurring within the Eighteenmile Creek AOC and within similar habitats at Oak Orchard Creek in Orleans County. This study will help to determine the status of two "unknown" BUIs and one "likely" BUI, including the existence of fish tumors and other deformities, the status of fish and wildlife populations (unknown), and the status of bird or animal deformities or reproductive problems (likely). The report is expected to be completed in early 2008 (see Section 7).

Baseline Characterization – Sediment/Nutrient Loading – Hydrology and Sediment Transport Modeling

- With assistance from the SUNY Brockport Department of Biological Sciences, NCSWCD completed a two-year investigation in 2006 of the baseline and storm event sediment and nutrient loading in Eighteenmile Creek. Water quality in the creek was monitored with a fixed monitoring station and grab samples. Sampling parameters included total phosphorus, total suspended solids, sodium, nitrate, nitrite, and total kjeldahl nitrogen.

- A watershed model was developed in 2005 by Buffalo State College using the Soil and Water Assessment Tool (SWAT) model. Funding was provided by the USACE – Buffalo District. Variables used in the model included precipitation records, drainage area, discharge (flow) data, and total surface flow volume. Watershed hydrology and runoff rates were calculated accounting for soil types, land use, vegetative cover, and slope, which all influence timing and quantity of surface runoff in response to precipitation events. Runoff rates were found to be influenced by density of development and season (see Section 5).

Baseline Characterization – Bioaccumulation Study

- The USACE – Buffalo District analyzed sediment samples collected from Eighteenmile Creek reach between just upstream of the mouth at Lake Ontario to Burt Dam, within the Village of Olcott. Surface sediment samples were analyzed for heavy metals, chlorinated pesticides, PCBs and dioxins/furans. Further, composited sediment samples were exposed to

the aquatic oligochaete *Lumbriculus variegates* for 28 days to quantify the bioaccumulation of chlorinated pesticides, PCBs, and heavy metals (US Army Engineer Research and Development Center 2006). A report interpreting the results of this investigation indicated that there is an on-going transfer of PCBs and DDE (a metabolite of DDT) from the sediments through the food web, between benthic invertebrates and their predators (USACE 2006). The bioaccumulation experiments also evidenced a higher than normal bioavailability of DDE and PCBs in certain areas of the creek. In addition, dioxin/furan contamination in the creek sediments suggested a bioaccumulation risk, and various sediment heavy metal concentrations appeared to exert chronic toxicity. PCB levels in the Eighteenmile Creek sediment samples were significantly higher than any other tributaries to Lake Ontario, including Black River, Salmon River, Oswego River, and Genesee River.

Source Identification/Contaminant Characterization/Remediation

- NYSDEC began a supplemental Remedial Investigation (RI)/Feasibility Study (FS) in 2007 that will further define the nature and extent of sediment contamination in Eighteenmile Creek and the Flintkote millrace and evaluate, to the extent possible, the source areas adjacent to the creek. The supplemental RI will also include investigations of adjacent source areas (i.e., White Transportation property, the former United Paperboard Company property, and Upson Park) to help locate potential sampling locations and possibly identify the source(s) of the fill materials found there (see Section 6).

- NCSWCD secured funds from the EPA GLNPO in 2006 to sample for PCB sources downstream of the Clinton Street Dam, in the city of Lockport, New York. This investigation involved reviewing all available historic sampling data to identify potential PCB sources and to locate future sampling locations of interest. Sediment surface and core sampling occurred in Eighteenmile Creek between Harwood Street and Stone Road, with the exception of an area of steep gradient in the vicinity of the Niagara escarpment. The overall study area was approximately 1.5 miles in length, with approximately 0.35 miles excluded. The surface, or screening, samples showed PCBs in all areas of the creek from below the Flintkote property to Stone Road. Analytical data on metals concentrations indicated no apparent correlation between metals and PCB concentrations. However, the concentrations of metals in the surface sediments are considered a concern.

- In 2005, the NYSDEC Division of Environmental Remediation and the Niagara County Department of Health initiated a comprehensive trackdown sampling project for various contaminants in the area of the Flintkote plant site. This site is linked to unknown contaminant sources that are emitting various concentrations of PCBs, mercury, and lead into Eighteenmile Creek. The results of this trackdown study will help to identify and remediate these sites.

- As of May 2005, the Guterl Steel Landfill Site is now included in the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP is a federal program designed to clean up sites that became contaminated with low levels of residual radioactivity during the nation's early atomic energy program more than 50 years ago. In 1999, the USACE completed a Preliminary Assessment (PA) of the site, which included a review of radiological data. Though

it was determined that there is no immediate health risk posed by AEC or Manhattan Engineer District (MED)-related contaminants at the site, the agency has determined that radiological contamination in excess of current federal and state standards exists at the site. This means that there is a high probability that remedial action would be needed before any future development of the property.

- Following the completion of the RI/FS at the AKZO Chemical Site, a Corrective Measures Study Report was prepared and submitted to NYSDEC for public review in 2003. NYSDEC will be coordinating closure certification and corrective action.

- During 2001, Delphi Harrison Radiator installed additional monitoring wells to further define the nature and extent of the groundwater contamination plume associated with its trichloroethylene (TCE) site. The RI and focused FS reports have since been completed by Delphi and reviewed by NYSDEC. NYSDEC issued a Record of Decision (ROD) for the site in March 2005 that called for a remedy consisting of monitored natural attenuation (MNA) for groundwater contamination. The ROD includes a Site Management Plan (SMP) to protect current and future site users. An intensive groundwater monitoring program will be developed for the site as well.

- Following the completion of Phase II studies, the Norton Labs and Diamond Shamrock sites were removed from the list of Inactive Hazardous Waste Sites in the Eighteenmile Creek watershed in 2001 due to the absence of hazardous waste.

Planning, Coordination, and Prioritizing

- The Eighteenmile Creek RAC was re-vitalized in 2005 and is again meeting on a quarterly basis and is in the process of adopting written guidelines and ground rules, developing participant responsibilities, and adopting delisting criteria for the identified BUIs of the creek.

Restoration

- Phase I of the Eighteenmile Creek Streambank Stabilization and Habitat Restoration Project has been completed. To address the problems associated with the creek, the Niagara County Department of Economic Development and numerous project partners implemented a pilot project for habitat restoration over a 1-mile reach of the AOC below the Burt Dam. This project was designed to be the first critical step in creating sustainable fisheries in and improving safer public access to Eighteenmile Creek. The long-term goals of the project included the restoration of the physical, biological, and chemical integrity of the entire creek ecosystem and the eventual delisting of Eighteenmile Creek as an AOC.

A follow-up to the Phase I restoration project included an environmental education workshop and a community environmental fair focused on project activities and restoration techniques.

The Eighteenmile Creek Restoration Project was awarded a 2004 New York State Governor's Waterfront Re-Discovery Award through the NYSDOS *Quality Communities Program*, and, for its success and diversity of project partners, the project team was also awarded the 2004 USDA NRCS Team Excellence Award.

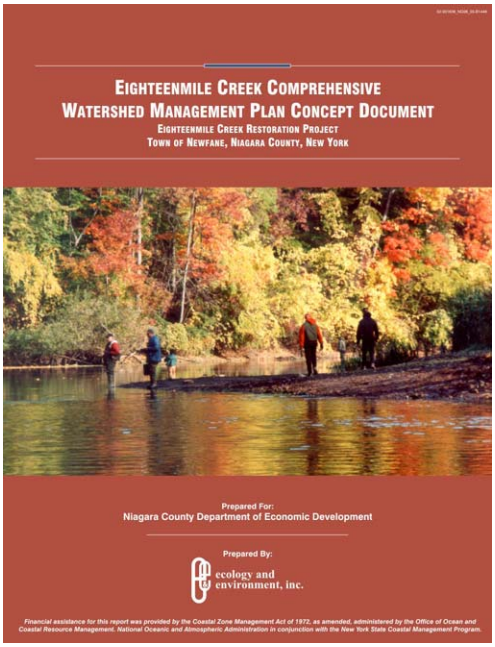
- Planning and design of Phase II of the Eighteenmile Creek Streambank Stabilization and Habitat Restoration Project (Phase II) was completed in 2006, and construction of the project was completed during summer 2007. Phase II consists of constructing a low-flow deflector/fishing access wall to re-define and narrow the channel to its former configuration, re-establishing 30,000 square feet of wetland habitat, and creating additional aquatic habitat through the placement of numerous hydraulic cover stones in the creek. This project was a joint effort of the Niagara County Soil and Water Conservation District, the Niagara County Public Works, the USACE, NYSDEC, the Town of Newfane, the Finger Lakes-Lake Ontario Watershed Protection Alliance, and the Eighteenmile Creek RAC.

- The Western New York Land Conservancy (WNYLC) is continuing their efforts on the Niagara Escarpment Legacy Project with the goal of preserving the escarpment for ecological and public benefit and of restoring native plant and animal life. The WNYLC is working with the city of Lockport to restore native grasses to city-owned lands on the escarpment with funding provide by the USFWS. The WNYLC is also discussing options for establishing conservation easements with nearby and adjacent landowners. Stakeholders for this project include:

  - Western New York Land Conservancy
  - New York Department of Conservation
  - U.S. Fish and Wildlife Service
  - The Nature Sanctuary Society
  - The Trust for Public Land
  - The City of Lockport
  - The Town of Lockport
  - University of New York at Buffalo Urban Design Program
  - HSBC
  - Land Trust Alliance
  - Land Conservation & Planning
  - First Niagara Bank
  - Ecology and Environment, Inc.
  - County of Niagara
  - Niagara County Soil and Water Conservation District

Additional efforts by the WNYLC involve the future restoration of wetland habitat within floodplains along Eighteenmile Creek.

Watershed Management



- The Niagara County Department of Economic Development and Ecology and Environment, Inc. prepared the Eighteenmile Creek Comprehensive Watershed Management Plan Concept Document in 2005. The document was prepared to initiate the development of a Comprehensive Watershed Management Plan (CWMP) and was intended for use as guidance to complete a CWMP for Eighteenmile Creek. Portions of the document addressed management issues and opportunities, goals and policies, actions (projects), phasing and implementation (of projects), and monitoring and assessment. This process was also supported by the USACE – Buffalo District.

- NCSWCD continued developing the CWMP between 2005 and 2007, with assistance from USACE – Buffalo District and Ecology and Environment, Inc. A prominent component of this effort was the creation of a historic/current pollutant generator/discharge database for the Eighteenmile Creek watershed (a.k.a. watershed database). The database provides a single, interactive source list of all pollutant generators/dischargers and water quality and sediment sampling data that have been collected within the watershed over the years.

  A thorough understanding of existing and past hazardous material discharges and disposal will support informed selection of future sediment sampling efforts, identify locations where contamination occurs and where persistent sources of contaminants may be located, and aid in prioritizing specific projects in the future. The database was developed into an ARC IMS site that will be used as an analytical tool and decision support model. The current/historic pollutant generator/discharge database will be a "living" database as new data are incorporated into the system over time.

- Through funding provided by USACE – Buffalo District, Buffalo State College updated land use/land cover (LULC) data layers for the Eighteenmile Creek watershed in 2004. The updating process involved comparing previously mapped land use – land cover layers from 1992 with 2002 aerial photography.

Pollution Prevention

- The City of Lockport developed a Combined Sewer Overflow Assessment for their sewer system in 2003, which included measurements of the volume, duration and impact of CSOs on Eighteenmile Creek.

- Three projects within the City of Lockport sewer system were developed and funded by the New York State Clean Water/Clean Air Bond Act to reduce combined sewer overflows in 2002. The Vine-North Sewer project installed new sanitary sewers in the northeastern portion of the city, separating storm water from the combined sewer system. The Ohio-Simonds Sewer Project constructed new storm sewers in the west central portion of the city, separating storm water from the combined sewer system. The Wastewater Treatment Plant Improvement Project included the construction of a new clarifier at the treatment plant to increase the capability for treating wet weather flows from the combined sewer system.

Building on Success: High-Priority Projects

There have been many recent successes within the Eighteenmile Creek watershed including the habitat restoration and water access projects below Burt Dam, as well as the collaborative efforts to identify and procure funding to carry out studies that are assessing the extent and sources of environmental degradation within the watershed. However, because of the current status and future potential value of the watershed to humans and the natural environment, a great deal of work still needs to be planned and executed in order to complete the full remediation and restoration of this watershed. High priority projects are summarized below:

Priority Projects

- **Sediment Investigation**
  Existing data on Eighteenmile Creek sediments indicate that most of the sources of contamination are located upstream of the AOC boundary, between Burt Dam and the New York Barge Canal. Actual sediment quality data on this reach of the creek is limited. The major sources of sediment contamination are believed to be the New York State Barge Canal, Flintkote Plant Site, and City of Lockport Sewage Collection System (USEPA 2002). The Burt and Newfane dams act as semi-containment structures, accumulating contaminated sediments that are transported downstream from upstream areas. Since NYSDEC and NYSDOH are actively investigating the segment of creek near the Flintkote Plant Site (Eighteenmile Creek Corridor Site), a scope of work has been completed which outlines a preliminary plan and cost estimate to sample and analyze sediments relative to all other suspected sources in the upstream reach.

- **Legacy Assessment**
  A project must be completed that focuses on the evaluation of contaminated sediments and the prevention of further contamination in order to set the stage for contaminated sediment removal. The project should include:

  – Sediment assessments to support the development of remedial alternatives pursuant to the Legacy Act;
  – Evaluations of remedial alternatives for sites requiring remediation;

- Completed remedial design for sites requiring remediation;
- Data collection to support a review of the short-term and long-term effects of remedial alternatives on human health and the environment; and
- Analysis regarding the soundness of approach, including scientific viability of the project.

■ **Legacy Remediation**
Remediation activities must be implemented. Under the Legacy Act, a project should include:
- Remedial design work completed or being addressed;
- Documented coordination with, and acceptance of project by, stakeholders;
- Information made available on existing risk to human health and the environment (e.g., fish contaminant levels, chemical concentrations in environment, routes of exposure, bioavailability of contaminants, etc.);
- Demonstration of ability to reduce risk;
- Coordination with regulatory agencies, as necessary;
- A project team that exhibits experience and ability to properly perform the work proposed, if applicable;
- Soundness of approach, including scientific viability of the project;
- Habitat mitigation alternatives; and
- Plan to restore beneficial use impairments.

■ **Continuing Updates to Watershed Database**
A number of tasks have been identified to continue the process of constructing and populating the Watershed Database, and to enhance its usability. These tasks have been defined so that progress can be accomplished quickly and in a cost-effective manner.

- **Improving and Expanding the Watershed Database.** This task involves two related steps, as follows:
  1. Improving the database by streamlining such that records are stored in a relational database which will result in eliminating duplicate geo-referenced points that contain different types of data. The database would be streamlined by capturing single point locations and containing all records for that point (e.g., various contaminant concentrations, variable contaminant concentrations within a depth profile, etc.).

  2. Increasing the database by adding more sampling information. Given the constraints of earlier funding, the database currently contains geo-referenced points with PCB parameters. This task will increase the information base by adding other analytical parameters to the points collected for PCBs, including mercury, lead, and other metals. These data can be obtained from a number of completed investigations including the PCB Trackdown Investigation conducted in 2006.

- **Enhancing the Usability of the Database.** This task calls for the design of query tools that will allow users to search the database by a set of criteria, and select out specific records of interest. In essence, this will create a "selected set" of queries. The selected set can sometimes be used to create new data, generate tables and/or lists, or as input to fur-

ther analysis. Example tools include address, parcel, search radius, parameter and threshold concentrations, date ranges, sources.

- **Migrate from the IMS platform to an ArcServer platform.** This task will result in the shift of platforms for the watershed database. The major benefit arising from the completion of this task will be improved user-friendliness and a higher level of intuitiveness. This migration would also ensure that the database keeps pace with technological changes occurring in the marketplace.

- **Completing a Comprehensive Watershed Management Plan**
  The Eighteenmile Creek Concept Document was developed under the budget available for the Eighteenmile Creek Restoration Project, on behalf of the Niagara County Department of Economic Development. The document was prepared to initiate the process of creating a Comprehensive Watershed Management Plan (CWMP) specific to the Eighteenmile Creek Watershed. The completion of a CWMP and the initiation of components of the plan remain a high priority for the watershed.

- **Developing Protocols for Delisting BUIs**
  The NCSWCD proposes to develop a detailed remedial strategy and monitoring protocol for all BUIs. This will include:
  - Identifying and prioritizing specific remedial actions;
  - Establishing costs and budgets for remediation, and acquiring funds for such actions;
  - Identifying responsible parties for remediation, if any; and developing monitoring schemes and protocol for each impaired BUI

- **Stormwater Monitoring Assessment Project**
  Non-point source pollution from the upper watershed is a major concern in the overall management and remediation of the AOC. Stormwater discharge as well as dry storm sewer outfall effluent should be monitored and evaluated.

- **Illicit Discharge Trackdown Investigation**
  Source trackdown investigations will be conducted if illicit discharges are detected as a result of the implementation of the Stormwater Monitoring Assessment Program.

3 Physical Features and Influences

3.1 Topography

The Niagara Escarpment is a major topographic feature within the watershed; elevations within the watershed are variable between the Niagara Escarpment and Lake Ontario, ranging from 245 amsl to 400 amsl.

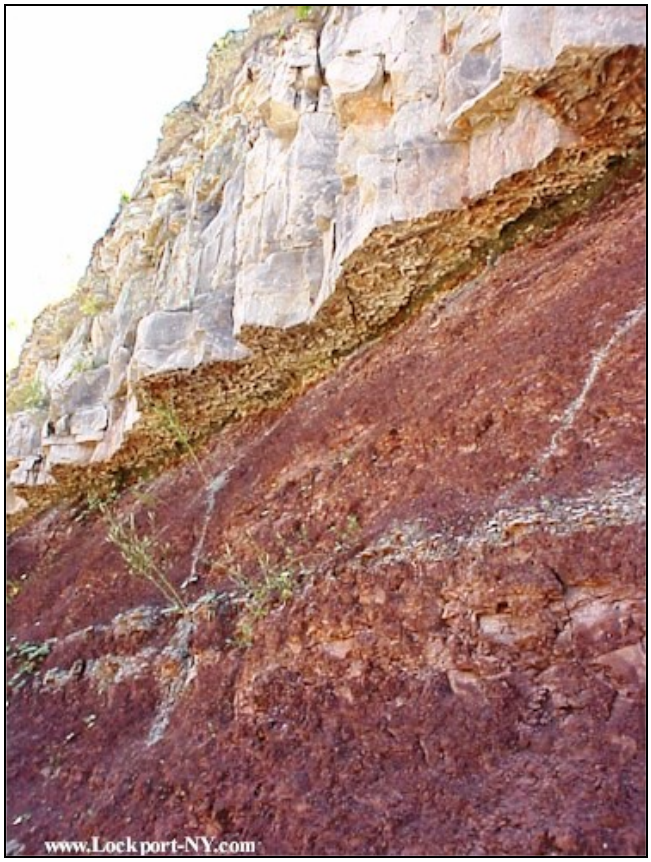
Topography influences direction of surface drainage patterns and groundwater flow, land development patterns, vegetation community types, and cultivation practices, to list a few. Topographic characteristics are therefore important in determining the characteristics of the movement of surface water in the watershed and the relationships between topography, land uses, and surface water conditions (see Figure 3-1). Topography also defines the limits of the watershed. The Eighteenmile Creek watershed is located within both the Ontario and Huron Plains, two relatively flat plains that are separated by the Niagara Escarpment, which runs generally east/west along the northern portion of the City of Lockport. Within the Ontario Plain (from Lake Ontario to the Niagara Escarpment) elevations range from 245 feet above mean sea level (amsl) at the shoreline to approximately 400 feet amsl at the toe of the escarpment. Within the watershed area the escarpment ranges from 100 to 175 feet high. Maximum elevations within the watershed occur within the Huron Plain in the southern portion of the watershed and are approximately 635 feet amsl in the southwestern portion and approximately 655 feet amsl along the southeastern extent.

Drainage within the watershed can be described as generally flowing to the north. The East Branch of Eighteenmile Creek initially flows to the northeast, before turning west and joining with the main branch. This change in direction is caused by a topographic high point located in the southeastern portion of the watershed.

The Gulf and the main branch of Eighteenmile Creek are both located within well-incised, steeply sloped channels for most of their lengths. The channel walls range in height but average approximately 35 feet. The East Branch lacks the incised channel characteristic of the rest of Eighteenmile Creek.

3.2 Soils

The soils of the Eighteenmile Creek Watershed have been mapped by soil types by the United State Department of Agriculture – Natural Resource Conservation Service [NRCS] (formerly the Soil Conservation Service) for the entire Niagara County area. More recently, phases of soil series mapping has been made available electronically through the Soil Survey Geographic Database (SSURGO), which is the most precise delineation generally available electronically. SSURGO mapping data also presents soils with the highest runoff potential. This is valuable information for watershed planning as it provides, although coarse, a useful interpretation as it contributes to analysis of possible nonpoint source (run-off-generated) pollution.



Niagara Escarpment at Jackson Street in Lockport

USDA-NRCS State Soil Geographic Database (STATSGO) is another soil data set which is reported at a coarser resolution than the SSURGO data. STATSGO data is useful for regional scale analysis. (Natural Resources Conservation Service. Soil Survey Geographic (SSURGO) Database http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/)

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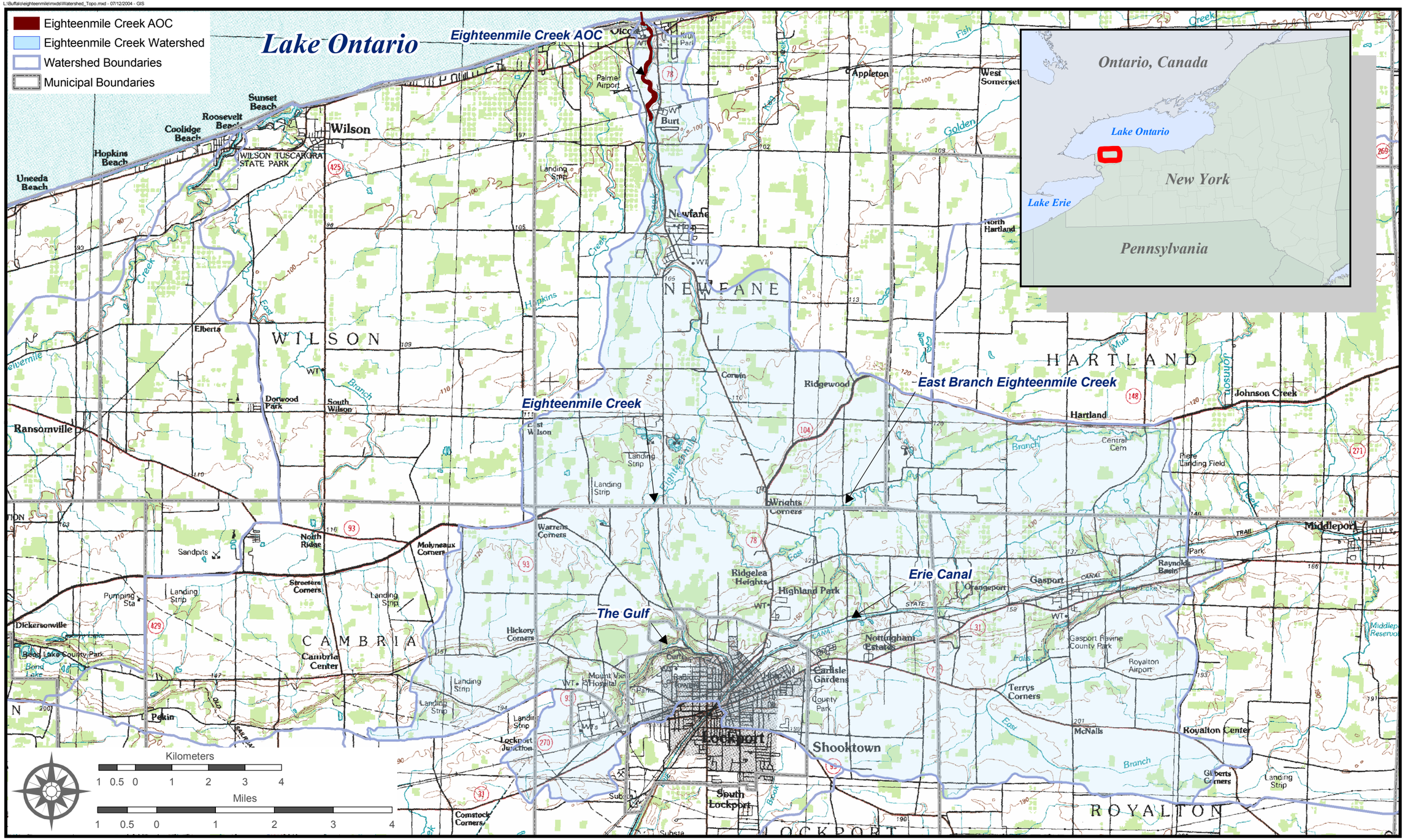

Source: US Geological Survey (100 K series, Lockport Quadrangle), NYS Department of Environmental Conservation

Figure 3-1 Eighteenmile Creek Watershed Topographic Map

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For this document the Niagara County Soil Survey (USDA 1972) was reviewed to provide information about sensitive soil types occurring within the Eighteenmile Creek watershed.

Sensitive soil types include hydric soils, prime farmland, farmland of statewide importance, and soils with high erosion potential. The soil survey identifies 94 soil types mapped as occurring within the Eighteenmile Creek watershed (see Appendix B).

Prime Farmland and Farmland of Statewide Importance.

Prime farmland is mapped as occurring on 57% of the land within the watershed.

Farmland is an important resource that is protected by New York State and by the federal government. Federal regulation of farmlands is based on soil types. The NRCS, the agency responsible for overseeing compliance with the Federal Farmland Protection Policy Act, designates certain soil types as *prime farmland, unique farmland, farmland of statewide importance, and additional farmlands of local importance*. In general, these soils offer a beneficial combination of chemical and physical characteristics for agricultural production.

Agricultural production in Niagara County is a valuable resource to the watershed and region.

Approximately 57% of the land within the Eighteenmile Creek watershed is classified as *prime farmland*. The USDA defines prime farmland as areas containing soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The majority of the prime farmland is found adjacent to Eighteenmile Creek and the major tributaries. Seventeen soil types within the watershed are designated as *farmland of statewide importance*. Farmland of importance is farmland other than prime or unique farmland that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate state or local government agency or agencies. These seventeen soil types comprise approximately 24% of the land area within the watershed,

half of which is adjacent to Eighteenmile Creek and its major tributaries. Soils classified as prime farmland or farmland of statewide importance are noted in Appendix B.

Excessive erosion adversely affects water quality.

Soils With High Erosion Potential. Identifying areas with the potential for erosion and areas where erosion is present is an important variable for evaluating the health of the watershed. Areas containing these soils can present problems in the form of loss of productive land and excessive erosion, which can adversely affect water quality and the effectiveness of riparian areas to act as buffers between uplands and streams and provide wildlife habitat. For example, soils with a high potential for erosion that are located along Eighteenmile Creek and its tributaries have the potential to introduce sediment loads to surface water resources. Sediment introduced into the creek and the tributaries can then affect water quality, diversity of aquatic life, and availability of habitat.

Excessively eroded streambank and trail below Burt Dam in 2002 and streambank after Phase I restoration

Eroded bank immediately downstream of Burt Dam in 2002 and after Phase I restoration

An examination of the Niagara County Soil Survey indicates that there are three soil types in areas adjacent to Eighteenmile Creek, The Gulf, and the East Branch of the creek that are considered to have high erosion potentials. These include Dunkirk, Arkport, and Ontario soils. These soils have a high erosion potential because of their soil characteristics and the steepness of the topography (>12% slope) where they occur. Dunkirk and Arkport soils (12% to 20% slope, eroded) and Ontario loam (15% to 30% slope, eroded) display the potential for erosion due to their locations in steeply sloped areas and evidence of past and continuing erosion. Although Dunkirk silt loam (6% to 12% slope, eroded) is not necessarily located in areas with steep slopes, this soil type displays historic and continuing erosion. Soils with high potential for erosion are noted in Appendix B.

Hydric Soils. The NRCS defines hydric soil as "a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS 2004). Wetlands are likely to be found in areas where hydric soils are present. Wetland areas provide important functions within the watershed, including but not limited to flood storage, water purification, and wildlife habitat. Many of these wetland areas are protected by state and federal regulations that are administered by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Army Corps of Engineers (USACE). Additional information regarding wetlands is provided in Section 7.2. Areas with hydric soils that are not considered wetlands under state or federal jurisdiction represent locations where wetland habitat could be created to protect water quality, act as flood storage areas, and increase local plant and animal diversity. Additionally, because these areas are likely to have poor drainage, areas with hydric soils should be carefully evaluated prior to developing.

Hydric soils and those that may contain hydric inclusions comprise approximately 34% of the land occurring within the watershed.

Approximately 14% of the land within the Eighteenmile Creek watershed is classified as hydric soil. An additional 20% contains soils with the potential for hydric inclusions, that is small areas of a hydric soil may be present within the larger mapped unit. Hydric soils and soils with the potential for hydric inclusions are noted in Appendix B.

3.3 Climate

Lake Erie and Lake Ontario affect climatic patterns in the watershed.

The climate in Niagara County is influenced by its proximity to Lake Erie and Lake Ontario. The lakes act as heat sinks, which can delay the spring season and lead to a milder summer. Similarly, the warm lake waters in fall extend the frost-free period later in the season, particularly in areas close to the lakes. Lake Ontario largely remains ice-free in the winter, reducing the extreme cold temperatures that may occur in similar areas further inland. Niagara County experiences lake effect snowstorms. These storms are caused by air that has been warmed and charged with moisture as it passes over Lake Erie and, to a lesser extent, Lake Ontario. This moisture is then deposited over land in the form of heavy snowfall. Lake effect snowstorms are variable year to year and tend to decrease later in the season as the ice cover on the lakes increases.

Historically and in general, Niagara County has experienced warm summers and fairly long, cold winters. Precipitation levels tend to be relatively stable throughout the year, with no distinct periods of heavy precipitation or drought. Seven out of ten years Niagara County will experience a high temperature of 91°F or higher and a low of –2°F. The first freeze typically occurs in mid-October with the last freeze occurring in early May. The exact dates may vary depending on elevation and proximity to Lake Erie or Lake Ontario. Average monthly precipitation in Niagara County ranges from 2.4 to 3.2 inches. According to the City of Lockport in the Niagara County Overview, average snowfall in the county is 82 inches (based upon across-the-year averages) (City of Lockport, http://www.lockport-NY.com/Reference/County.htm). Prevailing airflow is from the south and southwest. With the exception of an occasional heavy lake effect snowstorm, severe and damaging storms are not a serious hazard in the area. Table 3-1 provides average monthly temperature and precipitation data over a 30-year period (1971 to 2000) for Buffalo, New York.

Table 3-1 Climate Data for Buffalo, New York, 1971 to 2006

Month	Normal Temperature	Average Precipitation
January	24.6	3.16
February	25.9	2.42
March	34.3	2.99
April	45.3	3.04
May	57.0	3.35
June	65.8	3.82
July	70.8	3.14
August	69.1	3.87
September	61.5	3.84
October	50.7	3.19
November	40.2	3.92
December	29.8	3.80
Yearly Average	N/A	40.54

Source: National Weather Service Forecast Office

4 Human Resources and Influences

4.1 Historic Overview

The information below is a summary of the Phase I Cultural Resources Investigation for the Proposed Burt Dam Habitat Rehabilitation, Hamlet of Burt, Town of Newfane, Niagara County, New York (Hayward 2002). Additional information on Native American occurrence within the watershed was provided by Neil Patterson, Jr. (Haudenosaunee Environmental Task Force) (Patterson 2007). This discussion is considered to be strictly an overview and therefore there are certainly details of historic or pre-contact (pre-European settlement) that are not included.

Pre-Contact Period. Three major cultural traditions manifested in western New York State during the pre-contact period including the Paleo-Indian (ca. 10,000 – 8,000 BC), the Archaic (ca. 8,000 – 1,500 BC), and the Woodland (1,000 BC – 1,600 AD) traditions. The earliest people were nomadic big game hunters; adaptations led to hunter-gatherer societies with a less nomadic lifestyle and a shift in technology. Later societies relied upon hunting and gathering combined with agriculture. A more settled village life arose with increased dependence on agriculture. At the same time, population increased, technology changed, warfare changed, and social and political changes occurred.

Haudenosaunee groups occurred within the watershed before European contact.

During the late 16th century, prior to European contact, at least three Haudenosaunee groups occupied the 18 mile creek watershed – the Neutral, the Wenro, and the Eries. Warfare between these groups and the Seneca resulted in the absorption of these people into the Seneca Nation sometime around 1600. Excavations of Haudenosaunee sites near Eighteenmile Creek have revealed unusually large villages that grew through the adoption of large population segments.

Historic Period. The earliest Europeans visited the Niagara Frontier area as early as the 1610s; however for most of the seventeenth and eighteenth centuries, European activities involved limited commercial, religious, and military endeavors. Settlement in the area began in the early nineteenth century, but the regions growth was slowed by the War of 1812.

Permanent Haudenosaunee settlements in the region began around 1800 when the Tuscarora Nation, to the west, and the Tonawanda Seneca Nation, to the south, settled on federally-recognized reservations.

The Erie Canal was a boon to economic development in the early 19th century.

The region received a tremendous economic boost when the Erie Canal was routed through what was to become the village of Lockport in 1829 (the first village in Niagara County) and later the city of Lockport in 1829 (the first city in Niagara County). By 1830, Niagara County had a population of 18,000, and the economy of the northern watershed included farmsteads and ancillary agricultural activities as well as milling and tanning industries.

Around 1835, rail lines began to supplement transportation provided by the canal and roads, and farmers used railroads to ship lumber and food to markets east and west. Beginning in 1900, an electric trolley line was operated between Lockport and Olcott. Toward the end of the eighteenth century, roadways improved in some areas, and bridges were erected. Around the turn of the century, telephone service, cheap electricity, and reliable water supplies improved living conditions in the area. Development in the watershed accelerated after World War II.

Agriculture remains the dominant land use within the watershed to this day. Currently, residential uses are concentrated in the City of Lockport and Village of Newfane and otherwise are confined to areas along roadways. Commercial and industrial uses are concentrated primarily in the City of Lockport.

History of Dams Along Eighteenmile Creek. The following information on dams along Eighteenmile Creek was taken from the *Eighteenmile Creek Watershed Literature Search* (Niagara County 1988).

Various types of dams were built to provide power to mills and tanneries.

During the 1800s, numerous millraces and millponds provided power for a variety of industries located along the banks of Eighteenmile Creek. Multiple mills for flour rolling and paper utilized the power of Eighteenmile Creek at its descent of the Niagara Escarpment as did the Cowells Electric Smelting and Aluminum Company. In the City of Lockport, clustered mill districts formed where millraces were constructed to take advantage of water from the canal traveling down the escarpment. The millraces flowed into Eighteenmile Creek and the waterway provided power for pulp mills, gristmills, tanneries, and sawmills.

Dams were constructed to provide power in more level areas near Newfane and in the Town of Royalton. A dam was built in the 1830s near the end of McKee Street and Ewings Road in Newfane to provide power for the Newfane mill district. In the 1850s, a mill was built by D. VanHorn, near Ide Road in Newfane to provide power for a sawmill. The remains of this dam were still in existence in 1988. Around 1875, another dam was built near Condren Road in Newfane for a saw- and gristmill. The Burt Dam was built in 1924 creating a 95-acre reservoir within the creek gorge for approximately 2 miles upstream. The original mill generated power until the 1950s and was restored in 1988. In Royalton, two dams were built near Slayton-Settlement Road in the 1850s to provide power for mills. A wooden dam continued to provide power for a gristmill into the late 1960s. Historic topographic maps of the project area are shown in Figures 4-1 and 4-2 of this document.

4.2 Population Characteristics

The information presented in this analysis is derived from the U. S. Census Bureau (1990, 2000, and 2005) for Niagara and Erie Counties, the Town of Newfane and City of Lockport, all in New York State (U.S. Census Bureau 1990, 2000, 2005, and 2006). Because the Census Bureau's geographic study areas are not sensitive to watershed boundaries, the analysis provided includes information for general area surrounding the Eighteenmile Creek watershed, and areas that have a social and economic relationship with the watershed area. Eighteenmile Creek watershed, and areas that have a social and economic relationship with the watershed area.

Population. The entire Eighteenmile Creek Watershed lies within Niagara County, with portions of six towns lying within the watershed. For the purposes of this study, the population and demographic characteristics of Niagara and Erie Counties, along with the Town of Newfane and City of Lockport are presented. The watershed is most closely linked with these municipalities and therefore where the environmental quality of the watershed would be experienced. For the social and economic characterization, Erie County was included, even though it is not part of the study area for any of the other resources areas because it is closely associated with the population, economy, and social characteristics of Niagara County with respect to commuters and the labor force, in addition to inter-business relationships that occur in both counties.

Regional and watershed populations have continued to decline since 1990 however the population of Newfane has increased over 7% between 1990 and 2000.

As of 2005, the total population of Niagara County was 212,573 people (see Table 3-1), with the greatest densities in the City of Lockport and the Niagara Falls area. This figure is down approximately 3.7% from the 1990 population estimate and is a common theme among populations in Western New York, with the overall, regional population decreasing. Erie County (7.2% decrease from 1990 to 2005) and the City of Lockport (8.8% decrease from 1990 to 2000) both experienced population decline in recent years, while, alternatively, population within the Town of Newfane has increased by approximately 7.3% (1990 to 2000). Generally, young workers are leaving the region to find jobs elsewhere with better economic opportunities.

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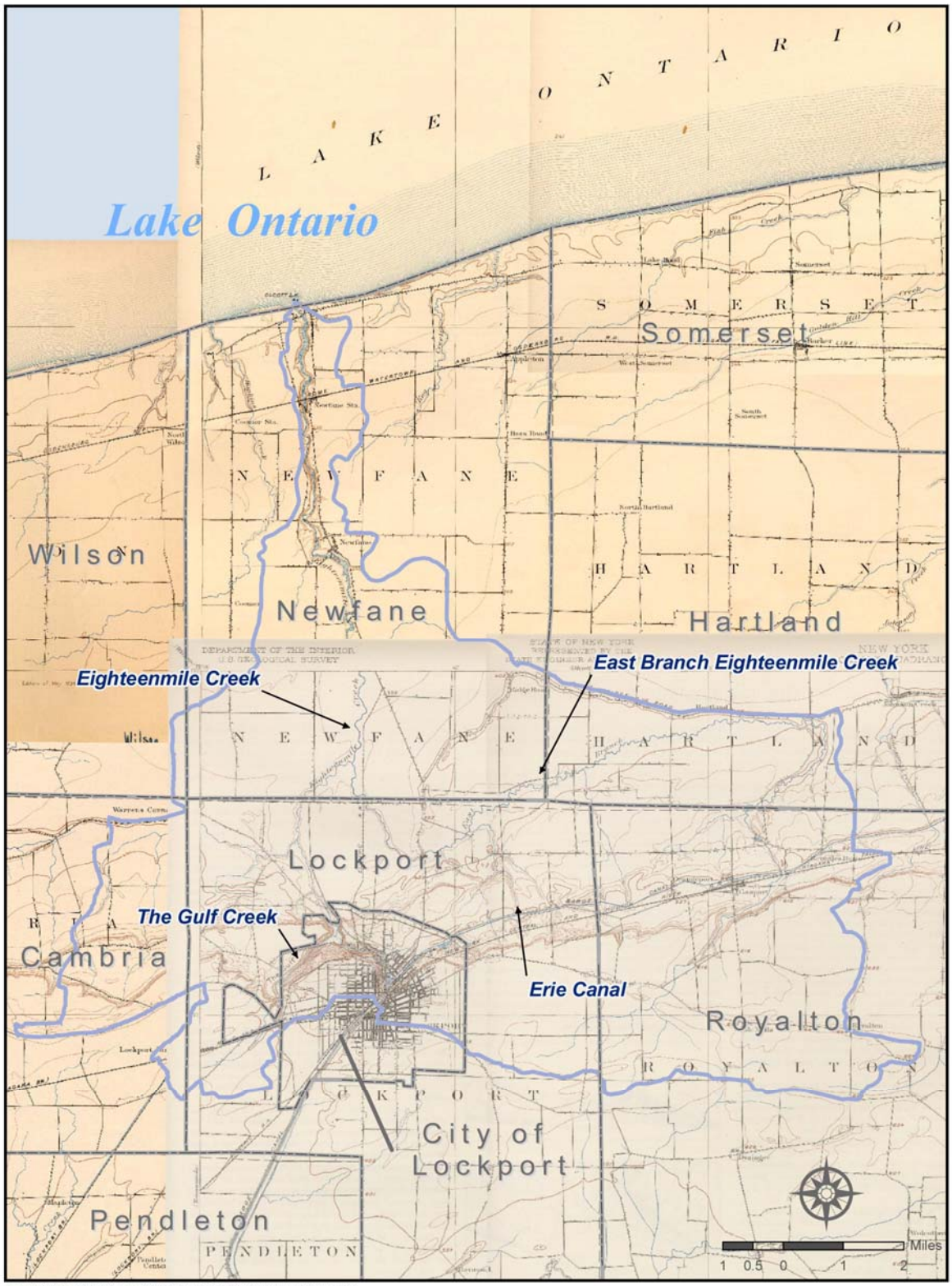

Source: US Geological Survey, NYS Department of Environmental Conservation
*Portions of the watershed were mapped at different times.

Figure 4-1 Eighteenmile Creek Watershed Historic Topographic Map 1894-1902

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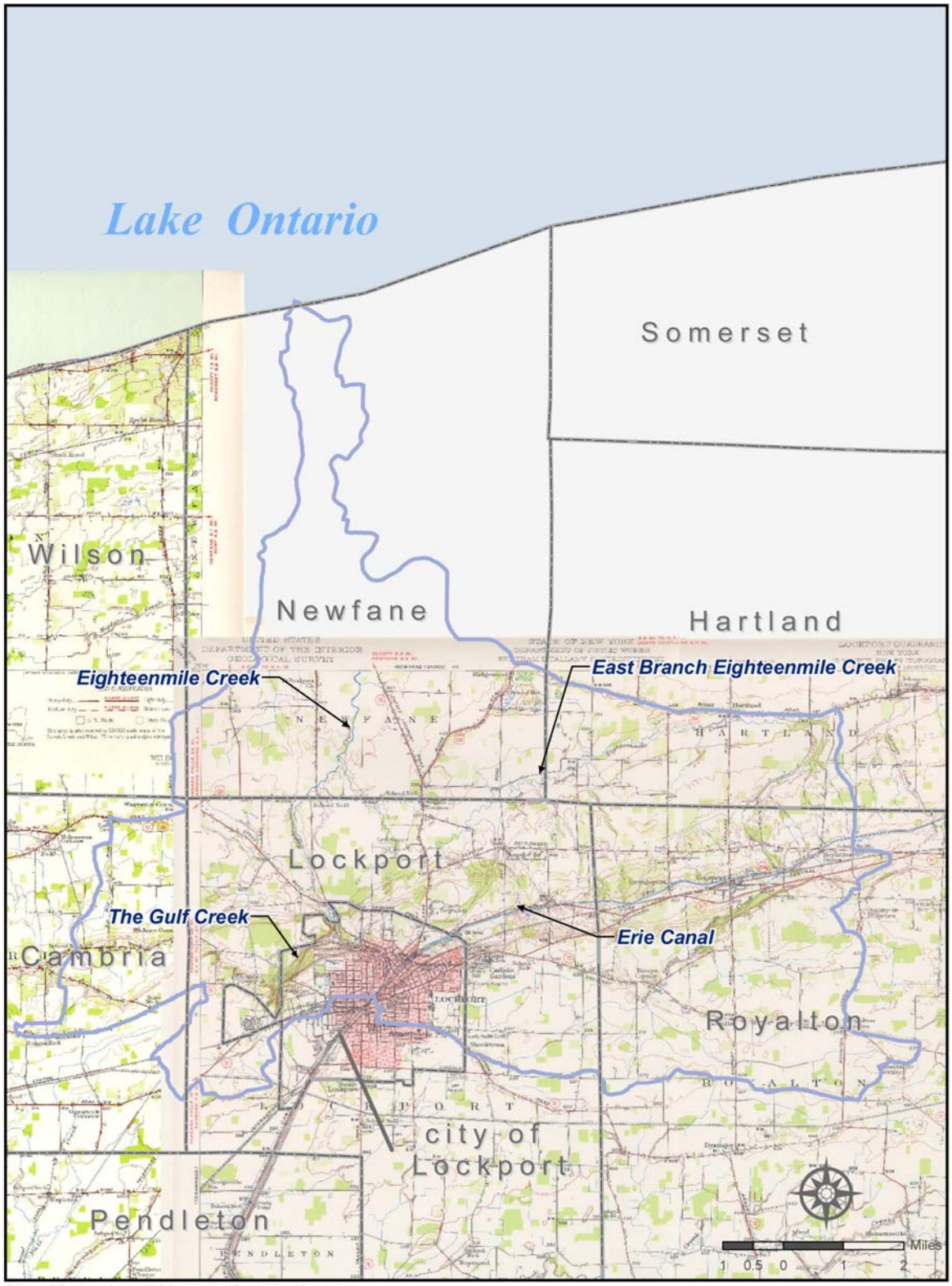


Source: US Geological Survey, NYS Department of Environmental Conservation
*Not all areas available.

Figure 4-2 Eighteenmile Creek Watershed Historic Topographic Map 1948

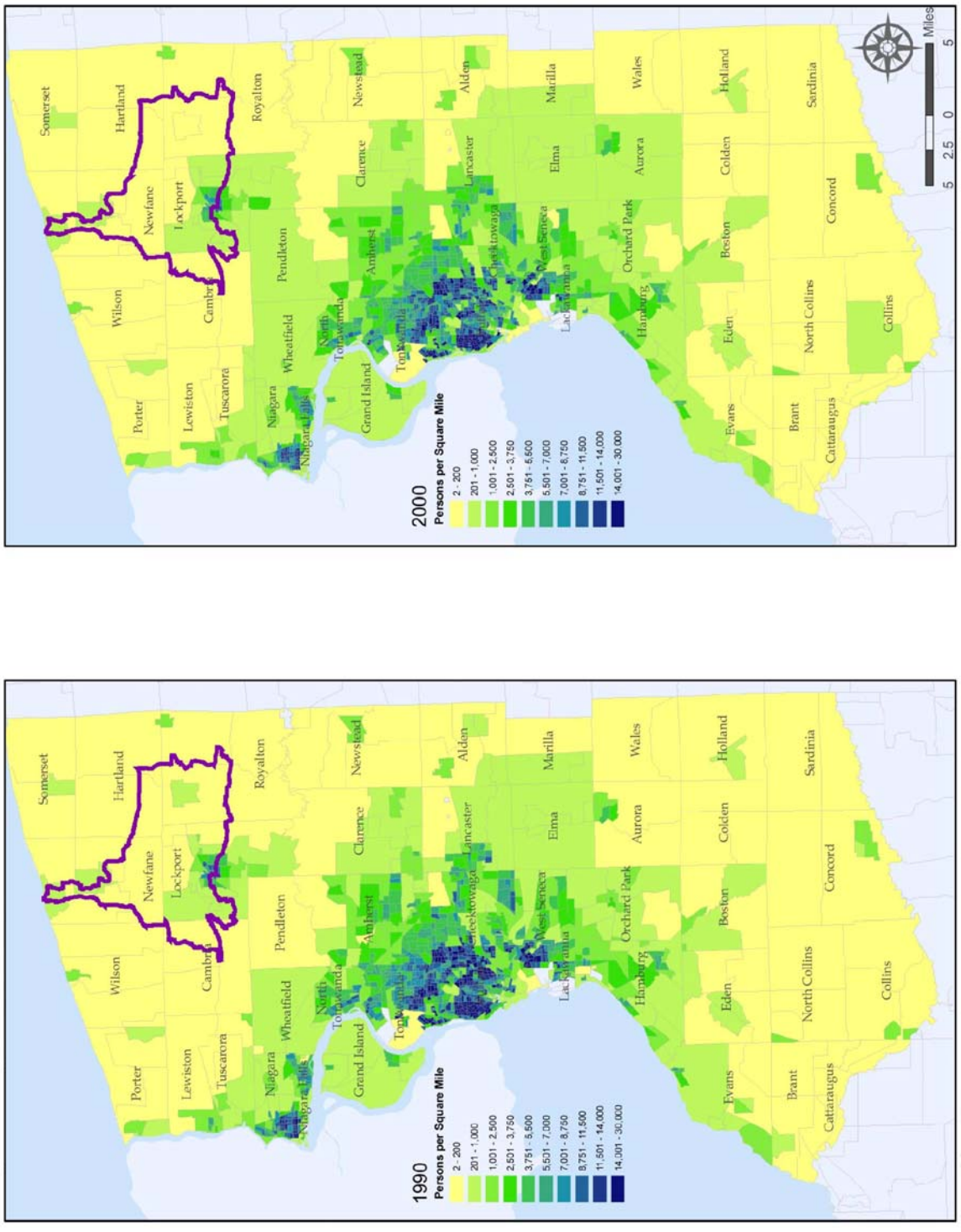


Figure 4-3 Population Density Change in Erie and Niagara Counties, NY 1990-2000

Population densities are relatively low in the watershed outside of Lockport, Newfane, Olcott, and Royalton.

Figure 4-3 depicts population densities within the Niagara and Erie County region, encompassing the Eighteenmile Creek watershed from 2000. The region depicts a population range from 25 to 1,000 persons per square mile, however, when examined at the census block group level, population centers clearly occur in the Niagara Falls, Buffalo and Lockport areas. In Niagara County, local to the Eighteenmile Creek watershed area, population density rises to levels greater than 1,000 persons per square mile in portions of the City of Lockport, in the Village of Newfane, in Olcott, and in small areas within the towns of Lockport and Royalton. Population densities for the watershed are graphically displayed in Figure 4-4.

The racial makeup in the region is dominated by Caucasians with commonly over 85-90% of the population being white. The majority of individuals over the age of twenty-five have high school educations or better, and between 10 and 20% typically have a Bachelor's degrees or higher levels of education. See Table 4-1 for detailed figures for Niagara and Erie Counties, as well as the City of Lockport and Town of Newfane.

4.3 Economic Characteristics

According to 2005 figures median household income is slightly higher in Niagara County compared to Erie County.

Income and Employment. The labor force in Niagara and Erie Counties has been decreasing along with the population of the counties in recent years. At the same time, unemployment has risen from 6.9 to 7.8% in Niagara County (1990 to 2005) and 7.0 to 8.2% in Erie County (same period). With major employers closing their operations over the past 10-20 years in the Western New York area (i.e., Delphi Thermal Systems, etc.), employment has suffered. As a result, a portion of the population is likely leaving the area in search of employment elsewhere. In 2005, the median household income in Niagara County was approximately $44,172, compared with Erie County at $41,967. The income level has been increasing over the years, but individuals living below poverty remain an issue. The percent living below poverty has decreased in Niagara County from 10.7% in 1990 to 7.3% in 2005; however, in Erie County, the percent below poverty has actually increased from 12.2% to 13.2% over the same time

Table 4-1 General Population and Social Characteristics

	Niagara County			Erie County			City of Lockport			Town of Newfane		
	1990	2000	2005	1990	2000	2005	1990	2000	2005	1990	2000	2005
Total population	**220,756**	**219,846**	**212,573**	**968,532**	**950,265**	**898,981**	**24,426**	**22,279**	**NA**	**8,996**	**9,657**	**NA**
Female (%)	52.2%	51.8%	51.8%	52.4%	52.2%	52.0%	53.1%	51.9%	NA	50.7%	50.2%	NA
Male (%)	47.8%	48.2%	48.2 %	47.6%	47.8%	48.0%	46.9%	48.1%	NA	49.3%	49.8%	NA
Median age (in years)	NA	38.2	39.9	NA	38.0	39.8	NA	35.9	NA	NA	38.4	NA
Level of education of people over the age of twenty-five years as percentage of the total population												
High school graduate or higher	75.8%	83.3%	86.5%	76.4%	82.9%	87.5%	73.5%	81.1%	NA	76.1%	86.4%	NA
Bachelor's degree or higher	13.6%	17.4%	18.6%	20.0%	24.5%	26.7%	14.2%	17.6%	NA	11.3%	13.7%	NA
Racial makeup as percentage of the total population												
White	93%	91%	90%	86%	82%	82%	93%	91%	NA	96%	97%	NA
African-American	5%	6%	6%	11%	13%	13%	6%	6%	NA	2%	1%	NA
Biracial (two or more races)	–	2%	2%	–	1%	1%	–	2%	NA	–	1%	NA
American Indian	1%	1%	1%	1%	1%	1%	<1%	1%	NA	1%	<1%	NA
Asian	<1%	1%	1%	1%	1%	2%	<1%	1%	NA	1%	0%	NA
Other	<1%	<1%	<1%	1%	1%	2%	<1%	<1	NA	<1%	<1%	NA
Households												
Average household size	2.56	2.45	2.45	2.50	2.41	2.34	2.43	2.33	NA	2.71	2.63	NA
Income level												
Median household income	$28,408	$38,136	$44,172	$28,005	$38,567	$41,967	$25,000	$35,222	NA	$29,437	$41,438	NA
Per capita income	$12,710	$19,219	$22,580	$13,560	$20,357	$23,801	$12,498	$19,620	NA	$12,764	$18,311	NA
Poverty status (% below poverty)	10.7%	10.6%	7.3%	12.2%	12.2%	13.2%	14.5%	13.3%	NA	9.2%	6.8%	NA
Total Labor Force	108,402	107,560	106,608	476,256	465,413	457,178	11,529	10,817	NA	4,490	4,557	NA
Number Employed	100,878	100,810	98,080	443,016	431,174	419,180	10,671	10,173	NA	4,173	4,328	NA
Number Unemployed	7,524	6,515	8,328	33,240	33,775	37,364	858	610	NA	317	229	NA
Unemployment Rate	6.9%	6.1%	7.8%	7.0%	7.3%	8.2%	7.4%	5.6%	NA	7.1%	5.0%	NA
Total housing units	90,385	95,715	97,423	402,131	415,868	421,954	10,374	10,341	NA	3,547	3,854	NA
Percent Occupied	93.8%	91.8%	89.1%	93.7%	91.6%	91.0%	95.1%	91.5%	NA	91.7%	93.3%	NA
Percent Vacant	6.2%	8.2%	10.9%	6.3%	8.4%	9.0%	4.9%	8.5%	NA	8.3%	6.7%	NA
Median Housing Prices (owner-occupied only)	$62,200	$82,600	NA	$73,600	$90,800	NA	$53,500	$69,900	NA	$60,300	$81,300	NA

Source: U.S. Census Bureau, 1990, 2000, 2005.

Key:
NA = Data not yet available.

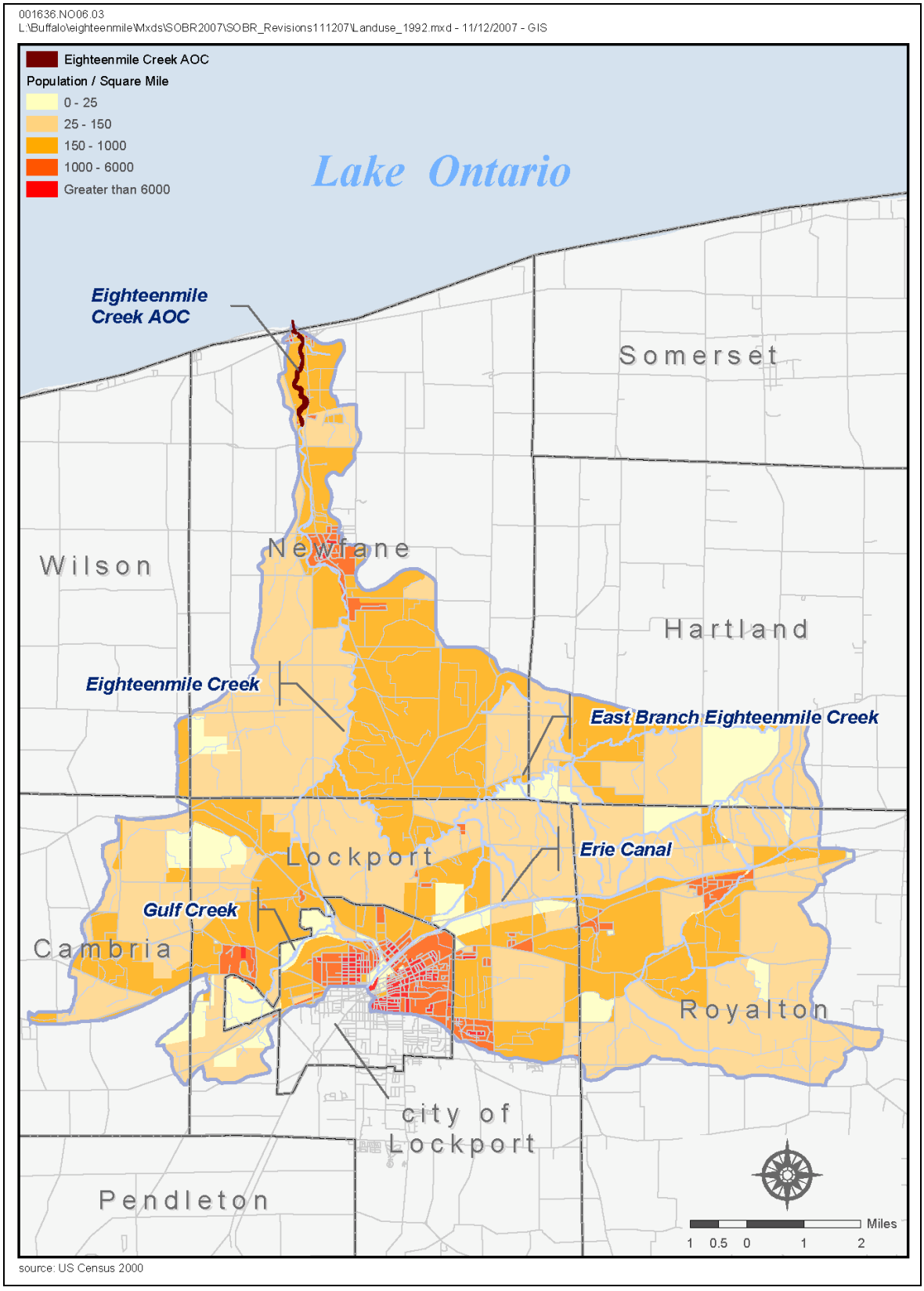


Figure 4-4 Population Densities Within the Eighteenmile Creek Watershed

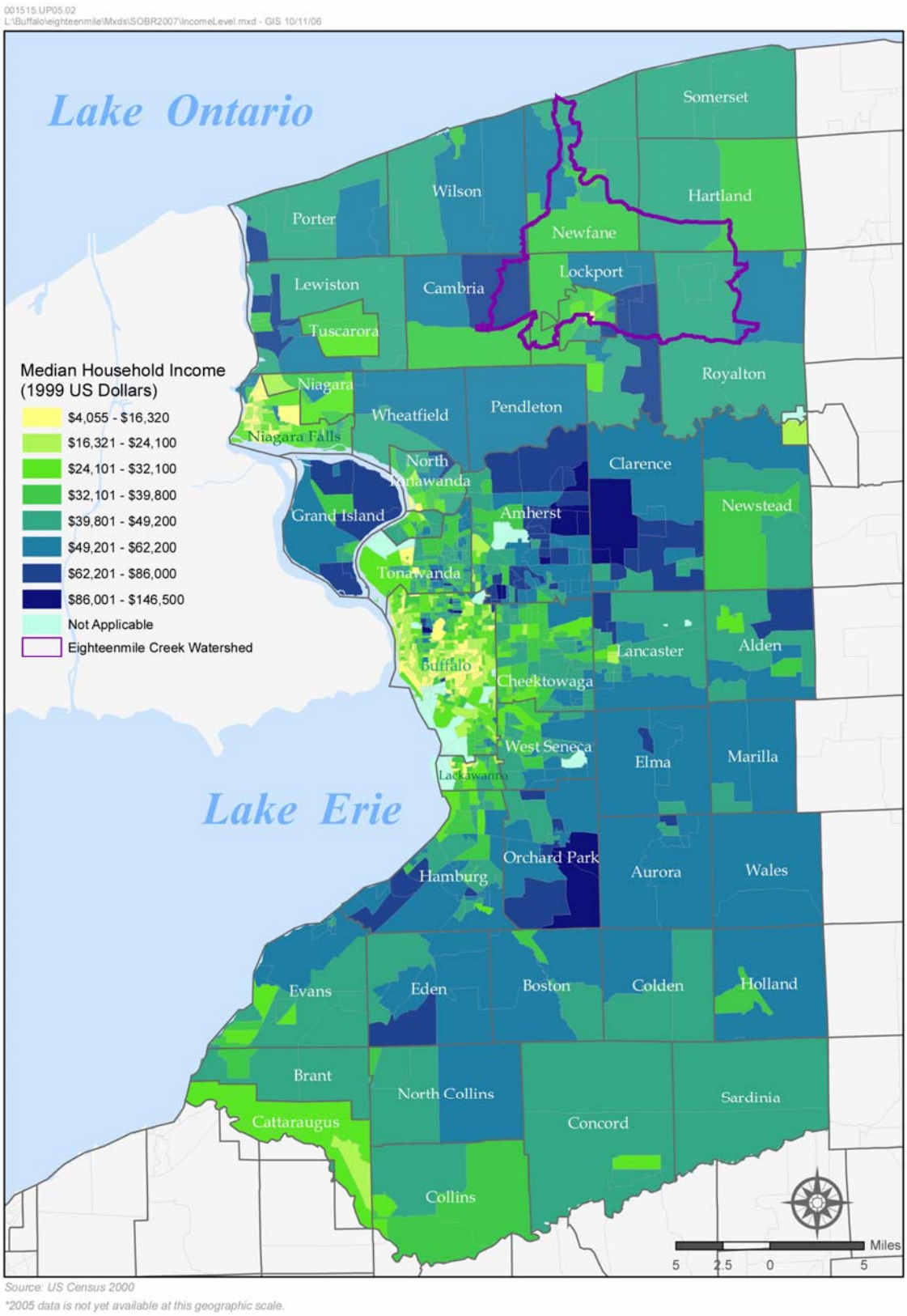


Figure 4-5 Median Household Income in Erie and Niagara Counties – 2000

period. See Table 4-1 for additional statistics on employment, income, and poverty in the Eighteenmile Creek area and see Figure 4-5 for median household income for Erie and Niagara Counties (U.S. Census Bureau 2006).

Housing. The housing statistics for the study area are presented in Table 4-1. Erie County has the majority of the housing stock in the area, over four times that of Niagara County. Vacancy rates between the two counties however are very similar, experiencing a generally low vacancy rate of around 6% in 1990 to a much higher vacancy rate around 10% in 2005. Part of this trend can be attributed to the population reduction and employment issues.

The average persons-per-household statistics across all geographic units are decreasing from 1990 to 2000 (and 2005 where data is available). It is assumed that with the decrease in average household size, there would be a decrease in general utility usage (including potable water). This, along with the overall decrease in population for many of the municipalities, would theoretically decrease demand on these utilities.

The median value of an owner-occupied home in 2000 for Niagara County was approximately $82,600. The same statistic for Erie County was approximately $90,800. In the City of Lockport and the Town of Newfane, the median value of an owner-occupied home was $69,900 and $81,300, respectively (U.S. Census Bureau 2006).

Home values in the Western New York area are some of the lowest in the entire country, and have risen only nominally over the years. While other areas of the country have experienced a "housing boom" in recent years, the housing market in the Erie and Niagara County region has remained fairly constant.

Industry, Taxes, and Revenue. Economic resources within the Eighteenmile Creek watershed include agriculture, tourism and recreation, real estate, industry, and com-

Government-related employment is the highest of all sectors in both Niagara and Erie Counties.

merce. The information presented in this section is derived from the Bureau of Economic Analysis, within the U.S. Department of Commerce (U.S. Bureau of Economic Analysis 2006).

The major employment sectors (by number of employees) in the Niagara and Erie County region are presented in the Table 4-2 below.

Table 4-2 Employment by Industry for Niagara and Erie Counties – 2004

Industrial Sector	Erie County	Niagara County
Manufacturing	14.2%	10.0%
Retail trade	13.4%	11.3%
Finance and insurance	2.3%	6.2%
Professional and technical services	3.1%	6.1%
Administrative and waste services	4.4%	6.1%
Health care and social assistance	12.9%	12.3%
Accommodation and food services	7.3%	6.7%
Government	16.9%	14.4%
Other	25.5%	26.9%
Total	**100%**	**100%**

Source: Bureau of Economic Analysis 2006

As detailed in the table, the major industrial sectors with respect to employment in the area are manufacturing, retail trade, healthcare and social assistance, and government. These four sectors represent in the vicinity of 50% of all employment in each of the counties.

4.4 Land Use

Land use/land cover for the watershed was updated by the Great Lakes Center in 2004 using 2002 imagery.

The Great Lakes Center at Buffalo State College updated land use/land cover (LULC) data layers for the Eighteen-mile Creek watershed in 2004. The data layer was developed by overlaying 2002 Digital Orthophotography with USGS Historical LULC dataset. The images were manually inspected for inconsistencies, and the LULC was revised to create the updated layer. A description of land use within the watershed was developed based on the analyses of LULC data.

Table 4-3 presents a comparison of the land use layers. The information presented below includes:

- 1992 LULC percentages generated from 1992 USGS/EPA Land Use and Land Cover Data (NLCD) developed through remote sensing with a spatial resolution of 30 meters (Figure 4-6);
- 2004 LULC percentages developed through manual inspection of 2002 Digital Orthophotography with spatial resolution of 2 ft overlain with USGS Historical Land Use Land Cover dataset (Figure 4-7).

Table 4-3 Land Use-Land Cover Comparisons within Eighteenmile Creek Watershed

Type of Land Use	Percent of Land Use	
	1992 LULC Data	2004 LULC Data
Agricultural Land	70.04	57.14
Residential Use	4.28	7.96
Commercial/Industrial	1.27	4.24
Other Urban/Transportation and Utility	–	3.13
Recreational	1.71	–
Forest and Wetlands	22.3	26.96
Open Water	0.39	0.59

Residential, commercial, and industrial land uses rose between 1992 and 2004, while agricultural uses declined.

Because the 1992 and 2004 percentages resulted from similar processes, the results could be useful in assessing potential changes in the watershed. The comparison shows a 12.9 percent reduction in agricultural use accompanied by an increase in residential use (+3.68%), commercial and industrial use (+2.97%) and forests and wetlands (+4.66). These changes may be the result of differences in resolution between the two data sets or changes in land use between 1992 and 2004. The changes may be the result of abandonment of agricultural land that was sub-divided and used for residential and commercial development and/or allowed to revert to wetlands and forest.

Agricultural Land and Production. According to the LULC datasets, agricultural land comprises the largest land use within the watershed, although that use has declined. Agricultural land within the watershed is used for row crops, pasture, and orchards. The majority of the agri-

cultural land is used for pasture and hay, however, fruit trees are also a common crop planted on the lake plain, below the escarpment.

Niagara County produces a wide variety of agricultural products.

The value of agricultural products and services is summarized for Niagara County below. This information was compiled by the United States Department of Agriculture for the 2002 Census of Agriculture County Profile. Profile data is collected every 5 years. 2002 totals were compared to previous census data from 1997. Information of this detail is not readily available for the watershed.

A diverse number of agricultural products and services are produced in Niagara County. They include grains, oilseeds, dry beans, and dry peas, tobacco, cotton and cottonseed, vegetables, melons, potatoes, and sweet potatoes, fruits, tree nuts, honey and berries, nursery, greenhouse, floriculture, and sod, cut Christmas trees and short rotation woody crops and hay, poultry and eggs, cattle and calves, milk and other dairy products from cows, hogs and pigs, sheep, goats, and their products, horses, ponies, mules, burros, and donkeys, aquaculture, other animals and other animal products (National Agricultural Statistics Service [NASS] 2002).

The number of operating farms declined somewhat between 1997 (855) and 2002 (801), which represents a decline of 6 percent. In contrast, acreage in active agricultural production increased by 6 percent, from 139,031 acres in 1997 to 148,041 acres in 2002. In concert with the increase in total acres, the average size of farm in Niagara County increased by approximately 13 percent from 163 acres (1997) to 185 acres (2002).

While total market value of agricultural production declined between 1997 and 2000, values increased on an average-per-farm basis.

The actual market value of agricultural production declined moderately in 2002 ($59,906,000) compared to $60,116,000 in 1997. The primary sector comprising agricultural production earnings was row crops, followed by livestock sales. Crop sales in 2002 accounted for $39,764,000 and livestock sales accounted for $20,143,000. Market

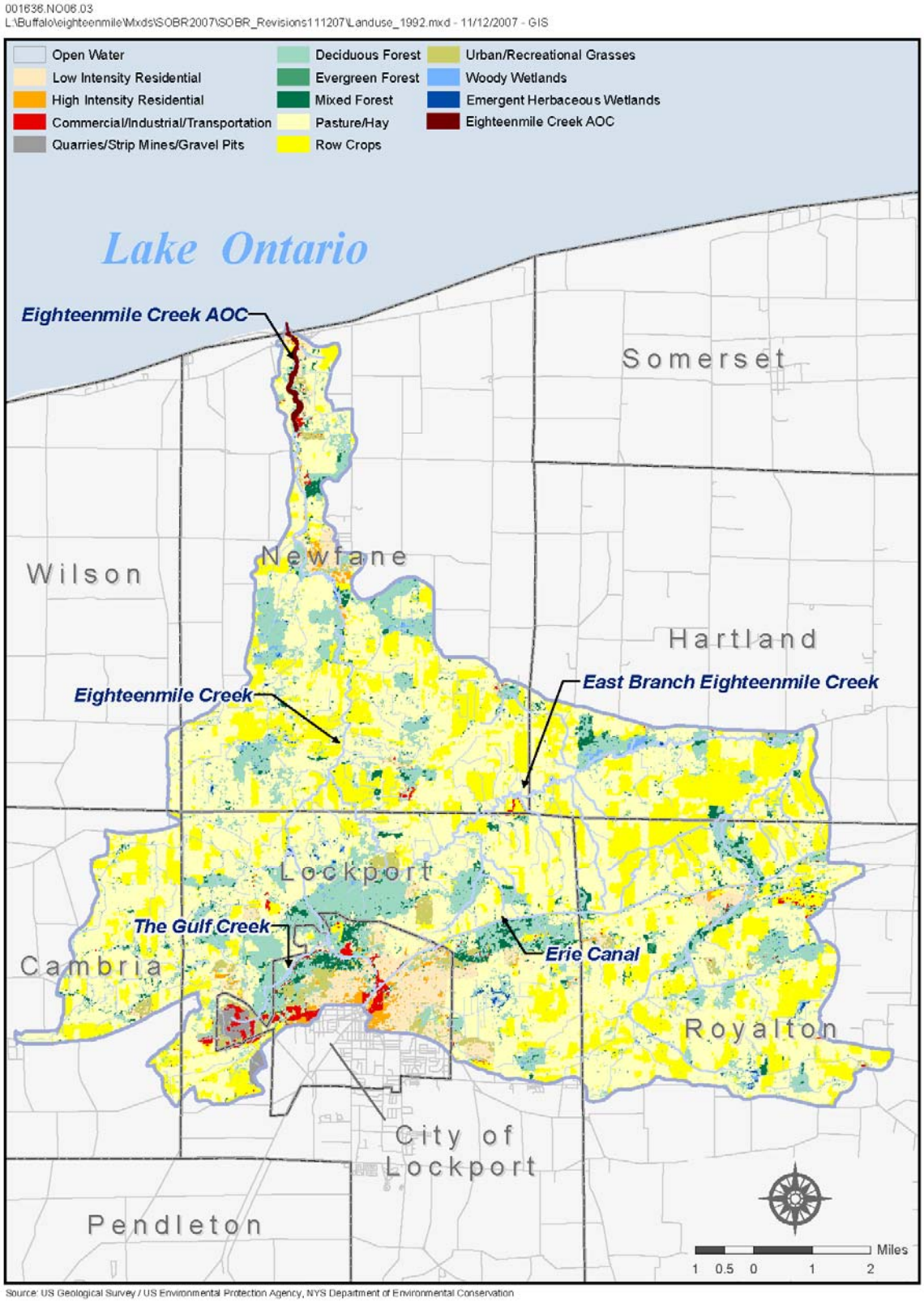


Figure 4-6 Land Use within the Eighteenmile Creek Watershed per the 1992 National land Cover Dataset (NLCD)

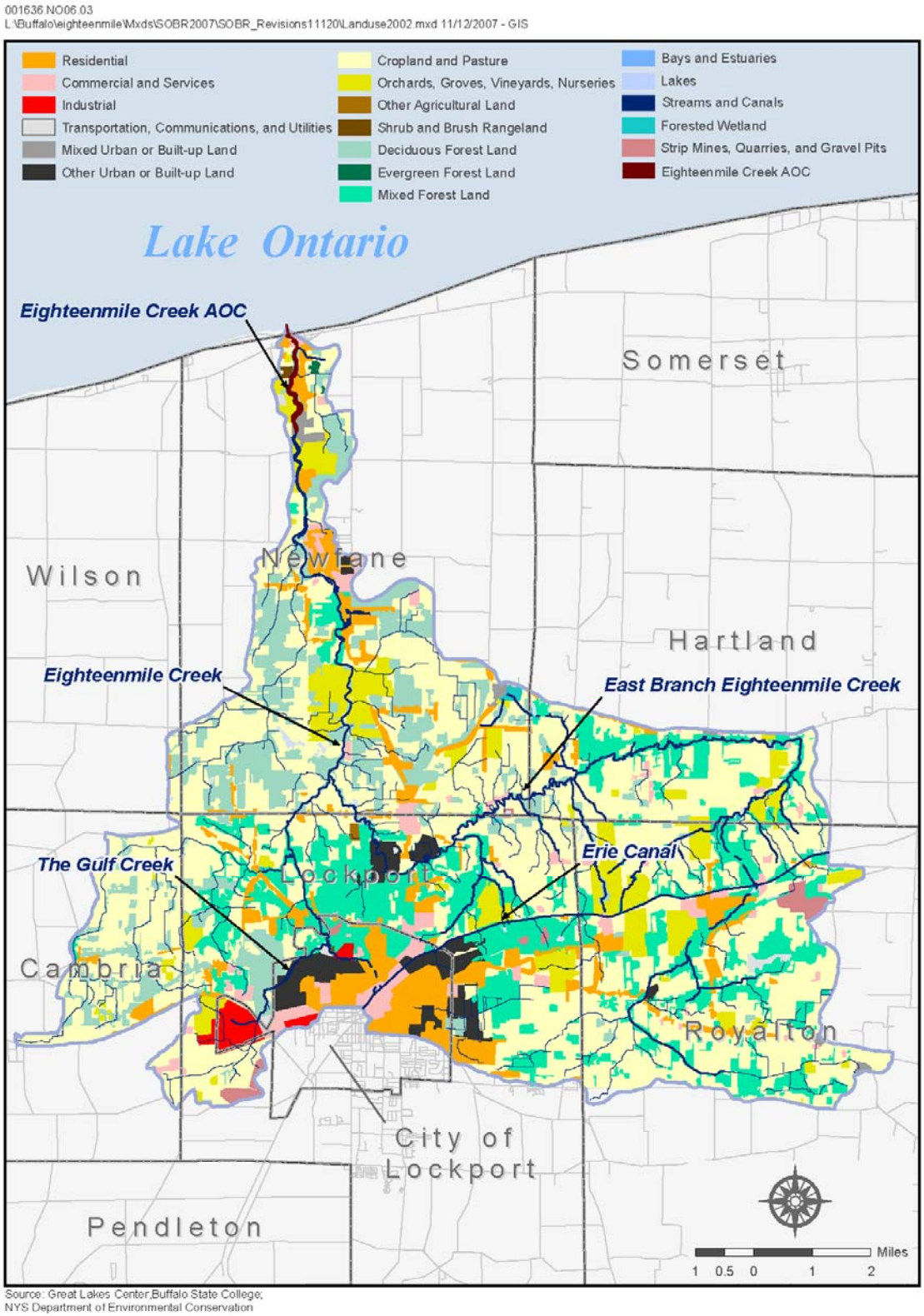


Figure 4-7 Land use within the Eighteenmile Creek Watershed per the 2004 Great Lakes Center at Buffalo State College Dataset

value production in terms of average per farm in 2002 was $74,789 compared to $70,311 in 1997, accounting for an increase of about 6 percent (NASS 2002).

Residential. Residential land is a mixture of high and low intensity development. According to the class definitions for Low and High Intensity Residential Land Use provided by USGS for the National Land Cover Data (NLCD), low intensity residential areas have a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of the cover. Vegetation may account for 20 to 70 percent of the cover. These areas most commonly include single-family housing units. Population densities will be lower than in high intensity residential areas. High intensity residential areas include highly developed areas where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80 to 100 percent of the cover.

The majority of residential land is located within the City of Lockport and to a lesser extent the small towns located throughout the watershed. High intensity development is largely located within the City of Lockport. Small areas of high intensity residential are located in Newfane and Gasport. The remainder of the residential land is typical of rural areas, with residential housing occurring in relatively low densities.

Recreational. Recreational land uses are important areas of consideration within the watershed. These areas include parks and marinas. The parkland serves to maintain green space in areas of urban or commercial/ industrial development and also provide opportunities for hunting, fishing, swimming, and hiking. Examples of parks within the watershed include: the Rollin T. Grant Gulf Wilderness Area, Highland Park, Krull Park, Olcott Beach, and Royalton Ravine County Park. Other recreational land uses within the watershed include golf courses and marinas. Olcott Harbor, at the mouth of Eighteenmile Creek, is used to house many pleasure and fishing boats during the summer months. The Erie Canal is also an important recreational land use; providing fishing, boating, and hiking opportunities. See expanded discussion on recreation below.

Forests and Wetlands. Forests and wetlands are important areas of consideration within the watershed. These areas provide habitat for a variety of species and provide other valuable ecological functions. These areas are discussed in Section 7.

Commercial/Industrial. The City of Lockport is the major commercial and industrial center of the watershed area. This land use appears to be most dense in the western portion of the city, along the Niagara Escarpment. Delphi-Harrison has been a major industrial facility located in this area. Other areas of high commercial/industrial development include Burt, Newfane, Wrights Corners, and Gasport. In these areas commercial/industrial land uses tend to be located along major roadways such as Route 78 and Route 31.

Brownfields. Brownfields are areas where redevelopment or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (Public Law 107-118 (H.R.2869). A listing of brownfields within the Eighteenmile Creek watershed, along with their past uses and current zoning can be found in Appendix C. The location of each is depicted in Figure 4-8. An understanding of these areas is important when understanding the impact of land use on water quality because each area represents a site where contamination potential may exist, and as a result, more careful consideration may be required prior to development. Depending on the specifics of a site, it may not be suitable for certain types of redevelopment (i.e., development that would require excavation and potentially disturb contaminants) or may be preferred for some types of development (i.e., the same type of development that the land was previously used for, thus avoiding impacting more pristine land). Some of these sites may require remediation before redevelopment.

Brownfields offer unique opportunities for the re-development of previously developed properties.

Niagara County is currently developing a brownfields plan to highlight regional opportunities for redevelopment, using a scoring system to determine reuse potential for sites. The White Transportation Site on Mill Street in the City of Lockport is considered as a location for redevelopment in the Plan. This site is located adjacent to the confluence of Eighteenmile Creek and the New York State Barge Canal. Sampling occurred in 2007 at this site as part of the NYSDEC

001636.NO06.03
L:\Buffalo\eighteenmile\Mxds\SOBR2007\SOBR_Revisions111207\Brownfields.mxd - 11/12/2007 - GIS

Source: Niagara County, NYS Department of Environmental Conservation

Figure 4-8 Brownfields within the Eighteenmile Creek Watershed

Supplemental Remedial Investigation/Feasibility Study of the former Flintkote site. Sampling is proposed to characterize the extent of contamination offsite of Flintkote, and what types of contamination, if any at the White Transportation site originated on site or are caused by the proximity to Flintkote and/or Eighteenmile Creek.

4.5 Local Plans and Development

Watershed management and planning should account for existing and proposed land uses, and existing and proposed planning documents, such as master or comprehensive planning documents and Local Waterfront Revitalization Plans (LWRP).

Five communities in the Eighteenmile Creek watershed have developed comprehensive or master plans, including the Towns of Hartland, Cambria, Lockport; the village and town of Wilson; and the City of Lockport. The Town of Newfane has a LWRP that was adopted in 1998 and The City of Lockport is also in the process of adopting a final Local Waterfront Revitalization Plan, which is expected by the end of 2007.

Local Waterfront Revitalization Plans show a vision for a community's waterfront and can increase an area's ability to attract appropriate development for waterfront areas while preserving the waterfront's natural features. A community with an LWRP is also more likely to attract public and private funding for waterfront development and preservation. The New York State Environmental Protection Fund allocates funding for LWRP development and implementation. Revitalization activities are underway in the Town of Olcott and have already begun in the City of Lockport.

As part of their LWRP, the Town of Newfane will implement the Olcott Harbor Renovation Project, which will improve amenities for boaters at Olcott Harbor. As the City of Lockport's LWRP is being finalized, the City has begun proposing zoning changes along the NYS Barge Canal and Eighteenmile Creek corridors to better fit existing uses and future plans for the waterfront. For example, the vision for the former Flintkote site is to develop a park once environmental remediation is complete. In an effort to expedite the development of a park the zoning

may be changed from industrial to a zoning classification that accommodates parks and recreation.

The City is also in the process of constructing the Lockport Historic Canal Park as part of the LWRP's waterfront vision. This project is intended to encourage commercial development and tourism and improve recreational outlets to the Canal. The City completed a decorative railing on Richmond Avenue as a component of this project in September 2006.

Master plans and LWRPs are tools for guiding future development in a manner that is compatible with existing and planned land uses. New development in Niagara County, as interpreted from Niagara County's survey of construction permits issued in 2005, tends to be heavily residential, with some commercial and other development as well. Table 4-4 summarizes overall building permits issued in the Niagara County municipalities that fall within the Eighteenmile Creek watershed boundary. Most development, residential and commercial, appears to be concentrated within the Town and City of Lockport. However, areas that are historically rural issued permits for several new residential developments in 2005, which may be a result of conversion of agricultural land to residential land.

Table 4-4 Number of Building Permits Issued in 2005 for Towns that Occur or Partially Occur in the Eighteenmile Creek Watershed

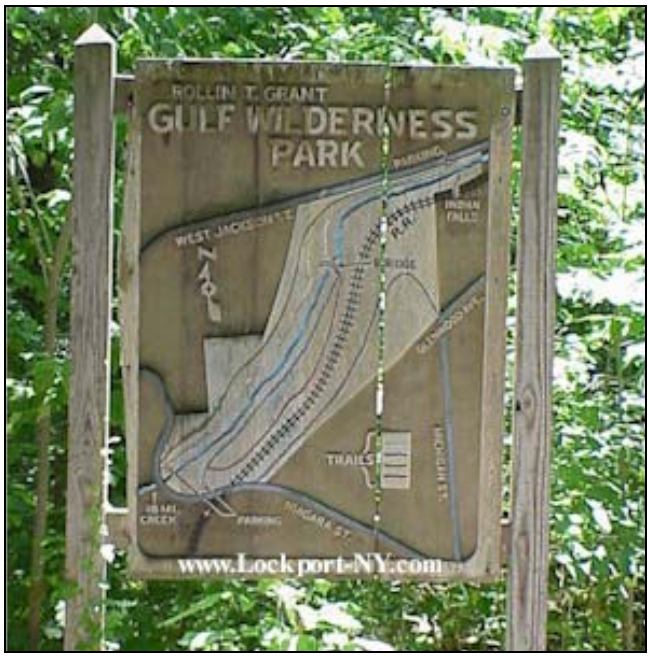
Municipality	Number of Building Permits Issued in 2005		
	Residential	Commercial	Other
City of Lockport	590	2	22
Town of Cambria	81	8	0
Town of Hartland	91	0	0
Town of Lockport	456	91	2
Town of Newfane	62	19	70
Town of Royalton	78	1	4
Town of Wilson	103	0	0

4.6 Recreation and Tourism

Recreational land uses are important areas of consideration within the watershed as they often represent opportunities for citizens to be outside and enjoy local resources for a variety of purposes. Increased participation in outdoor recreational activities also tends to increase awareness of local natural resources and the status of each.

These areas include parks, marinas, access for fishing, birding and hiking trails, etc. Parkland serves to maintain green space in areas of urban or commercial/industrial development and also provide opportunities for hunting, fishing, swimming, and hiking.

Examples of parks within the watershed include: the Rollin T. Grant Gulf Wilderness Area, Highland Park, Krull Park, Olcott Beach, and Royalton Ravine County Park. Other recreational land uses within the watershed include golf courses and marinas. Olcott Harbor, at the mouth of Eighteenmile Creek, is used to house many pleasure and fishing boats during the summer months. The Erie Canal is also an important recreational land use; providing fishing, boating, and hiking opportunities.

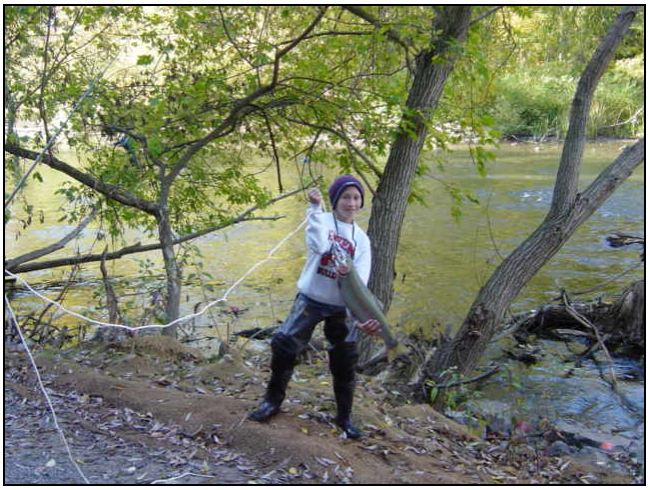


Gulf Wilderness Area Trailhead

Recreational opportunities abound within the Eighteenmile Creek watershed. The watershed is nestled in an area rich in natural and historic resources that provide recreational opportunities for people of all ages. Lake Ontario, Eighteenmile Creek, and the Erie Canal provide ample opportunities to enjoy boating, fishing, and other water-related activities. Lockport and Gasport feature boat launch ramps to access the canal and access to Lake Ontario is available in Newfane and Olcott. Shore fishing opportunities abound within the Eighteenmile Creek watershed, particularly from Fisherman's Park access to Burt Dam and the lower portion of Eighteenmile Creek in Newfane. In addition to boating and fishing, beach access is offered in Olcott just east of the mouth of Eighteenmile Creek.

Indian Falls, Gulf Wilderness Area

The reach of Eighteenmile Creek between Fisherman's Park and Burt Dam is the site of the Phase I and Phase II streambank and habitat restoration projects. Niagara County of Economic Development, along with a variety of other organizations and agencies (USACE, NCSWCD, NYSDEC, Natural Resource Conservation Service, and others), supported the completion of this project.



Sportfishing is a major economic resource in Niagara County. In 1982 it was estimated that sportfishing for salmonids generated $2.6 million for Niagara County's economy and more than 90 jobs were directly linked to the industry (Niagara County 1984). The New York Sea Grant conducted a study in 1996 in an effort to update information pertaining to usage and expenditures related to fishing on waters of the Great Lakes in New York (Connelly 1999). According to the study, more than 35,000 anglers fished on the Great Lakes waters in Niagara and Orleans counties, contributing more than $7.6 million to local economies. Of these 35,000 anglers, 58% were from the Buffalo area, 18% were out-of-state residents, and 10% came from the Rochester area. Estimated angler effort for 1998 showed 65% focused on cold-water species, with the remainder being focused on bass or no specific type/other. Coho and chinook salmon were the most sought after species, comprising 34% of the total effort. Bass were the second most targeted group, receiving 15 % of the total effort. (See analysis of Fisherman's Park angler data below).

The NYSDEC began a Lake Ontario Tributary Angler Survey in Fall 2005 to gather baseline data for what is a planned regular survey (every three years) of Lake Ontario and its tributaries. The survey involved data collection through interviewing anglers at 28 Lake Ontario tributaries, including Eighteenmile Creek. While some of the smaller tributaries were visited less frequently for surveying purposes, angler surveys at Eighteenmile Creek accounted for a large part of the effort. Surveys revealed that overall release rates are higher for Lake Ontario tributaries than in

1984 when the last study of this kind was conducted, which the NYSDEC attributes to angler's desire to maintain the fisheries and conserve important angling species, such as steelhead. In comparison to other Lake Ontario tributaries, the survey revealed that Eighteenmile Creek has the highest number of angler hours of any tributary of Lake Ontario, excluding the Salmon River. The number of chinook salmon, steelhead and brown trout caught were also relatively high in comparison to other tributaries. The number of steelhead caught in Eighteenmile Creek was the highest of any tributary, excluding the Salmon River, which is attributed to more successful steelhead stocking in the western portion of Lake Ontario. The number of brown trout caught and harvested was highest in Eighteenmile Creek (Prindle et. al. 2005).

In addition to the world class salmonid fishery located in the lower reaches of the Eighteenmile Creek watershed and in the off shore waters of Lake Ontario at Olcott, the area is rich in history, historic properties and other facilities promoting the history of the area prior and after European settlement.

Numerous recreational and tourism opportunities exist within the Eighteenmile Creek watershed and in Niagara County. Activities that are promoted through a number of regional and state venues include cultural history, boating, hunting, fishing, bird watching, hiking, agricultural markets, wineries, camping, bed and breakfasts, museums, and local fairs and expositions.

Fisherman's Park (Newfane). An evaluation of angler use data was completed using the Town of Newfane's park access information from 2004 and 2005. Despite the fact that it falls within the Eighteenmile Creek Area of Concern, Fisherman's Park fishing is major angler destination and is located near Burt Dam on Eighteenmile Creek. Fisherman's Park represents a publicly accessible outlet for freshwater anglers. Eighteenmile Creek is a highly productive tributary of Lake Ontario and is popular for salmon, steelhead, and trout fishing during the fall month spawning runs from Lake Ontario. The Creek will hold salmon and trout October through November. By December, the Creek will contain primarily steelhead and rainbow trout.

Western New York was recently ranked as the number one fall fishing destination site for recreational fishing by Outdoor Life Magazine (Outdoor Life, Sept. 2006).

Fishing activity on Eighteenmile Creek during fall spawning runs.

The Fall 2005 Lake Ontario Tributary Survey showed that Eighteenmile Creek was ranked number one in angler hours for all Non-Salmon River tributaries (Prindle et. al. 2005). The data from Fisherman's Park provide an indication of the importance of this waterbody to the Watershed and New York State. A detailed description of the data and analyses is presented in Appendix D.

The Town of Newfane keeps records of vehicles by license plate number, state of origin, and total dollar amount collected for each day for the fall fishing season (October through November). Anglers pay a two dollar per-person ticket fee to fish at the Park. In 2005, $20,637 was collected, up 9% from 2004.

Fisherman recorded 22,000 fishing hours at Fisherman's Park in 2005, while license data from 2004 and 2005 showed that vehicles from 41 of 50 states arrived at the park.

The majority of vehicles visiting Fisherman's Park were from New York, Pennsylvania, and Ohio. An estimated 5,701 vehicles traveled to the Park in 2005, while 10,319 angler trips, representing 22,000 fishing hours were recorded in that year. Total angler trips grew by 9% in 2005 over 2004. The Park is a popular destination and attracts anglers from throughout the United States. About one half of the angler trips were taken by non (NYS) residents. Non-resident visitation for the Fall season (at least 5,000 anglers/yr.) represents one half of the Town of Newfane's permanent resident population. Over the course of the two-year period evaluated, vehicles from a total of 41 of the 50 states in the U.S. visited Fisherman's Park, attesting to its popularity. The estimated direct economic impact associated with fishing trip related spending for Fisherman's Park in 2005 was over $366,000.

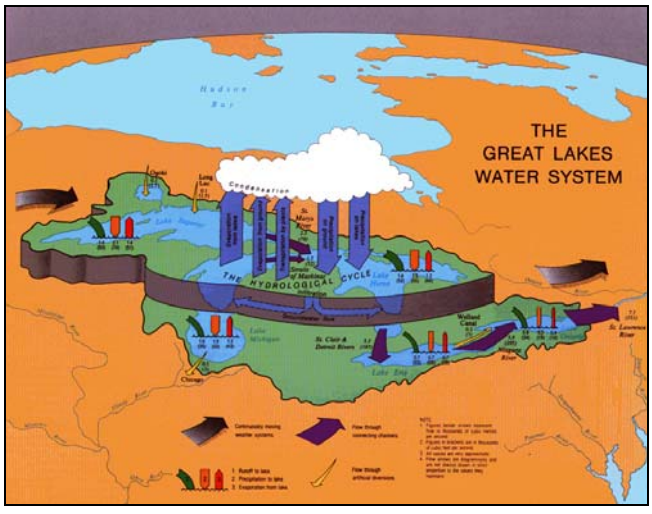
5 Basin Hydrology

5.1 Groundwater

Important aspects of understanding groundwater and watershed issues include acknowledging the value of the water stored, the interconnection of groundwater and surface water resources, and the dynamics (i.e. seasonality, frequency, volumes, etc.) of groundwater interactions with surface water resources. Groundwater used for agriculture, drinking water, and other uses is also important to note. Groundwater uses in the Eighteenmile Creek watershed are expected to be primarily agricultural and residential, as only rural areas are not serviced by a public water supply.

Four large aquifers are located in the watershed, however the primary source for drinking water is the Niagara River.

Four large aquifers are in the Eighteenmile Creek watershed: one carbonate rock aquifer and three unconsolidated sand and gravel aquifers (USGS 2000) (Figure 5-1). The New York and New England carbonate rock aquifer is found in the southern portion of the watershed. This aquifer extends eastward from the shore of Lake Erie near the City of Niagara Falls to just south of Utica, New York and, within the watershed, is bound on the north by the Niagara Escarpment. Most carbonate rock aquifers consist of limestone; however, marble and dolomite may also be found (USGS 2006).



Three unconsolidated sand and gravel aquifers also are found within the watershed: a small isolated aquifer at the toe of the es-

carpment east of Lockport, a larger isolated aquifer area near the shore of Lake Ontario, and a third area that encompasses much of the main branch of Eighteenmile Creek and spans an area from the confluence of The Gulf and the East Branch of Eighteenmile Creek northwest to Rochester. These aquifers were formed by glacial or alluvial deposition and are highly productive (USGS 2006). Groundwater flow is primarily local, originating from recharge areas near stream valley walls and discharging in the streams. Hydraulic conductivity (the capacity of the material to transmit fluids) of the unconsolidated sand and gravel aquifers is generally high.

Drinking Water. The primary source of drinking water for municipalities within the Eighteenmile Creek watershed is the Niagara County Water District, which supplies water to most of Niagara County from the West Branch of the Niagara River. The District serves the Towns of Cambria, Hartland, Lockport, Newfane and Royalton. The East Branch of the Niagara River is the source of drinking water for the City of Lockport. According to the 2005 Annual Drinking Water Quality Reports for both the Niagara County Water District and the City of Lockport Department of Public Utilities there are no violations of drinking water quality standards in either drinking water supply.

5.2 Surface Water

Knowledge of significant characteristics of surface water and groundwater (i.e., amount, quality, flow, recharge, etc.) is central to describing the state of the basin. To begin characterizing the surface water and groundwater in the Eighteenmile Creek watershed, topographic maps and the National Atlas (USGS 2000) were reviewed. These maps provided an overview of the hydrologic resources within the watershed. Analysis of surface water resources in this discussion is focused on perennial and intermittent streams; however, wetlands and ponds may also be placed this category. Wetland communities found within the watershed are discussed in Section 7. This discussion is focused on the large aquifers that occur in the region. Future study of local groundwater resources such as local water tables and small, perched aquifers may be important for watershed management. Surface and groundwater resources are depicted in Figure 5-1.

There are approximately 230 miles of streams and creeks within the watershed; with the primary drainage sources including Eighteenmile Creek, the East Branch, the Gulf, and the Erie Canal.

The Eighteenmile Creek watershed comprises approximately 230 miles of streams, both perennial and intermittent (see Figure 5-1 and Table 5-1). In general, the smaller tributaries drain to the east or west into the main branch of Eighteenmile Creek. Water then flows to the north into Lake Ontario. The exception is the Erie Canal, a manmade structure that runs east to west through the City of Lockport. During normal operations and drawdown periods water is discharged from the canal into Eighteenmile Creek, resulting in an increase in natural flow volumes. During dry periods, the canal contributes the majority of the flow for Eighteenmile Creek in the City of Lockport (NYSDEC 1997 and 2001).

Table 5-1 Stream Types within the Eighteenmile Creek Watershed

	Length (miles)[1]
Intermittent	156
Perennial	67
Erie Canal	9
Total	**232**

[1] Estimates were developed using GIS to calculate stream lengths from digital USGS topographic quadrangle maps.

Hydrology, Runoff, and Sediment Transport.

Approximately 9 miles of the historic Erie Canal occur within the watershed, which contributes flow to Eighteenmile Creek.

USGS stream flow gage data are not available for the Eighteenmile Creek watershed. However, a model of the watershed hydrology and sediment transport was funded by the U.S. Army Corps of Engineers, Buffalo District (Inamdar, 2005). The watershed model was developed using the Soil and Water Assessment Tool (SWAT) model. Inputs to the model included precipitation, recorded at the NOAA weather station in Niagara Falls, at an average of 923 mm (36.3 inches) over a 14 year period from 1990 to 2004. The same weather station recorded an average annual snowfall of 1832 mm (72.1 inches) over the same time period. The model was calibrated to match the seasonal pattern of monthly runoff ratios from SWAT simulations of the nearby gauged Tonawanda and Cayuga Creek watersheds. Annual runoff ratios for these watersheds is 45% of precipitation, which is somewhat higher than the typical range of between 25% to 40%, but not unusual given the wide runoff ratio range (5% to 100%) that is reported in the literature (Sankarasubramanian and Vogel, 2002). Model results indicate that the Eighteenmile Creek watershed has an annual stream flow discharge of 412 mm (16.2 inches) over a 211

Eighteenmile Creek has a total surface flow volume 69,880 acre-feet and an annual stream flow discharge of just over 16 inches. Modeling indicates that high water periods are reflected in periods of high sediment transport.

km^2 drainage area, or a total surface water flow volume of 8.69 x 10^7 m^3 (69,800 acre-ft). Figure 5-2 shows the average annual pattern of precipitation, evapotranspiration, and water yield from the Eighteenmile Creek basin, as simulated using the Eighteenmile Creek SWAT model. Periods of high water yield, shown below, correspond well with the periods of high sediment yield as presented in Inamdar (2005).

Snowmelt plus rainfall and early seasonal plant growth during spring months tend to lead to increased stormwater runoff, while runoff is greatly reduced during summer months when rainfall is lower and plant growth is greatest.

Soil types, land use, vegetative cover, and slope all influence timing and quantity of surface runoff in response to precipitation events. Higher runoff rates correspond with higher rates of urban development. Urbanized areas, such as Lockport, and Newfane have more impervious surfaces, typically connected to stormwater conveyances, and have less vegetation, and thus less precipitation interception, and less evapotranspiration. In general, the watershed is largely non-urban, and thus will see larger rates of interception and infiltration than would be expected in an urban area. Simulated runoff ratios, in the Eighteenmile Creek watershed SWAT model, show a distinct seasonal pattern. Runoff ratios increase in the Spring to greater than 1.0 when snowmelt during rainstorms results in greater runoff than precipitation. Runoff ratios decrease dramatically, to a low of less than 0.2 during the summer months when vegetation is at its thickest, thus rainfall interception and evapotranspiration are at their maximum.

Further modeling and analyses will need to be conducted to increase the accuracy of predicting sediment loads within the watershed.

Because of the presence of the Erie Canal, there are some unique challenges to modeling the hydrology within the watershed. The Erie Canal is fed by numerous tributaries, and is laid out perpendicular to natural flow patterns. The Erie Canal is a source of water to Eighteenmile Creek through a spillway and sluice (see Figure 5-3). Simulating these interconnections, in a more complete model of the hydrology of the watershed, would allow for a more accurate prediction of sediment loads, as well as pollutant fate and transport through the reach and canal network.

Figure 5-1 Hydrology of the Eighteenmile Creek

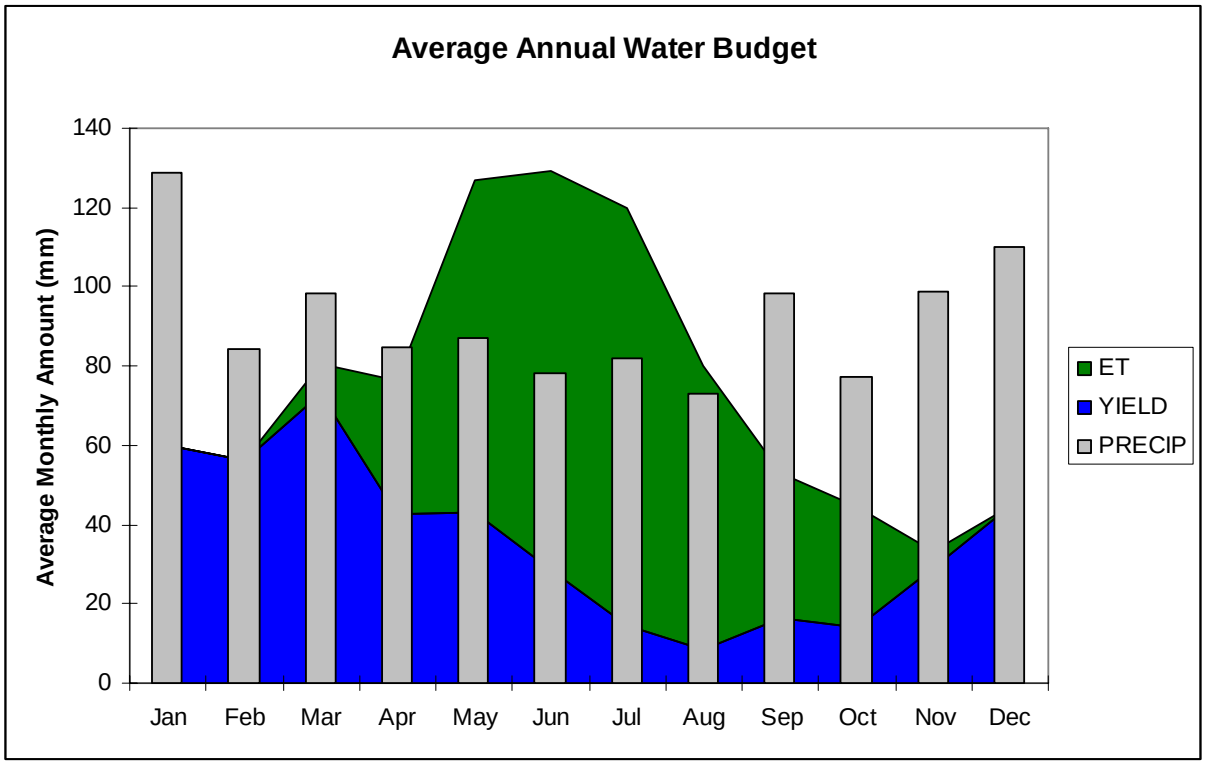


Figure 5-2 Average Annual Pattern of Precipitation, Evapotranspiration, and Water Yield

Figure 5-3 Hydraulic Connection between the Erie Canal and Eighteenmile Creek

5.3 Floodplains

Information on floodplains within the watershed assist municipalities with flood control issues, and is also relevant to water quality protection and ecosystem restoration efforts. Floodplains are typically lower-lying areas that are inundated by a waterbody during periods of high water levels, typically caused by heavy precipitation or upstream/downstream flooding. These areas are important as they dissipate excess flow and minimize potential damage further downstream. They also protect water quality by reducing erosion by reducing flow velocity and retaining silt and sediment carried in the water. Streams that remain connected to their floodplains are also less apt to experience severe down-cutting within the stream channel. Undisturbed floodplains can contain diverse habitat types and distinct plant and animal communities. These floodplain ecosystems are of high biological diversity and provide important spawning and rearing, nesting, and feeding areas for a variety of fish, birds, and amphibians.

Floodplains are important for the protection of water quality within streams. About 5% of the land area or 2,900 acres of mapped 100-year floodplain occur within the watershed.

A qualitative characterization of floodplains was conducted using USGS topographic maps and Federal Emergency Management Agency (FEMA) flood insurance mapping in order to determine the presence, extent, and orientation of FEMA-mapped floodplains within the Eighteenmile Creek watershed (Figure 5-4). The regulated floodway includes the channel of the stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood discharge can be conveyed without creating an increase of 1-foot cumulative rise in the 100-year floodplain. The floodplains are determined using statistical analyses of records of stream flow and rainfall, information obtained through consultation with the community, topographic surveys, and analyses using computer models. These areas are not static and may change based upon a number of variables, including development in areas upstream or physical changes to the stream channel. As floodplains are developed, and encroached upon, flood water flow width decreases, resulting in increased flow velocity and thus flood damage potential.

Figure 5-4 FEMA-Mapped Floodplains within the Eighteenmile Creek Watershed

Approximately 5% of the land area, or approximately 2,900 acres, within the watershed is considered to be within the 100-year floodplain, which the area that statistically has a 1% chance of being flooded any given year. The 100-year floodplain areas tend to be centered on the major streams within the watershed.

An additional 1% of the land area, approximately 400 acres, falls within the 500-year floodplain. The 500-year floodplain includes the areas designated as 100-year floodplain. These are areas above the 100-year floodplain, which are subject to 0.2% chance of flooding annually. The mapped 500-year floodplains within the watershed are largely located in the southern portion of the Town of Newfane, both north and south of the confluence with the East Branch and in a small portion of the East Branch in the southeast corner of the town (see Figure 5-4).

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6 Water Quality

Eighteenmile Creek is located in a Category I watershed, which is defined as those in need of restoration.

Water quality directly impacts the biotic conditions of Eighteenmile Creek, including habitat, wildlife, fisheries and human health. These impacts result in impairment to recreational uses and quality of life in the area. Water quality concerns span from the water column to the sediments in Eighteenmile Creek and the sources of these concerns encompass the watershed. The Eighteenmile Creek watershed is located within the greater Oak Orchard-Twelvemile watershed, which is designated a Category I watershed by the New York Unified Watershed Assessment Program (NYSDEC 1998). Category I watersheds are defined as those in need of restoration. These watersheds do not now meet, or face imminent threat of not meeting, clean water and other natural resource goals.

Water quality designations for rivers and streams are published by the NYSDEC to ensure that water quality is good enough for the designated best use. Water quality designations are based on existing or expected best uses, using a grading system from AA (highest quality) to D (most degraded). Each designation coincides with a best-use for classified water bodies and establishes water quality standards that must be met to ensure the designated use. Table 6-1 provides the best use for each water classification within the state and the total stream miles designated as such within the Eighteenmile Creek watershed. A total of 158.25 miles of streams are classified by the NYSDEC in the Eighteenmile Creek watershed.

Table 6-1 New York State Department of Environmental Conservation Best Use Designations for Surface Water Resources and Stream Length within the Eighteenmile Creek Watershed

Class	Best use	Length of Streams (miles)
AA	Drinking (after chlorination)	0
A	Drinking (after chlorination and filtration)	17.60
B	Bathing	1.62
C	Fishing	36.24
D	Secondary contact recreation (e.g. boating, kayaking)	102.79

Most of Eighteenmile Creek and its tributaries are Class D, while downstream sections of the creek are classified B and C and various tributaries are classified A, B, and C (Figure 6-1). Three segments of Eighteenmile Creek are listed in the 2005 NYSDEC Priority Waterbodies List (PWL) as experiencing water quality impacts. The lower portion of the creek, the section from the Lake Ontario outlet to 0.4 miles upstream, is classified B, and listed as impaired with fish consumption known to be precluded and aquatic life and recreation possibly stressed due to priority organics from toxic/contaminated sediments. This section is within the AOC. Eighteenmile Creek, middle portion, stretches from 0.4 miles from Lake Ontario to Newfane, is classified C and listed as having minor impacts. Aquatic life and recreation are suspected of being stressed by nutrients and priority organics. The sources are listed as agriculture, toxic/contaminated sediments and urban runoff. The portion of this segment below Burt Dam is part of the AOC.

A majority of Eighteenmile Creek is not safe for fish consumption, bathing, or drinking.

Eighteenmile Creek, upper portion is the main channel from Lockport to Newfane, is classified D and listed as impaired, with aquatic life and recreation known to be impaired by nutrients from municipal sources. Eighteenmile Creek is also on the Draft 2006 NYSDEC 303(d) List of Impaired Waterbodies for fish consumption, with the primary listing as polychlorinated biphenyl (PCB) contaminated sediments.

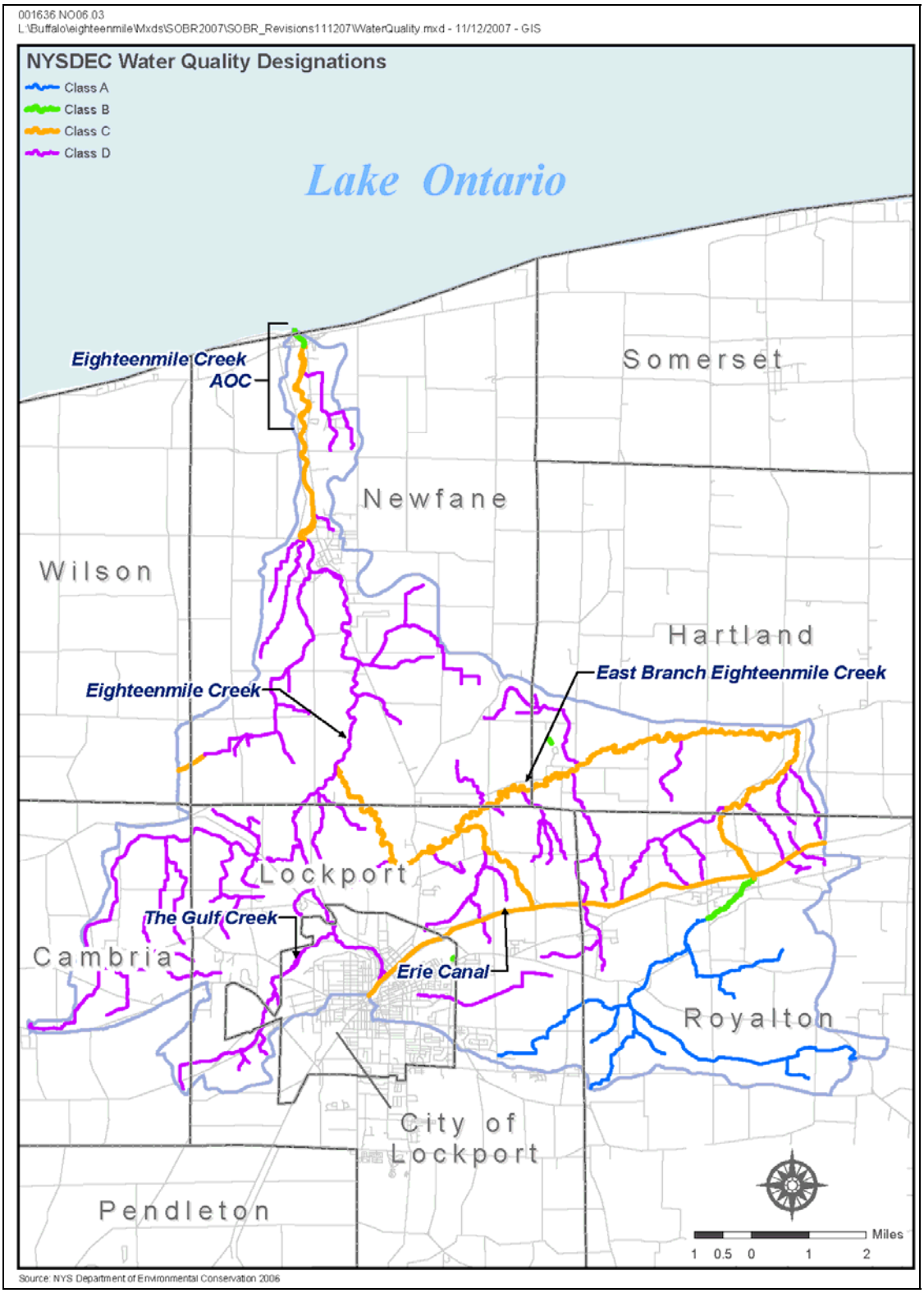


Figure 6-1 NYSDEC Water Quality Designations for Streams in the Eighteenmile Creek Watershed

The stream miles classified as A include the headwaters of the East Branch of Eighteenmile Creek, and are located in the Towns of Royalton and Lockport, upstream of the New York State Barge Canal and the City of Lockport (See Figure 6-1).

6.1 Sources Impacting Water Quality

Several factors have had a negative impact to the water quality within the Eighteenmile Creek watershed and have caused impairments and diminished use. Primary factors are discussed briefly below.

High levels of PCBs have been found in NYSBC.

New York State Barge Canal (NYSBC; a.k.a. Erie Canal). The NYSBC has been synonymous in previous studies with high levels of PCBs. An April 2005 investigation to determine the source of PCBs to the NYSBC involved extensive sediment sampling from upstream of the Route 93 bridge to a sampling area below the canal locks, a total study area of 3,970 feet of the canal. This area is downstream from the NYSBC/Eighteenmile Creek confluence. Sample analysis detected PCBs in all 53 sediment samples collected. The PCB Aroclor 1248 was most frequently detected; it was found in 48 of 53 samples, with a maximum concentration of 40,000 µg/kg at the farthest downstream sampling point (URS 2006). Previous water quality studies by NYSDEC (1994, 1995) indicated high levels of PCBs present in the NYSBC. The NYSBC discharges to Eighteenmile Creek, where PCB concentrations are some of the highest found throughout the stretch of the waterway, indicating that the source of PCB contamination is in the immediate vicinity of the NYSBC. Dioxins and furans have also been detected in canal sediments and exhibit the same pattern as PCBs: high concentrations in the vicinity of the canal, with lower concentrations downstream.

There are eleven SPDES-permitted facilities that discharge to Eighteenmile Creek.

Industrial and Municipal Wastewater Discharges. Six industrial and five municipal facilities are permitted to discharge to Eighteenmile Creek. These facilities contribute effluents to the creek system that could contain metals, organics, total suspended solids (TSS), and coliform bacteria and could cause fluctuations of biochemical oxygen demand (BOD), temperature, and pH. However, this effluent is monitored per the requirements of current State Pollutant Discharge Elimination

System (SPDES) program permits for these facilities. Table 6-2 below provides a listing of these facilities by application number and location. The SPDES program lists effluent limitations and monitoring requirements that must be met to avoid violation of water quality standards.

Table 6-2 NYSDEC SPDES Permit Holders, June 2005 through December 1, 2006

Application Number	Facility	Permit Expiration Date	Permit Status
Town of Cambria			
9-2920-00001/00001	Franklin Traffic Services	03/31/2011	Issued 08/05/2005
Town of Hartland			
9-2922-00006/00001	Piatkowski's Riteway Meats	Discontinued 08/01/2005	SPDES Deletion
City of Lockport			
9-2909-00026/00001	Lockport STP	10/31/2006	Needs Modifications
9-2909-00026/00001	Lockport STP	10/31/2011	Issued 6/8/2006
9-2909-00026/00001	Lockport STP	10/31/2011	Modification Issued 8/4/2006
9-2999-00002/00008	Redland Quarries NY	5/31/2012	Issued 11/9/2006
9-2909-00018/00138	Delphi Automotive Systems	Removal of WWTP discharge number 001 from current permit	Completeness Determination Due 12/26/2006
Town of Lockport			
9-2999-00002/00008	Redland Quarries NY	5/31/2012	Issued 11/9/2006
Town of Royalton			
9-2936-00008/00001	Gasport Sd 1 STP	6/30/2012	Issued 11/21/2006
9-2936-00017/00006	FMC Corp	Renewal	Completeness Determination Due 1/2/2007
Town of Newfane			
9-2928-00019/00006	Newfane-T-Waste Treatment Plant	5/1/2009	Issued 8/1/2006
Town of Wilson			
–	–	–	–

Additionally, other permitted industrial effluent in the form of industrial stormwater discharges from the above listed facilities enters the Eighteenmile Creek watershed. These discharges only require the development of a stormwater management plan and are not routinely monitored for physical and chemical parameters.

Even though permitted, these facilities contribute pollutants to Eighteenmile Creek. Recent monitoring studies concluded that total phosphorus contributions to Eighteenmile Creek were elevated by 6 to 12 times the total phosphorus levels of other waterbodies in Niagara County. Phosphorus concentrations were found to be significantly higher at a sampling site representing less than 5 percent of the watershed area (Stone Road), which was attributed to the upstream location of the City of Lockport's sewage treatment plant. Based on the phosphorus loading levels detected, Eighteenmile Creek is moderately to severely impacted by phosphorus pollution (Makarewicz et. al. 2006).

Five hazardous waste sites remain within the watershed.

Hazardous Waste Sites. Eighteen hazardous waste sites have been identified within the Eighteenmile Creek watershed, thirteen of which have been remediated or de-listed. The remaining five sites have the potential to affect on- and off-site environmental media. Contaminated soils and water can migrate off site and affect the surrounding area. Some of the contaminants of concern that were indicated during initial investigations of these sites include PCBs and heavy metals. Several sites may still pose a problem to the water quality of Eighteenmile Creek, including the former Flintkote site, which has been the focus of recent studies to characterize the extent of on- and off-site contamination (TVGA 2005 and Ecology and Environment, Inc. 2007).

Stormwater. Nonpoint source pollution has impacted the beneficial uses of Eighteenmile Creek by disrupting benthic habitat, and potentially degrading fish and wildlife populations, by contributing nutrients, TSS, toxics and increasing BOD. Nonpoint source pollution, or stormwater, from agricultural and urban sources is difficult to quantify. In addition to runoff from these areas, other sources may include spills within the watershed. The creation of a Historic/Current Pollutant Generator/Discharge database (a.k.a. watershed database) for the Eighteenmile Creek watershed was funded by the USACE – Buffalo District in 2005. The database indicates that 280 spills were reported between 1986 and 2004. Reported spills are typically petroleum based products from overfilling or leaking tanks (186 of reported spills). During that time period there were also 48 reported spills of hazardous materials including PCBs and ethylene glycol, with the rest of reported spills categorized as non-petroleum, non-hazardous, or other. When these mate-

rials are spilled they have the potential to seep into groundwater or wash into waterways if not properly contained and disposed. The majority of reported spills are contained immediately by responders; however, there is a potential for spills that are not reported, or not contained immediately, to migrate to surface waters like Eighteenmile Creek.

Over an 18-year period, 280 spills of petroleum and other hazardous materials occurred within the watershed.

The Western New York Stormwater Coalition was established in 2003 to address stormwater pollution to waterways like Eighteenmile Creek. Niagara County and the Town of Cambria are members of the Coalition. The remaining municipalities in the watershed are not mandated to institute a stormwater management program per recent regulations controlling stormwater from municipal separate storm sewer systems (EPA Phase II Stormwater Regulations); however, Niagara County has plans to identify and monitor stormwater outfalls to Eighteenmile Creek beginning in 2008.

Nonpoint source pollution from agricultural practices is being addressed via an Agricultural Environmental Management Program by the Niagara County Soil and Water Conservation District. Through this program, farms in the Eighteenmile Creek watershed will be inventoried to begin identifying best management practices and technical and financial assistance needed to reduce nonpoint source pollution. Habitat restoration and streambank stabilization efforts that have been completed and those that may occur in the future will also assist by naturally buffering Eighteenmile Creek from nonpoint source pollution.

Erosion and Sedimentation. Erosion and sedimentation of the surrounding land from agricultural and other land uses result in an increase in nutrients and suspended sediments within the water column of receiving streams and creeks. Nitrogen, phosphorus, and TSS loadings to Eighteenmile Creek increase during storm events, as eroded soils are washed into the waterway. Burt Reservoir acts as a sink for most particulate forms of these pollutants, however, loading of dissolved and particulate constituents contribute to water quality degradation downstream and in Lake Ontario. In addition, erosive forces of the creek on adjacent stream banks most likely also contribute to downstream loading of nutrients and TSS (Makarewicz et. al. 2006). As provided

in Section 5.2, additional studies will need to be conducted to further define and quantify sediment transport dynamics within the watershed.

Combined Sewer Overflows (CSOs). CSOs are relief points along a combined sewer system that discharge directly to waterways when the connected sewage treatment plant is at, or beyond, capacity. The City of Lockport has reduced the number of CSOs discharging to Eighteenmile Creek and the NYSBC from 30 to 13 as of October 2006. Currently, 6 CSOs discharge to Eighteenmile Creek and the remaining 7 discharge to the NYSBC. The City has prepared a Long Term Control Plan to address CSOs in accordance with the EPA's CSO Control Policy.

CSOs discharge directly into Eighteenmile Creek and the NYSBC from the City of Lockport.

In an effort to reduce the number and volume of CSOs to surface waters, Lockport has made various improvements to the system, including replacement of old sewer pipes and separation of storm and sanitary combined sewers. However, remaining CSO discharges continue to contribute pollutants. According to monitoring results, fecal coliform levels are in exceedance of Class D water quality standards most of the time (fecal coliform levels are above Class D standards upstream of CSOs as well). Several heavy metals have also been detected in CSO flows including copper, lead, chromium, iron, mercury and zinc. Dioxins were detected from one CSO outfall and from two ambient water samples (Clough Harbor Associates 2006). An ongoing monitoring program of remaining CSOs and an annual reporting procedure will continue in an effort to ensure that the City of Lockport's combined sewer system meets the goals of the EPA's CSO Control Policy. There are several mechanisms that can be used to show compliance with the Policy. The City of Lockport is taking a presumptive approach toward compliance and under this approach must show that at least 85 percent by volume of the combined sewer system is being eliminated or treated and that the City is taking steps to meet water quality standards in Eighteenmile Creek.

Sediments. The Lakewide Management Plan for Lake Ontario has documented six critical pollutants that contribute to impairments based on their toxicity and persistence in the environment: PCBs, mercury, DDT, dieldrin, mirex, and dioxins. Numerous studies have revealed that sediments in Eighteenmile Creek are a source of these pollutants to Lake Ontario, most notably,

PCBs. A recent investigation of sediment contaminants in Eighteenmile Creek by NCSWCD in the City of Lockport (Ecology and Environment, Inc. 2007) found that PCBs were present in sediments in most areas sampled. Samples were taken from Harwood Street, immediately downstream of the former Flintkote site, to Stone Road, which encompasses a stream length of approximately 8,000 feet (2,000 feet of this study area was omitted due to limited access and sediment accumulation). PCB concentrations were generally lower in deeper sediments, suggesting that there continues to be an active source of PCBs discharging to Eighteenmile Creek. Sediment studies have also revealed that heavy metal concentrations in sediments are also near or above TAGM criteria (Ecology and Environment, Inc. 2007) in the upper portion of the watershed.

Eighteenmile Creek is a source of pollutants to Lake Ontario.

Sediment PCB concentrations are generally higher above Burt Dam, which acts as a sediment sink within the ecosystem. High PCB levels found above the dam indicate that pollution sources are in the upper portion of the watershed. However, sediment contaminants are also found downstream within the AOC. In 2004, the Army Corps of Engineers analyzed sediments from 15 sites in the vicinity of the Village of Olcott near the outlet to Lake Ontario, and used sediment toxicity levels to determine bioaccumulation rates of these pollutants by exposing benthic oligochaetes (*Lumbriculus variegates*) to sediments for 30 days. Various pollutants were found in the tissues of these organisms depending on which sediment sample they were exposed to. Pollutants included chlorinated pesticides, PCBs, and heavy metals (USACE – ERDC 2004).

The results of the bioaccumulation study together with a recent study below Burt Dam (USEPA 2006a) indicate the continual transfer of these pollutants to the water column. PCBs, mercury, and dioxins were all detected in the ambient water. Ambient water PCB concentrations were significantly higher in Eighteenmile Creek than any other tributaries to Lake Ontario (Black River, Salmon River, Oswego River, and Genesee River).

Potential Impacts to Groundwater. The high conductivity of unconsolidated sand and gravel aquifers within the watershed lends to a high susceptibility to contamination in these areas. Sus-

ceptibility of these aquifers to pollution from spills, hazardous waste sites, and polluted stream water is a concern in the Eighteenmile Creek watershed. Review of the pollution generation database indicates there are 36 sites known to have groundwater impacts from spills and leaking underground storage tanks. Other groundwater contamination has been reported at known brownfield and inactive hazardous waste sites within the watershed. Aquifers characteristic of the watershed often discharge groundwater through streambeds and banks, making groundwater pollution another source of concern for the Eighteenmile Creek watershed.

The largest use problem facing the water supply system may be the aging water distribution infrastructure in the City of Lockport. The average daily water treated in 2005 in the City of Lockport was 7,459,800 gallons, while the total metered for daily use was 4,897,318 gallons. The remaining 2,562,518 gallons were unaccounted for and are attributed to leaks in the aging water mains. The impact of this infiltration to groundwater and surface waters has not been accounted for.

6.2 Contaminant Source Identification Efforts

Improving water quality for the long-term is going to necessitate tracking down, identifying, and discontinuing sources of pollution. A 2001 PCB source tracking study found high concentrations coming from some of the City of Lockport's CSOs, indicating a need to determine the sources of these discharges to the sanitary sewer system. Two recent source identification efforts were undertaken by Niagara County and NCSWCD, investigating the Flintkote site as a potential source of sediment contamination. A 2005 Site Investigation/Remedial Action report of the Flintkote site detected contamination on-site in surface and subsurface soils, standing water and sediments within the existing buildings, some groundwater samples, and the sediment within an outfall from the site to Eighteenmile Creek. Previous NYSDEC studies (NYSDEC 2004) had also found contamination within the creek sediment. There is some similarity between the types of contaminants detected in the creek sediment and on-site, including semi-volatile organic compounds (SVOCs), metals and PCBs. However, no impacts to surface water were identified in this investigation, and while the Flintkote site may have contributed to the contamination within

the creek in the past, past industrial activities upstream may have also contributed to sediment contamination (TVGA 2005).

Prior sampling by NYSDEC involved sediment sampling at Eighteenmile Creek from the Flintkote site and upstream to Remick Parkway (located south of the NYSBC). Eighteen of 19 sediment samples taken in this stretch had PCBs in levels that exceeded sediment criteria for human health bioaccumulation. Lead also exceeded sediment criteria at many sites, and, to a lesser extent, heavy metals including arsenic, mercury and zinc were found in Eighteenmile Creek sediment. The sources of these pollutants are unknown, but PCB concentrations were discovered to be higher upstream of the Clinton Street dam, suggesting that the source is in the vicinity of the dam (NYSDEC 2004). The NCSWCD study (Ecology and Environment, Inc. 2007) revealed elevated sediment concentrations of PCBs and metal concentrations throughout a study area, which spanned from Harwood Street to Stone Road (8,000 feet) in the City of Lockport. This study area was located entirely downstream from the Flintkote Site. Areas close to the Flintkote property and in the area near the intersection of Old Niagara and Plank Roads had elevated PCB and metal concentrations, suggesting the potential for an additional source of PCBs in an area north of the waste water treatment plant.

Currently, a supplemental remedial investigation/feasibility study (RI/FS) of the former Flintkote site is underway by NYSDEC. Objectives of the RI/FS include defining the nature and extent of sediment contamination in Eighteenmile Creek from the NYSBC to Harwood Street for the purpose of evaluating remedial alternatives, which includes determining sediment thickness, extent and type of contamination in the soil, waste and groundwater at properties adjacent to the site that could be potential sources of contaminants, and identifying potential human exposure pathways.

Contaminant source tracking efforts should continue to take place, as they are integral to determining whether specific sites are contributing to the degradation of water quality. Source tracking studies conclude that there is most likely an active source of PCB discharge within the upper watershed that is contributing to contaminant loading, as the characteristics of sediments (higher

concentrations near the surface and in certain hotspots) indicate constant loading to Eighteenmile Creek and the NYSBC in addition to past industrial discharges.

6.3 Surface Water and Sediment Studies

A host of surface water and sediment quality studies of Eighteenmile Creek have been completed over the years and include the following surveys and sampling by NYSDEC:

- Stream surveys for water quality parameters such as BOD, pH, temperature, nutrient levels, and coliform bacteria counts.
- Dioxin and furan sampling (1990), which included a single sample taken from Eighteenmile Creek that tested for total dioxins and total furans. This study was conducted to determine if there were any exposure risks to 2,3,7,8-TCDD (dioxin) from exposure to the water. Dioxins were not detected in this study.
- Lake Ontario tributary sampling in 1994, which included Passive In-Site Chemical Extraction Sampler (PISCES) and pressure filtration samples taken from various locations along Eighteenmile Creek and the NYS Barge Canal that were tested for dissolved phase PCBs, pesticides in the water column, and contaminant levels associated with the suspended solids in the water column.
- PCB sampling in 1995 as part of the Lake Ontario tributary sampling program tested specifically for PCBs from the discharge of the NYS Barge Canal into Eighteenmile Creek downstream to North Transit Road.
- Phenols and chlorinated benzene sampling and analysis in 1995 did not detect any of these compounds.
- PCB trackdown project (1998-2000) of the City of Lockport Sewer System, included PICES (within sewers) and whole water (collection from wastewater flow) sampling to identify potential source areas of PCBs within the sewer system (NYSDEC 2001).
- Rotating intensive basin surveys (RIBS), which included sampling for a wide range of contaminants such as metals and organic compounds as well as physical water quality parameters. The last RIBS data samples taken in Eighteenmile Creek and its tributaries were in 1999-2000 and included intensive sampling at Eighteenmile Creek at Newfane, and screening (macroinvertebrate surveys) at four additional sites: Eighteenmile Creek in Corwin, below Lockport, and the East Branch of Eighteenmile Creek in Wrights Corners and below Gasport.
- In 2002, NYSDEC, with NYS Department of Health and the Niagara County Health Department, conducted three separate sampling events to obtain information sufficient to de-

termine if the properties along Water Street are being impacted by the former Flintkote site and/or Eighteenmile Creek.

Other monitoring studies have taken place to determine the extent of water quality impairment:

- Long term monitoring of the City of Lockport's CSO discharges and downstream ambient water quality began in 1999 and will continue per the City's wastewater treatment plant SPDES permit.

- EPA Field Data Report: Lake Ontario Tributaries (2002-2004) studied the loadings of the six critical pollutants to Lake Ontario (PCBs, mercury, DDT, dieldrin, mirex, and dioxins) and found that PCB levels are significantly higher in Eighteenmile Creek than other major U.S. tributaries to Lake Ontario (Black, Salmon, Oswego and Genesee Rivers). Mercury was also found on all sampling dates. Some Lake Ontario Management Plan priority pollutants of concern (DDT, dieldrin and mirex) were not detected in Eighteenmile Creek in this study.

- A U.S. Army Corps of Engineers (2004) sediment bioaccumulation study examined the bioaccumulation potential of sediment contaminants in the AOC portion of Eighteenmile Creek. Chlorinated pesticides, PCBs, and heavy metals were all found to bioaccumulate to some degree depending on sediment constituents.

- Nutrient and Soil Losses from the Eighteenmile Creek Watershed were investigated (June 2006) in a joint project by SUNY Brockport and Niagara County Soil and Water Conservation District. The study quantified concentrations and loadings of nutrients and TSS that enter Lake Ontario through the Eighteenmile Creek watershed. Chemical and physical parameters sampled included total phosphorus, nitrate and nitrite, TSS, total Kjeldahl nitrogen, sodium, temperature, dissolved oxygen, conductivity and pH. Discharge was also monitored to calculate loading rates.

- Niagara County (2005) conducted a Site Investigation/Remedial Alternatives Report (SI/RAR) of the former Flintkote site involved sampling of on-site and off-site (outfall sediments in Eighteenmile Creek) environmental media and determined that while the Flintkote site may have been a source of contaminants to Eighteenmile Creek, there are likely other sources of contaminants in the upper watershed (TVGA 2005).

- NCSWCD (2006) PCB track down project found PCBs in all areas sampled in Eighteenmile Creek (from Harwood Street to Stone Road) and also showed that metals continue to be a source of concern in the creek. Areas in the vicinity of the Flintkote property and the intersection of Old Niagara and Plank Road had higher levels of PCBs.

Current and ongoing studies in the Eighteenmile Creek watershed:

- NYSDEC is conducting a Supplemental Remedial Investigation (RI)/Feasibility Study that will further define the nature and extent of sediment contamination in Eighteenmile Creek and the Flintkote millrace, and evaluate, to the extent possible, the source areas adjacent to the creek. As part of the Supplemental RI, Phase I Environmental Site Assessments will be completed at the adjacent source areas (i.e., White Transportation property, the former United Paperboard Company property and Upson Park) to help locate potential sampling locations and possibly identify the source(s) of the fill materials found there. Field investigations will then be completed at these properties to further characterize the nature and extent of contamination found on them during the Eighteenmile Creek Corridor Site RI. Additional sediment samples will also be collected during this study from areas no previously sampled (e.g., the center of the creek). Finally, an FS will be completed that evaluates remedial alternatives for Eighteenmile Creek and the millrace adjacent to the former Flintkote Plant.

7 Natural Resources

Lake Ontario and its drainage basin span two nations with very diverse landscapes and natural resources. The region has experienced many changes since the 19th century, as it became primarily agricultural, has experienced a rise, then decline of commercial fisheries, supported many industrial uses, and experienced a loss of many natural features including forests and wetlands. However, overall water quality is improving in the region and natural resources are abundant. The area is home to productive farm land, a sport and recreational fishing industry, many unique habitats, rare and endangered species, and mineral resources (Government of Canada and US EPA 1995).

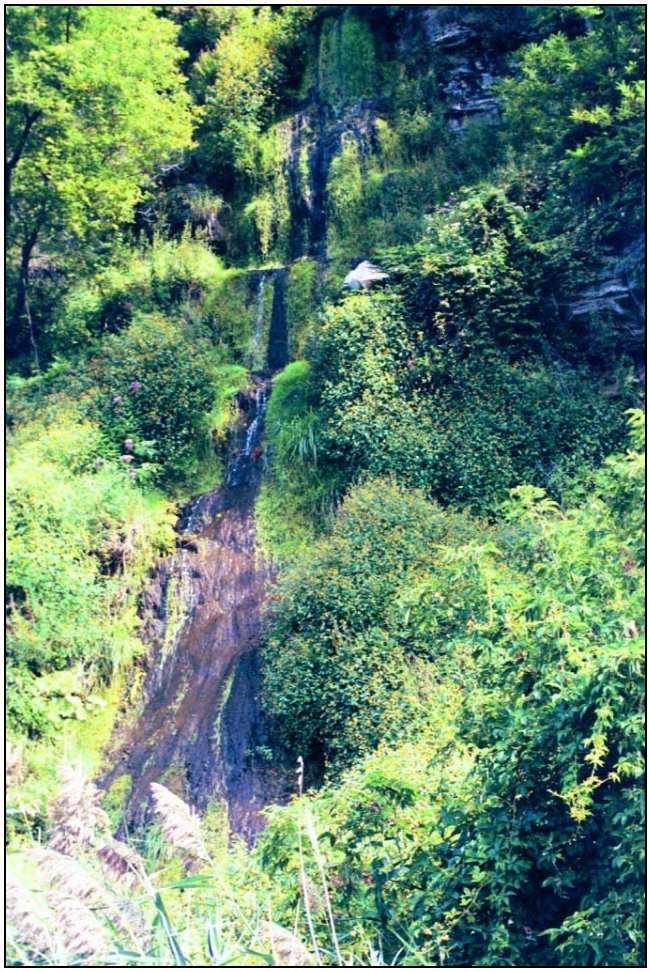
The watershed and surrounding areas have historically contained a wide variety of natural resources, and is an integral part of the ecological health of the Great Lakes Basin.

The Eighteenmile Creek watershed is part of the larger Southwestern Lake Ontario Basin, over 2 million acres of land in western and central New York that drain to Lake Ontario. The drainage basin supports a wide variety of vegetation, wildlife habitat and land use, all of which cumulatively affect the health of the Great Lakes Basin. While the headwaters of this larger basin are primarily forested with varying topography, the Niagara County portion of the watershed, including the Eighteenmile Creek basin, is generally flat with scattered forests and is primarily an agricultural region (NYSDEC 2005a).

The climate of the region is largely influenced by Lake Ontario, which in turn, influences the vegetative communities of the region. The area is classified as a humid temperate climate. Lake Ontario modifies and regulates the climate, making the region ideal for its agricultural uses, especially the establishment of fruit trees and vegetables. The soils in the watershed were formed by glacial deposits and are primarily silt and clay, making the soils ideal for agriculture and supporting high quality hardwoods in forested regions (Government of Canada and US EPA 1995).

The most prominent natural feature in the region is the Niagara Escarpment. While most of the Eighteenmile Creek watershed is generally flat, the Escarpment is a unique geological formation that provides a rocky, forested habitat for a variety of plants and wildlife, and is home to biotic communities not typical elsewhere in the County. The Escarpment begins in Ontario, Canada and stretches to Orleans County; within the watershed it passes through the City of Lockport. The corridor is characterized by steep cliffs containing exposures of rocks and fossils.

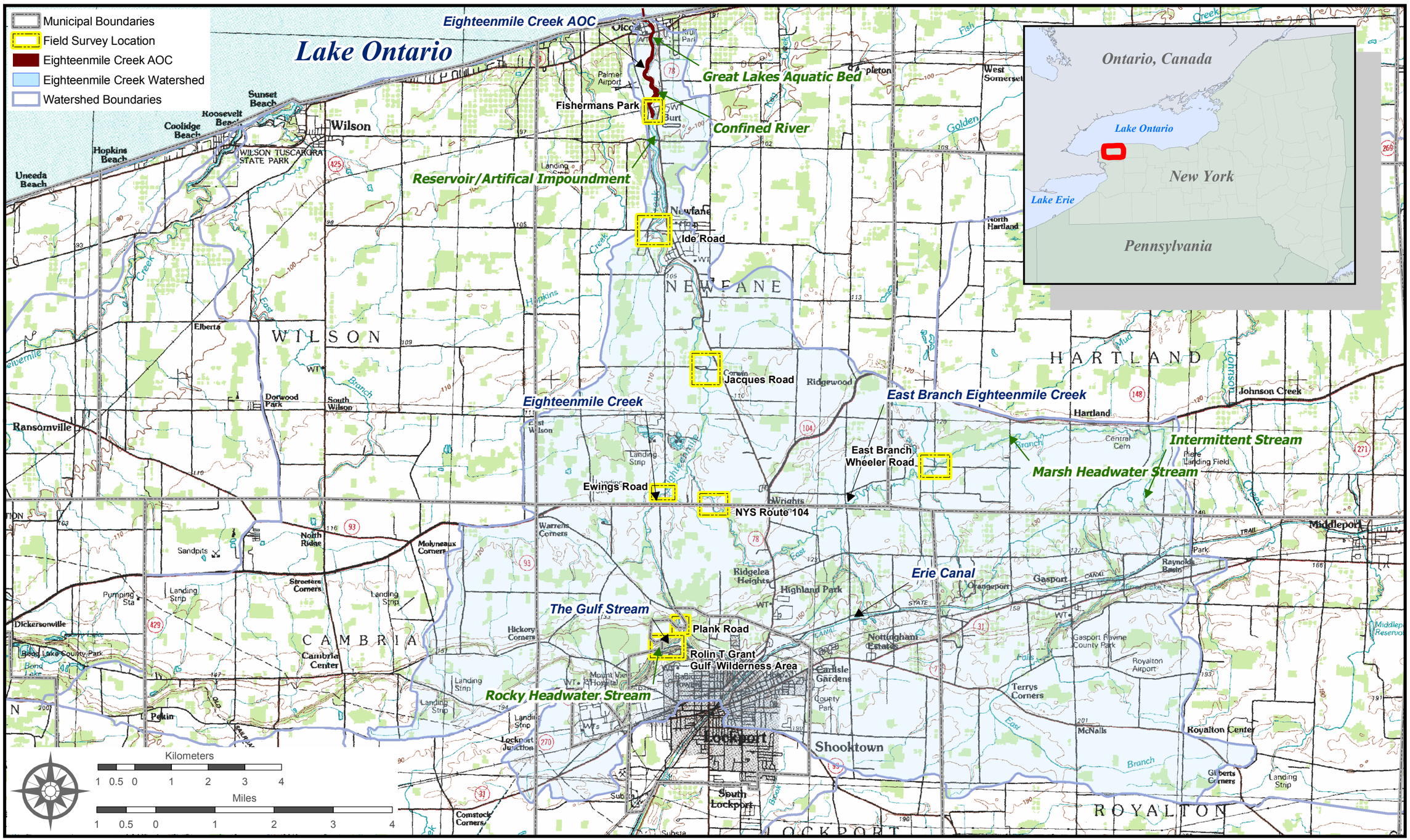
In many places the Escarpment is coupled with vernal pools at its base, which provides important habitat for aquatic wildlife. The area is home to at least three rare species of salamander, over 50 mammal species and over 300 bird species. In 1990, the Escarpment in Canada was designated a World Biosphere by the United Nations (Western New York Land Conservancy 2003). The exposed rocks and fossils in the region also provide abundant mineral resources, the watershed currently supports active mining quarries, as well as clay and sand and gravel mining.



Niagara Escarpment, Niagara County

Field surveys were conducted in 2003 and 2004 to sample in-stream and riparian habitats at 8 locations within the watershed.

In order to gain greater detail of information on ecological communities within specific areas, qualitative terrestrial (riparian) and aquatic surveys were conducted at eight locations throughout the watershed in order to initiate efforts of compiling information on the existing conditions within the Eighteenmile Creek watershed (Figure 7-1). Surveys were conducted



Source: US Geological Survey (100 K series, Lockport Quadrangle) 1994, NYS Department of Environmental Conservation

Figure 7-1 Field Survey Locations and Examples of Various Aquatic Community Types within the Eighteenmile Creek Watershed.

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within the mainstem and upper creek, and the East Branch. The terrestrial surveys were limited to areas adjacent to the creek and did not extend far beyond the stream corridor. Terrestrial and aquatic communities were classified using the New York State Ecological Community Classifications system (Edinger et al. 2002), which were developed as part of the New York State Natural Heritage Program (NHP) to provide a standard classification system for environmental impact statements. Wetland community classification was based upon the Cowardin (1979) system, which is used by the U.S. Fish Wildlife Service to identify wetland types for National Wetland Inventory (NWI) mapping. These efforts have been documented in two reports separate from this document, including the *Eighteenmile Creek Restoration Project: Baseline Habitat Characterization and Threatened and Endangered Species Coordination* (Ecology and Environment, Inc. 2003) and *Qualitative Habitat Characterization within Eighteenmile Creek Watershed* (Ecology and Environment, Inc. 2004).

Seven of the eight survey sites were established above Burt Dam. The site located below Burt Dam, the Fisherman's Park Access site, includes the creek area where the Eighteenmile Creek Aquatic Habitat Restoration Project was constructed in 2003 (Figure 7-1). The remaining sites were selected based on ease of accessibility (bridge/road crossing) and cooperation of landowners. Additionally, an attempt was made to distribute the sampling locations throughout the watershed in order to increase the probability of sampling a range of habitat types. Site selection was also influenced by a biological assessment of Eighteenmile Creek that was completed in 1990 (NYSDEC 1990) by the NYSDEC Stream Biomonitoring Unit to collect data to determine if biological impairment occurred in the reach from Lockport to the mouth at Lake Ontario. Two of the three sites (Jacques Road and Route 104) identified in the NYSDEC study were used for the qualitative field surveys in order to provide follow-up information from the 1990 effort.

The eight terrestrial and aquatic survey locations included (Figure 7-1):

- Mainstem of Eighteenmile Creek
  - Fishermans Park Access – located on the west side of Route 78 in the hamlet of Burt, NY; access is between Drake Road (to the south) and Godfrey Road (to the north).
  - Ide Road – located west of the village of Newfane and is the second bridge crossing upstream of Burt Dam; the bridge is located between West Creek Road and Route 78.

  - Jacques Road – located between Ewings Road and Route 78 in the Town of Newfane; the first road crossing downstream of the confluence with the East Branch of Eighteenmile Creek.

- Upper Eighteenmile Creek
  - Ewings Road – located approximately 0.1 miles north of Route 104 north of the Newfane/Lockport border; first accessible area upstream of the confluence of the Upper Eighteenmile section and the East Branch.
  - Plank Road – located between Old Niagara Road and West Jackson Street; north of the headwater area for Eighteenmile Creek in the northwest corner of the City of Lockport.
  - Rollin T. Grant Gulf Wilderness Park – the park is bounded by West Jackson Street, Michigan Street, Niagara Street and Glenwood Avenue in the northwest portion of the city of Lockport. This is the headwater area of upper Eighteenmile Creek; access to the site is from West Jackson Street.

- East Branch of Eighteenmile Creek
  - Rt. 104 – located at the bridge crossing between Ewings Road and Route 78 on the border of Lockport and Newfane; first bridge crossing on the East Branch upstream of the confluence with the Upper Eighteenmile Creek.
  - Wheeler Road – located at the bridge crossing, just east of Checkered Tavern Road in the Town of Hartland.

7.1 Terrestrial Vegetation Communities

10 ecological community types were identified in riparian areas during field surveys.

From a general perspective, terrestrial communities comprise the majority of the land within the Eighteenmile Creek watershed. Most of the undeveloped upland communities in the watershed appear to have been affected to some degree by human disturbance and are in various stages of succession following agricultural or silvicultural disturbance. Based on the interpretation of 2001 aerial photographs and limited roadside ground-truthing, the agricultural community types (e.g., cropland, orchard) are the dominant communities within the entire watershed, followed by forested areas, the latter of which are mostly limited to areas such as wetlands and ravines that could not historically been used for agriculture or developed for other purposes.

The field surveys identified ten ecological community types (i.e., cover types) across all of the survey locations; the most common ecological community in the study area was floodplain forest (the predominance of this community type is largely a by-product of the sampling scheme; surveys were conducted in relative proximity to the creek systems). Given the nature of past disturbance (logging, agriculture, land clearing, etc.) most communities types surveyed are considered

successional. One climax community, beech-maple mesic forest, was identified within the Rolin T. Grant Gulf Wilderness Park. Other terrestrial community types included:

- Oak hickory/Northern hardwoods
- Successional shrubland
- Successional old field
- Cropland/Field crops
- Brushy cleared land
- Mowed lawn
- Pine plantation
- Wetlands

There are a variety of wetland community types occurring throughout the watershed. These are described in more detail in the following section. Figures 7-3 through 7-10 present the survey areas where terrestrial and aquatic habitat surveys occurred (see Section 7.3).

A total of 126 plant species were identified among the sites. Table E-1 in Appendix E provides the species list and the presence and relative abundance of each species within each community type surveyed. Common tree species in the areas surveyed included black willow, box elder, green ash, black cherry, and sweet cherry. Less commonly occurring trees included Austrian pine, beech, slippery elm, and wild apple. Common shrub layer species included multiflora rose, red-osier dogwood, and silky dogwood; species found in fewer areas included Canadian yew, catalpa, glossy buckthorn, and winterberry. There was a wide variety of herbaceous species surveyed across the survey locations, representing the different degrees of moisture/soil saturation, soil types, and topography found within the survey areas. Poison ivy and the two invasive species mugwort and garlic mustard were found in most locations in relatively high abundances.

7.2 Wetlands

Wetlands are habitats of relatively high biological diversity and represent transitional zones between aquatic and terrestrial community types.

Wetlands are areas of land where water covers the soil or is present either at or near the surface of the soil at least part of the year, and contain plants and animals that are adapted to these conditions. Marshes, swamps, and bogs are those that many people can easily recognize as wetlands. Wetlands also occur along oceans, lakes, ponds, streams, and rivers, functioning as transitional areas between the aquatic and land environments. These ecological communities can also be less obvious and can occur in places where water is present for extended periods of time such as a low spot in a field that does not have an outlet for water to drain. Wetlands offer a variety of benefits and many are protected under federal and state laws.

Wetlands improve water quality by filtering out many pollutants such as excess sediment and nutrients (e.g., phosphorous and nitrogen from fertilizer runoff or sewage). High sediment loads can reduce clarity in the water column which can adversely affect aquatic plants and other organisms and can affect fish that filter water through their gills to breathe. Excess nutrients (i.e., nitrogen and phosphorus) in the water column can increase the growth of algae, which can lead to reduced oxygen in the water, which, in turn, can cause fish and other organisms to die thereby disrupting biological cycles and ecosystem function and integrity. Wetlands can support rich plant communities (including many grasses, sedges, herbs, shrubs, and trees) that are adapted to hydrologic conditions (water levels) that are intermediate between aquatic and terrestrial environments. These plants filter out excess sediment and absorb excess nutrients.

Wetlands also provide flood control and protect shorelines from erosion, which protects stream banks and upland areas, thus providing economic benefit. Wetlands function like big sponges, slowing down and absorbing excess water during storms. This combined action of slowing and storing water reduces flooding downstream and shoreline erosion.

Wetlands are some of the world's most diverse ecosystems. These communities provide food and habitat for fish and wildlife. Most species of freshwater fish are dependent on wetlands for breeding grounds, sources of food, and/or cover from predators. Many varieties of waterfowl and other birds depend on wetlands for feeding and resting areas during their spring and fall migration and for nesting.

Forested wetland during flood conditions in vicinity of Plank Road.

Additional social and cultural values associated with wetlands are linked to the many opportunities for educational and recreational activities. Wetlands offer an excellent opportunity to study ecosystems and interactions between species and their chemical and physical surroundings. Wetlands also support a number of recreational activities such as hunting, fishing, hiking, bird watching, and photography.

Wetland Communities within the Watershed

U.S. Fish and Wildlife Service NWI maps and NYSDEC Freshwater Wetland maps were reviewed to describe the community types and acreages of wetlands occurring within the Eighteenmile Creek watershed (Figure 7-2). NWI maps provide wetland coverage estimates based on aerial photography and topographic map interpretation. These maps represent a preliminary estimate of wetlands under federal jurisdiction. However, any additional wetlands that meet the federal criteria may be regulated regardless of whether they appear on NWI mapping. NYSDEC Freshwater Wetland mapping represents approximate locations of wetlands identified through aerial photography, soil surveys, other wetland inventories, and occasionally field verification. NYSDEC's wetland maps represent an agency record of wetlands under state jurisdiction; however, wetlands larger than 12.4 acres in size or of local significance that are not currently mapped as regulated may be taken into jurisdiction by NYSDEC.

National Wetland Inventory Mapping. The wetlands depicted on NWI mapping are classified according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin 1979). This classification system is based on characteristics of the individual wetland such as landscape position (i.e., lacustrine, riverine, palustrine, etc.), associated cover type (i.e., forested, shrub/scrub, emergent, etc.), hydrologic regime (i.e., semi-permanently flooded, seasonally flooded, etc.) and special modifiers/features (i.e., diked, excavated, impounded, etc.). U.S. Fish and Wildlife Service recently updated (2005) NWI mapping in Niagara County, which has modified the mapping of wetlands within the watershed compared to the previous mapping that was conducted.

There are more than 4,300 acres of wetlands at 698 locations mapped within the watershed.

Review of the NWI mapping identified 698 wetland areas encompassing approximately 4,362 acres, or roughly 8% of the total watershed acreage (55,456 acres) (Figure 7-2 and Table 7-1).[1] Six general categories of wetlands are shown on the NWI maps (Table 7-1).

Table 7-1 Wetland Communities Occurring within the Eighteenmile Creek Watershed (NWI)

Wetland Community	Number of Wetlands	Estimated Acreage	Relative Percentage of All Wetlands
Freshwater Forested/Shrub Wetland	267	3532	81%
Freshwater Emergent Wetland	69	237	5.4%
Freshwater Pond	338	235	5.4%
Lake	5	189	4.3
Riverine	15	16	3.9
Other	4	1	.0002

Forested and shrub wetland types are the predominant wetland community found within the watershed, comprising roughly 3,532 acres and accounting for approximately 81% of the total area of all wetlands.

NYSDEC Wetland Mapping. NYSDEC classifies wetlands according to function and value, ranging from Class I to Class IV. Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6NYCRR) Part 664 describes the system used to derive the individual classifications. The classifications are based on characteristics of the individual wetland such as special features, associated cover type, hydrologic and pollution control features, ecological associations, distribution, and location.

[1] This estimate is different than previously reported by Ecology and Environment, inc. (2004) apparently due to recent re-mapping efforts of NWI maps by the U.S. Fish and Wildlife Service.

Class I wetlands are those wetlands that are considered to be unique or of special value. Wetlands are designated a Class I wetlands if they: provide habitat for endangered or threatened species or contain an endangered or threatened plant species; support an animal species in abundance or diversity unusual for the state or for the major region of the state in which it is found; provide flood protection for a substantially developed area; are associated with a body of water or aquifer that is used primarily for public water supply; or contain four or more of the Class II characteristics.

Class II wetlands contain emergent areas with less than two-thirds cover comprised of purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*); are associated with a Class C(T) stream; are associated with a vulnerable species; provide flood protection for agricultural areas; provide tertiary treatment for sewage disposal systems; or are located in an urban area.

Class III wetlands are adjacent to fertile land; are a component of a surface water system with an open water component that receives significant pollution that may be processed by the wetland; occur on publicly owned land; or are visible from an interstate highway, a parkway, a designated scenic highway, or a passenger railroad and serve a valuable aesthetic or open space function.

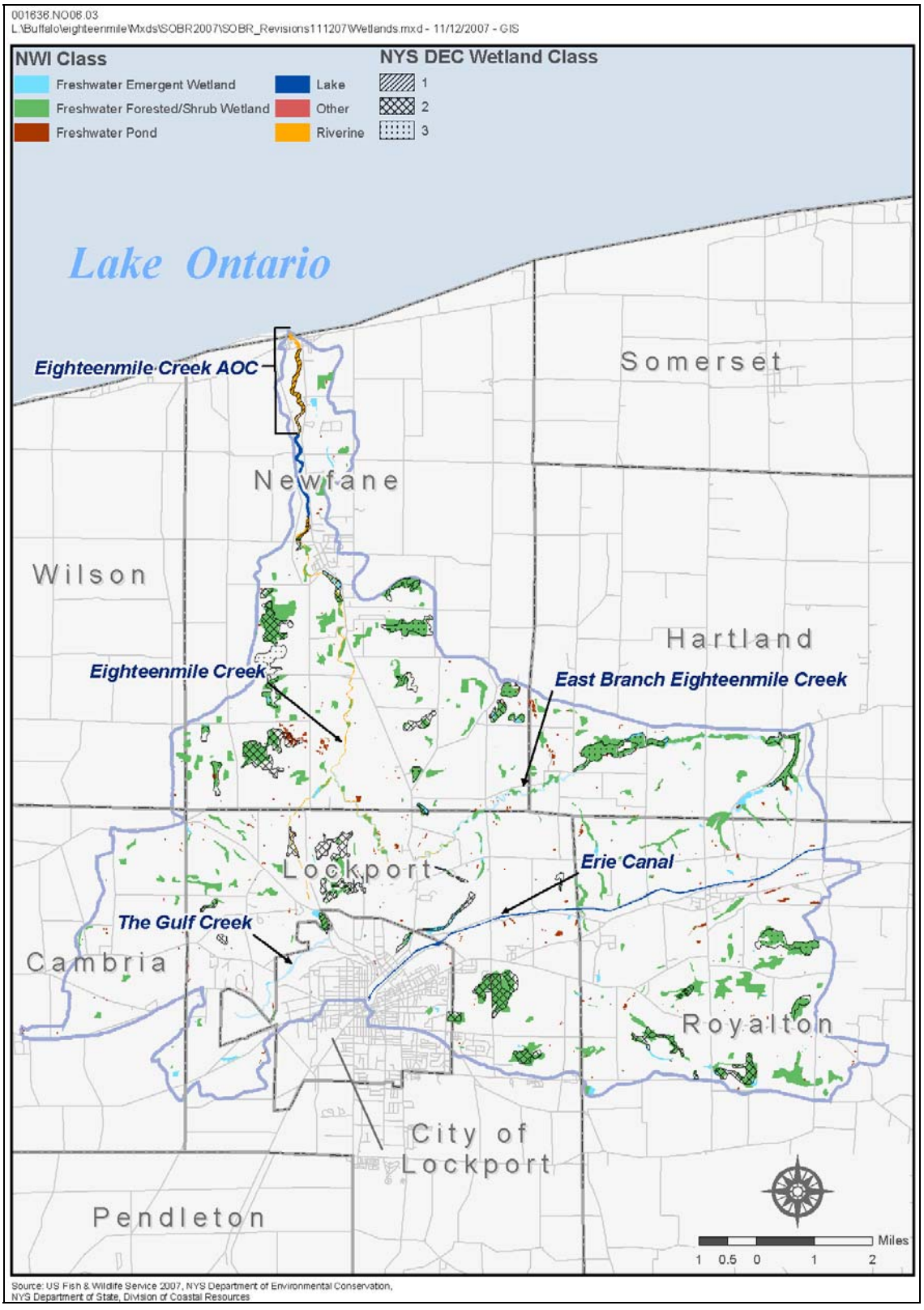


Figure 7-2 Wetlands and Significant Coastal Fish and Wildlife Habitats within the Eighteenmile Creek Watershed

Class IV wetlands are wetlands, that do not meet the qualifications for the other three classifications.

Review of NYSDEC's Freshwater Wetlands mapping shows 42 NYSDEC wetlands comprising approximately 2,143 acres within the Eighteenmile Creek watershed (Table 7-2). Most of these wetlands overlap or are mapped as occurring within or over portions of NWI mapped wetlands and therefore do not constitute additional wetland areas. The two largest wetlands are approximately 177 acres and 174 acres; one is associated with the East Branch of Eighteenmile Creek and the other wetland is located near the eastern boundary of the City of Lockport. Class II and Class III are the most numerous wetland types.

Table 7-2 NYSDEC Wetland Types Mapped within Eighteenmile Creek Watershed

NYSDEC Freshwater Class	Number of Wetlands	Total Area (Acres)
I	3	90
II	24	1,197
III	15	856
IV	-	-
Totals	42	2,143

7.3 Aquatic Communities

Limited field surveys identified 8 different aquatic communities at selected locations within the watershed.

A variety of aquatic communities occur within the Eighteenmile Creek watershed. Limited, qualitative field surveys were conducted as part of the pre-design of the aquatic habitat restoration efforts below Burt Dam and at site locations above the reservoir (as described below under Field Survey Results). Field visits were also conducted in other locations in order to identify community types in various locations per the New York State Ecological Community Classification System (Edinger et al. 2002) in order to provide consistency with a recognized convention.

This survey effort is not considered exhaustive given the limited nature of the total area surveyed rather this is an initial step toward the documentation of aquatic communities within the watershed. Community types are described briefly below.


E & E field team electrofishing in creek

Intermittent Stream. A small, intermittent, or ephemeral streambed in the uppermost segments of stream systems where water flows only during the spring or after a heavy rain and often remains longer, ponded in isolated pools is referred to as an intermittent stream. This is an extremely general classification as intermittent streams can be quite variable from habitat structure and wildlife value perspectives. These streams typically have a moderate to steep gradient and hydric soils. In terms of total stream length this community type is prevalent throughout the watershed. Examples of this community type are the natural stream systems occurring in the headwater areas (i.e. Upper East Branch of Eighteenmile Creek) that drain into Eighteenmile Creek (Figure 7-1).

Rocky Headwater Stream. A small- to moderate-sized perennial rocky stream typically with a moderate to steep gradient and cold water that flows over eroded bedrock, boulders, or cobbles in the area where stream systems originate is referred to as a rocky headwater stream. These streams are typically shallow, narrow, have a relatively small low flow discharge and usually represent a network of first to second order stream segments. These streams typically include alternating riffle and pool sections. Most of the erosion is headward, and deposition is minimal. Waterfalls, chutes, flumes, and cascades are typically present; these are treated as features of the more broadly defined community. The predominant source of organic energy in the stream is terrestrial leaf litter or organic matter. These are allochthonous streams or streams that depend on materials introduced from some other source as the predominant source of energy. They are typically surrounded by upland forests and situated in a confined valley. Tree shade reduces pri-

mary productivity. These streams have high water clarity and are well-oxygenated. An example of this community type in the Eighteenmile Creek watershed is The Gulf tributary in the Rolin T. Grant Gulf Wilderness Park (Figure 7-1).

Marsh Headwater Stream. A small, marshy perennial brook with a very low gradient, slow flow rate, and cool to warm water that flows through a marsh, fen, or swamp where a stream system originates is referred to as a marsh headwater stream. These streams usually have clearly distinguished meanders (i.e., high sinuosity) and are in unconfined landscapes. Marsh headwater streams are typically shallow and dominated by runs with interspersed pool sections. They are typically shallow, narrow, and have a relatively small flow discharge and usually represent a network of first- to second-order stream segments. Most of the erosion is headward, and deposition is minimal. The substrate is typically gravel or sand, but some segments may be dominated by silt, muck, peat, marl deposits, and/or woody/leafy debris. These streams may have high turbidity and be somewhat poorly oxygenated and can vary in alkalinity and color. An example of this community type in the Eighteenmile Creek watershed is the lower section of the East Branch of Eighteenmile Creek (Figure 7-1).

Ditch/Artificial Intermittent Stream. An artificial waterway constructed for drainage or irrigation of adjacent lands is referred to as a ditch or artificial intermittent stream. Water levels either fluctuate in response to variations in precipitation and groundwater levels or are artificially controlled. The sides of the ditches are often vegetated with grasses, and sedges are usually dominant. Exotic or weedy species are common. Examples of this community type in the Eighteenmile Creek watershed are some of the unnamed ditches that have been modified to drain agricultural lands and developed areas along the Eighteenmile Creek system; these systems are found throughout the agricultural areas within the watershed.

Confined River. Relatively large, fast-flowing sections of streams with a moderate to gentle gradient are referred to as a confined river. These streams have well-defined patterns of alternating pools, riffles, and runs. Confined rivers usually have poorly defined meanders (i.e., low sinuosity), occur in confined valleys, and are most typical of the mid-reaches of stream systems. These streams are typically of moderate depth, width, and low flow discharge and usually represent a network of third- to fourth-order stream segments. Most of the erosion is lateral, creating braids, channel islands, and bars, and deposition is moderate with a mix of coarse rocky to sandy substrate. The predominant source of organic energy is generated in the stream and is referred to as autochthonous. Autochthonous streams are streams that depend primarily on energy produced in the stream rather than on materials introduced from some other source. These streams have high water clarity and are well-oxygenated. They are typically surrounded by open upland riverside communities including riverside sand/gravel bar, cobble shore or one of the shoreline outcrop communities. This community type is present in the lower Eighteenmile Creek segment below Burt Dam. Lower Eighteenmile Creek is likely a third-order stream, but the majority of this segment is influenced by water levels from Lake Ontario that confound the classification (Figure 7-1).

Great Lakes Aquatic Bed. The Great Lakes Aquatic Bed refers to the protected shoals of the Great Lakes or Lake Champlain that occur in quiet bays that are protected from extreme wave action by islands, shoals, or barrier bars, and typically support large areas of "weeds" or aquatic macrophytes. These bays may freeze over in the winter and become inversely stratified. They are warm, mesotrophic, and alkaline. Substrate can vary among sand, silt, muck, and rock. Two variants are known: classical "aquatic beds" with abundant macrophytes and sparsely vegetated or un-vegetated bays. An example of this community type in the Eighteenmile Creek watershed is possibly Olcott Harbor and the lower portion of Eighteenmile Creek, which are dominated, in portions by aquatic macrophyte beds. Water levels are extremely influenced by Lake Ontario (Figure 7-1).

Eutrophic Pond. This aquatic community includes small, shallow, nutrient-rich ponds. The water is usually green with algae, and the bottom is mucky. Eutrophic ponds are too shallow to

remain stratified throughout the summer; they are winter-stratified, monomictic ponds. Additional characteristic features of a eutrophic pond include water that is murky, with low transparency, water rich in plant nutrients, high primary productivity, and a weedy shoreline. Examples of this community type are the typical farm ponds that are visible from roadside areas throughout the watershed.

Reservoir/Artificial Impoundment. An artificial lake created by the impoundment of a river with a dam is referred to as a reservoir or an artificial impoundment. Reservoirs are constructed to collect water for municipal and/or agricultural water use, to provide hydroelectric power, and to improve opportunities for recreational or development activities. This community type is present in the Burt Dam Reservoir section above Burt Dam (Figure 7-1).

Field Survey Results. Qualitative habitat descriptions were developed for small reaches at all eight of the survey locations, while the sampling of fish communities occurred at six sites. Fish sampling occurred at Ide Road, Jacques Road, Rollin T Grant Gulf Wilderness Park, Route 104, and Wheeler Road during the fall of 2003, and Ide Road, Jacques Road, Ewings Road, Rollin T Grant Gulf Wilderness Park, Route 104, and Wheeler Road during the spring of 2004 (Figure 7-1). Summary descriptions are provided below for each of the survey locations, however more complete details can be found in the report entitled *Qualitative Habitat Characterization within Eighteenmile Creek Watershed* (Ecology and Environment, Inc. 2005).

Fish surveys at 6 locations within the watershed resulted in the sampling and identification of 16 species

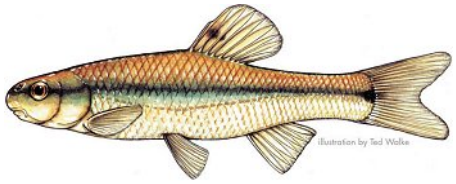
Main Stem Eighteenmile Creek

Fisherman's Park Access. The Fisherman's Park Access site includes the area where the Eighteenmile Creek Habitat Restoration Project work was conducted (Figure 7-3). The site extends from below Burt Dam to the Fisherman's Park Access point. The creek is located within a steep-sloped valley setting. The stream is characterized by pool-riffle-run complexes. Substrate at this site is a mixture of gravels, cobbles, and small and large boulders. The restoration project enhanced the aquatic habitat through a portion of the area

The greatest diversity and number of fish were sampled from the Ide Road survey location.

just downstream of Burt Dam to the Fisherman's Park access. Elements of habitat restoration included bank stabilization, the placement of hydraulic cover stones, installation of LUNKER structures (artificial overhanging bank structures that provide fish resting and cover areas), and placement of additional woody debris in the creek channel. Fish sampling was not conducted in this portion of Eighteenmile Creek.

Ide Road. The Ide Road sample location is just upstream from the upper extent of Burt Dam Reservoir (Figure 7-4). This area is characterized by a steep-sloped valley setting. The stream is characterized by run-riffle in-stream habitats. Substrate at this site is a mixture of gravels, cobbles, and small boulders, with silts and sands dominating the shallow, slackwater areas.



Bluntnose Minnow

Log Perch

Streambanks appeared to be relatively stable, with little active erosion in the project reach. Fish sampling yielded the highest diversity of fish species and the greatest number of fish of all locations sampled (Table 7-3). Darters were the most abundant fish in the riffle areas, and the log perch and creek chubs were the most abundant fish in the slack water areas. This may be a result of the proximity of this sampling location to Burt Reservoir, which would increase the number of different species that would potentially use the area (i.e. stream and lake/reservoir species).

Jacques Road. The Jacques Road site riparian zone is highly disturbed (Figure 7-5). The stream is characterized by run-riffle in-stream habitats. Substrate is dominated by cobbles and sand/gravel, in addition aquatic macrophyte beds (i.e. aquatic plants such as pondweed, duckweed, wild celery, raccoon tail, etc.) are located in the central portion of the creek channel. Streambanks appeared to be relatively stable, with little active erosion in the project reach. Sampling efforts resulted in the collection of 7 fish species (Table 7-3). The bluntnose minnow was the most abundant fish captured.

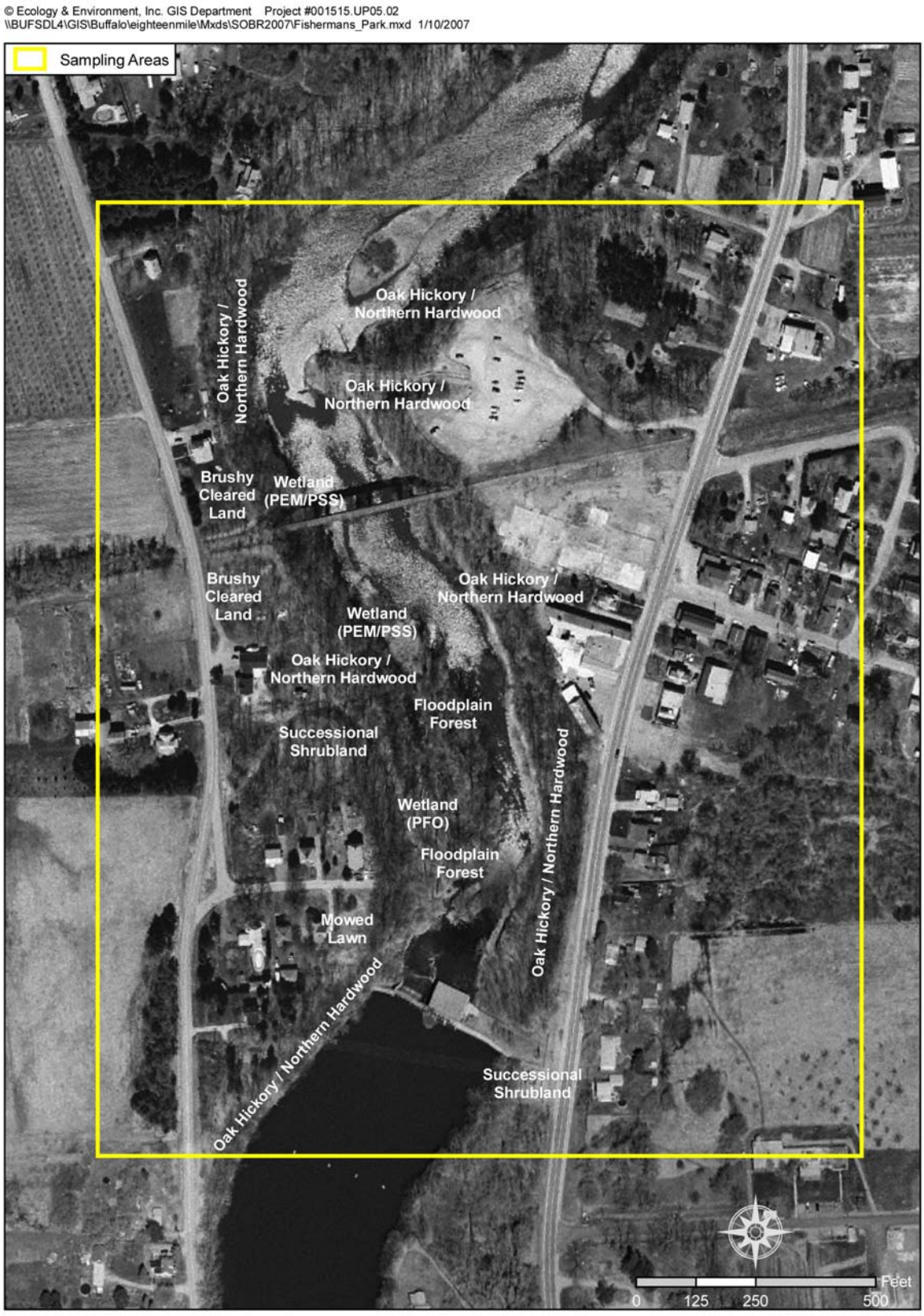


Figure 7-3 Terrestrial and Aquatic Surveys, Fishermans Park Location

Figure 7-4 Terrestrial and Aquatic Surveys, Ide Road Location

Figure 7-5 Terrestrial and Aquatic Surveys, Jaques Road Location

Table 7-3 Fish Species Composition at the Sampling Sites Above Burt Dam in the Eighteenmile Creek watershed

Common Name	Scientific Name	Ide Road	Jacques Road	Ewings Road	Gulf Park	East Branch – Route 104	East Branch – Wheeler Road
Banded killifish	*Fundulus diaphanus*					Y	
Blackside darter	*Percina maculata*	Y				Y	
Bluegill	*Lepomis macrochirus*				Y		
Bluntnose minnow	*Pimephales notatus*	Y	Y	Y	Y	Y	Y
Carp	*Cyprinus carpio*	Y			Y		
Common shiner	*Notropis cornutus*				Y	Y	
Fathead minnow	*Pimephales promelas*	Y	Y		Y	Y	
Greenside darter	*Etheostoma blennioides*	Y	Y			Y	
Green sunfish	*Lepomis cyanellus*	Y			Y	Y	
Logperch	*Percina caprodes*	Y					
Pumpkinseed	*Lepomis gibbosus*	Y					
Rock bass	*Ambloplites rupestris*	Y	Y			Y	Y
Smallmouth bass	*Micropterus dolomieui*	Y					
Striped shiner	*Notropis chrysocephalus*		Y			Y	
Tesselated darter	*Etheostoma olmstedi*	Y	Y			Y	Y
White sucker	*Catostomus commersoni*	Y	Y		Y		
Total Number of Species		**12**	**7**	**1**	**7**	**10**	**3**

Key:
Y = Present.

Upper Eighteenmile Creek

Ewings Road. Ewings Road contains a relatively undisturbed, late-successional to mature deciduous forest throughout most of the riparian zone, which shades much of the creek channel (Figure 7-6). The entire area sampled included the run in-stream habitat type. Substrate is completely embedded, dominated by silts/sands and organic matter. Signs of dumping of debris into the creek channel were observed from the Ewings Road Bridge.

Sampling efforts were only conducted during the spring at the Ewings Road site, and netted a total of 1 fish species (Table 7-3). It is likely that sampling technique and substrate conditions that prohibited wading in this section of the creek influenced the sampling results; a good portion of the available habitat in this area was not sampled. However, a lack of aquatic habitat structure and diversity were noted.

Plank Road. Plank Road contains an undisturbed, late-successional to mature deciduous/floodplain forest throughout most of the riparian zone (Figure 7-7). The channel shape is a u-shaped, meandering channel. The sampled reach was comprised of run habitat; substrate is completely embedded, dominated by silts/sands and organic matter. Signs of dumping of debris into the creek channel and the floodplain were observed from the Plank Road Bridge. Fish sampling did not occur at this location.

Rollin T Grant Gulf Wilderness Park. The Rollin T Grant Gulf Wilderness Park site is located in a City of Lockport Wilderness Park and was the most undisturbed of the sampling locations (Figure 7-8). The riparian zone consisted of a mature deciduous forest dominated by red oak and sugar maple, with almost 100% shading of the creek channel. Habitat types included pool-riffle, with most of the sample reach containing shallow riffles and one larger, deeper (1.5 feet) pool. Predominant substrate composition included boulder, cobbles, and gravels. Sand, silt, and organic matter also occurred.

Seven fish species were collected over the course of the fall and spring sampling events (Table 7-3). Most fish sampled were collected in the pool habitat below Indian Falls. The most abundant fish was the bluntnose minnow.

East Branch of Eighteenmile Creek

Route 104. The Route 104 East Branch site contains a partially intact riparian zone dominated by black willow and box elders, with silky dogwood dominating the shrub community (Figure 7-9). Habitats occurring within the sample reach included run-riffle. Substrate throughout the channel was completely embedded in silts and fines, except above and below the bridge abutments, where the substrate was dominated by cobble, gravel, and sand. Fish sampling efforts at

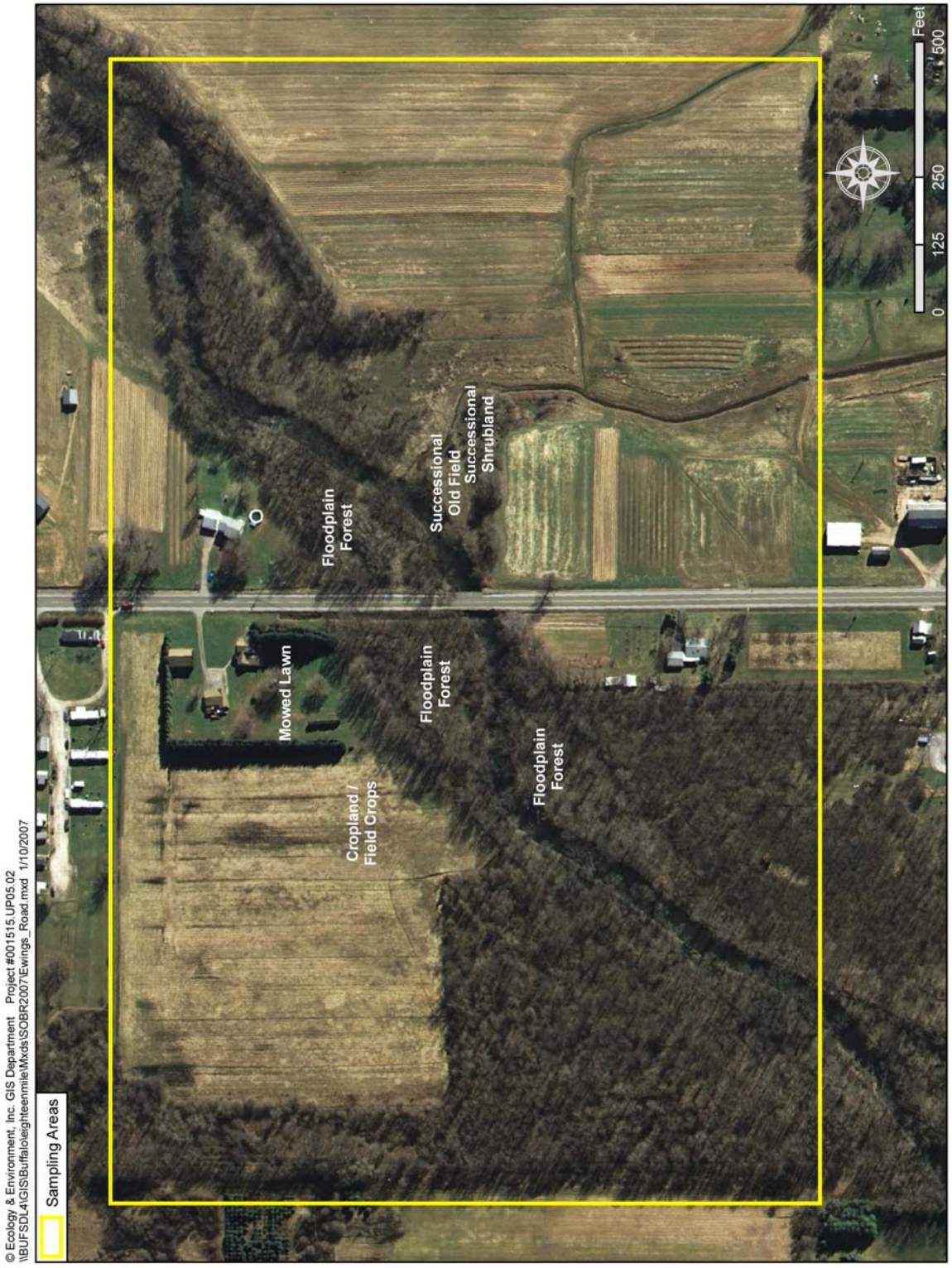


Figure 7-6 Terrestrial and Aquatic Surveys, Ewings Road Location

Figure 7-7 Terrestrial and Aquatic Surveys, Plank Road Location

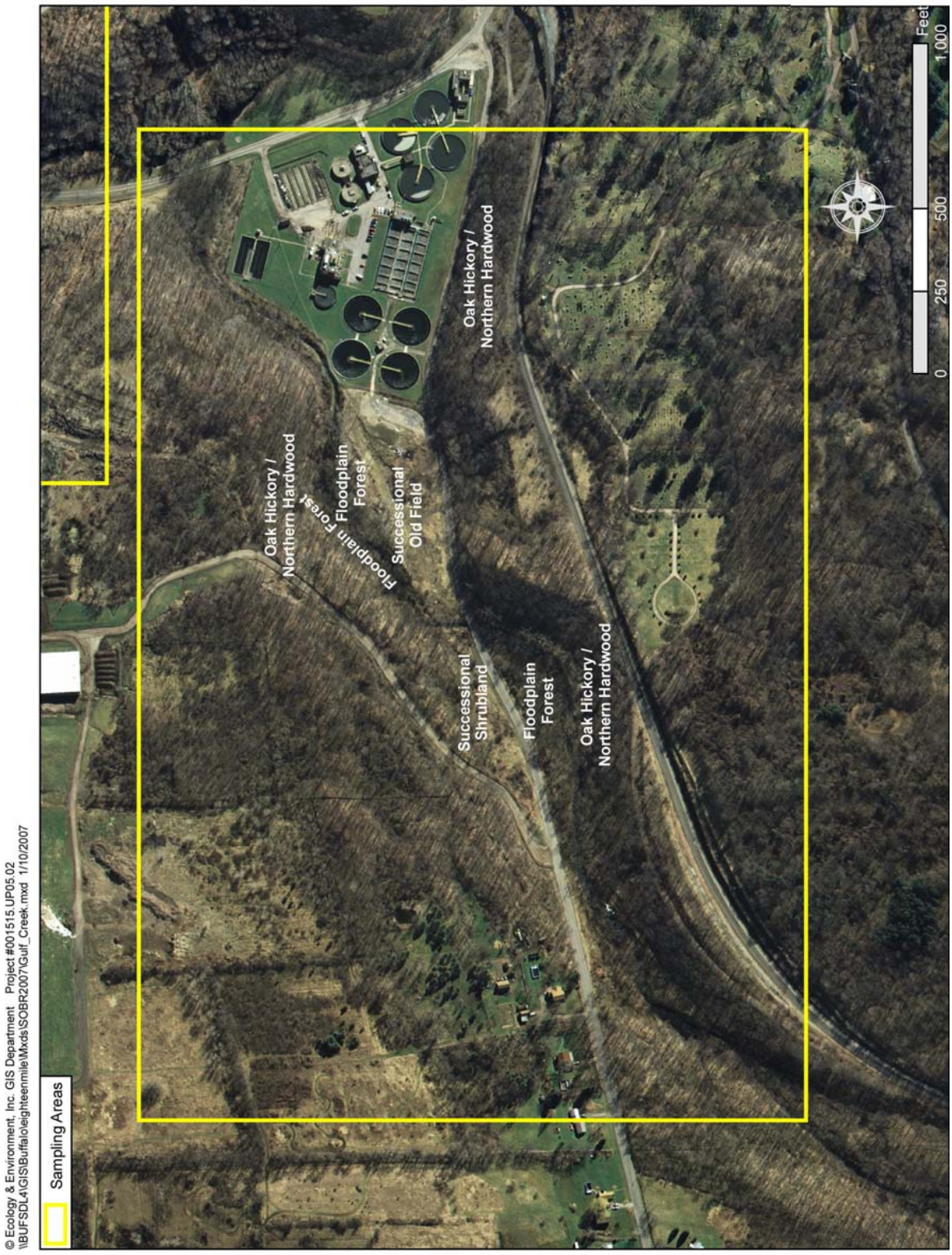


Figure 7-8 Terrestrial and Aquatic Surveys, Gulf Wilderness Park Location

Figure 7-9 Terrestrial and Aquatic Surveys, Wheeler Road Location

the East Branch Route 104 site netted a total of 10 fish species (Table 7-3), exhibiting relatively high diversity compared to other locations sampled. The most abundant species collected were the bluntnose and fathead minnow, although greenside darter was fairly common as well.

East Branch Wheeler Road. The Wheeler Road East Branch site contains a relatively undisturbed riparian zone (Figure 7-10). In-stream areas were characterized by run habitat within the sample reach. Substrate is mostly embedded with silts, fines, and organic matter, except above and below the Wheeler Road bridge abutments.

Sampling efforts at the East Branch Wheeler Road site collected a total of 3 fish species (Table 7-3). Rock bass were the most abundant fish captured during the spring and fall sampling events. Fish survey results were likely affected by channel and bank structure and steepness and soft, mucky substrates which made it difficult to wade in the channel and frustrated electrofishing efforts.

7.4 Wildlife

The types and abundance of wildlife occurring within the watershed are directly related to habitat availability and ecosystem health

The landscape within the Eighteenmile Creek watershed encompasses a variety of ecological communities, as presented in Sections 7.1 – 7.3. The diversity and overall numbers of wildlife species occurring within the watershed are directly related to the number, size, and quality of the existing habitat types, and the degree to which land has been developed. Generally, wildlife habitat contains a combination of resources (e.g. water, forage, cover) and environmental conditions (e.g., climate, temperature, predators/competitors) that promote the presence of certain species and allows for their survival and reproduction. Therefore, high quality habitats are those areas that contain the resources and environmental conditions that allow for the relatively successful survival and reproduction of a species over relatively long periods of time. On the other hand, habitats of lower, or marginal, quality maintain wildlife species but their rates of survival and reproduction are relatively low, and/or the area is suitable for only temporary or intermittent periods of time (Morrison, Marcot, and Mannan, 1998). Understanding the structure and composition of vegetation communities, the types and

frequencies of human disturbances, and the impact of contamination is critical in understanding the distribution and abundance of wildlife within the Eighteenmile Creek watershed.

There is currently no known formal wildlife monitoring program for the watershed beyond the Marsh Monitoring Program (MMP), occasional fish community sampling conducted by NYSDEC, and qualitative additional wildlife and habitat community characterizations in the upper watershed. There is therefore an apparent lack of watershed-specific information on the composition and diversity of wildlife communities. This may be especially true for mammals and herpetofauna. There is readily available information on birds as a result of the New York State Breeding Bird Atlas (Atlas 2000) project (NYSDEC 2006), and on fish species due to NYSDEC electro-fishing results and NYSDEC fish stocking and rearing efforts. Future efforts could focus on determining the value of the watershed by whether it sustains a variety of wildlife populations.

The 2007-2008 BUI Study will attempt to answer questions regarding the effects of contamination on fish and wildlife populations

As identified in Section 2, a Beneficial Use Impairment (BUI) Study was initiated in the spring of 2007, with field surveys continuing through the summer. The field work includes surveys at selected locations for mammals, amphibians, birds, and fish occurring within the Eighteenmile Creek AOC, and within similar habitats at Oak Orchard Creek in Orleans County. Mammal, amphibian and bird surveys began in the spring 2007 and will be completed in early fall 2007. Fish community sampling occurred in early and late summer. Collection of brown bullhead catfish was conducted during the late summer sampling event in order to complete gross visual external and internal body condition observations. Liver and fish tissue samples will be analyzed to determine the presence of abnormalities and for uptake of contaminants by the fish.

Figure 7-10 Terrestrial and Aquatic Surveys, East Branch Route 104 Location

This study will begin the process of determining the status of two "unknown" BUIs and one "likely" BUI, including the existence of fish tumors and other deformities and the status of fish and wildlife populations (unknown), and status of bird or animal deformities or reproductive problems (likely). The report is expected to be completed early in 2008.

Discussions of wildlife species are often discussed in association with particular upland community types. However, many species have habitat requirements that overlap between community types or may have a respective habitat niche that comprises a small portion of the community. For instance, since wetlands represent transitional areas between aquatic and terrestrial environments, wetlands are used by a wide variety of both terrestrial and aquatic species. The following provides a cursory discussion of mammal, reptile and amphibian, bird, and fish species that may occur within the Eighteenmile Creek watershed.

Mammals. Some common mammal species that are likely to inhabit the various upland communities within the watershed include raccoon, opossum, white-tailed deer, gray squirrel, red squirrel, chipmunk, gray fox, red fox, woodchuck, skunk, eastern cottontail rabbit, meadow vole, least shrew, hairy-tailed mole, coyote, and bats. Mammal species common in wetland habitats include beaver and muskrat; wetlands can additionally support many of the species listed above.

Reptiles and Amphibians. Common terrestrial reptiles and amphibians that likely inhabit the watershed include woodland and dusky salamanders, red-spotted newt (red eft-phase), various toads, eastern garter snake, and rat snake. Reptile and amphibian species commonly occur in wetland habitats, including the leopard frog, spring peeper, wood frog, bullfrog, as well as common turtle species such as the painted turtle and snapping turtle.

NYSDEC conducted the New York State Amphibian and Reptile Atlas Project between 1990 and 1999 to identify herpetofauna in New York State (NYSDEC 2000). Species reported to occur in the vicinity of the Eighteenmile Creek watershed included northern redback salamander, northern two-lined salamander, Eastern American toad, gray tree frog, northern spring peeper, western chorus frog, bullfrog, green frog, northern leopard frog, pickerel frog, northern water

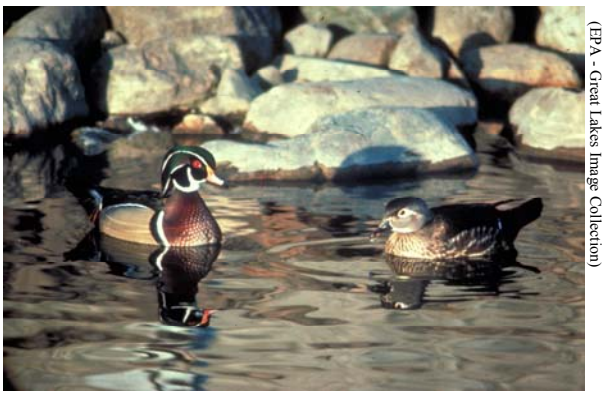
snake, northern redbelly snake, common garter snake, Eastern ribbon snake, common snapping turtle, painted turtle, and Blanding's turtle. The complete New York State Amphibian and Reptile Atlas can be seen at http://www.dec.state.ny.us/website/dfwmr/wildlife/herp/.

Birds. As suggested above, there is more known about the occurrence of bird species within the Eighteenmile Creek watershed due the proximity to Lake Ontario and common migration routes, activities of birding groups, and the completion of the Breeding Bird Atlas. Various species of birds are found in Niagara County and within the Eighteenmile Creek watershed including many species of waterfowl, shorebirds, raptors, and songbirds. These species use multiple habitats within the watershed and have varying seasonal distributions.

A review of the Breeding Bird Atlas reveals that the Eighteenmile Creek watershed provides high quality habitat for a large number of avian species. Migratory songbirds, waterfowl and resident bird species utilize the watershed for food, cover, and breeding. The watershed as well as coastal Lake Ontario around the mouth of Eighteenmile Creek is popular for hunting a variety of waterfowl game bird species. The area is also an important destination for birders to observe resident and migratory species that pass through the area during spring and fall migration or nest during the summer months. Common migratory species observed in the watershed include rose breasted grosbeak, indigo bunting, Baltimore oriole, blue wing teal, kingfisher, wood thrush, cedar waxwing and numerous warblers.


(EPA - Great Lakes Image Collection)

Blue-Winged Teal


(EPA - Great Lakes Image Collection)

Wood Ducks

Cedar Waxwing

Yellow Warbler

The presence of bird populations and especially evidence of breeding are valuable indicators of the biological health in the watershed. Known habitat and foraging requirements of selected species can be matched with documented occurrence and observed use of specific habitat features. Monitoring of resident and migratory bird activity and use of the watershed could provide valuable information to guide environmental protection of critically sensitive areas as well as definition of restoration targets.

The Atlas 2000 project (NYSDEC 2006) was an extensive survey to determine the current distribution of breeding bird species in New York State. Volunteer birders recorded evidence of breeding bird species throughout the state within 5-km by 5-km blocks. The data provides evidence of breeding composition and, in general, quality of breeding habitat. A total of 76 species was considered the approximate average species diversity per block across the state during the first atlas conducted between 1980 and 1986 (Andrle and Carroll 1988). Surveys for the Atlas 2000 project (2000-2005) were recently completed, allowing a comparison to the results of the first atlas to see how the distribution of breeding birds has changed. Draft data from the Atlas 2000 project and final data from the 1980 to 1986 Atlas project are available for review on NYSDEC's Atlas 2000 Website (http://www.dec.state.ny.us/website/dfwmr/wildlife/bba/index.html). Depending on the breeding evidence observed, species were classified as possible, probable, or confirmed breeders.

The Breeding Bird Atlas data for the survey blocks within the watershed and adjacent Niagara County blocks provide current and specific information on avian species use in the area. The

Eighteenmile Creek watershed is located within 19 New York State Breeding Bird Atlas blocks (see Figure 7-11). Draft data for the species totals in these blocks through the 2005 season are included in Table 7-4. As most of the 19 block totals are below 76 species, these blocks are considered to hold less than average species diversity compared to the rest of the state. However, the lower totals may also be attributed to the relatively uniform habitat and limited topographic relief along the Lake Ontario plain.

Table 7-4 Total Species Identified in New York State Breeding Bird Atlas Blocks in the Basin

Block	Status			
	Species	Possible	Probable	Confirmed
1878B	59	11	25	23
1879D	52	9	22	21
1978A	67	10	33	24
1978B	77	14	47	16
1978C	76	11	48	17
1978D	80	12	11	12
1979A	69	11	22	36
1979B	69	11	27	31
1979C	69	15	25	29
1979D	65	14	23	28
1980C	71	17	22	32
1980D	79	15	37	27
2078A	77	10	37	30
2078B	65	12	24	29
2078C	62	23	27	12
2078D	72	20	20	32
2079C	61	4	33	24
2079D	70	14	23	33

Source: NYSDEC 2006

A combined total of 113 species was identified in the 19 atlas blocks; see Appendix F, Table F-1, for the species identified in each block. The species identified in these 19 blocks are generally consistent with regularly-occurring nesting species for the region.

113 species of birds were identified within the 19 Breeding Bird Atlas blocks, including least bittern and northern harrier, both state-threatened species.

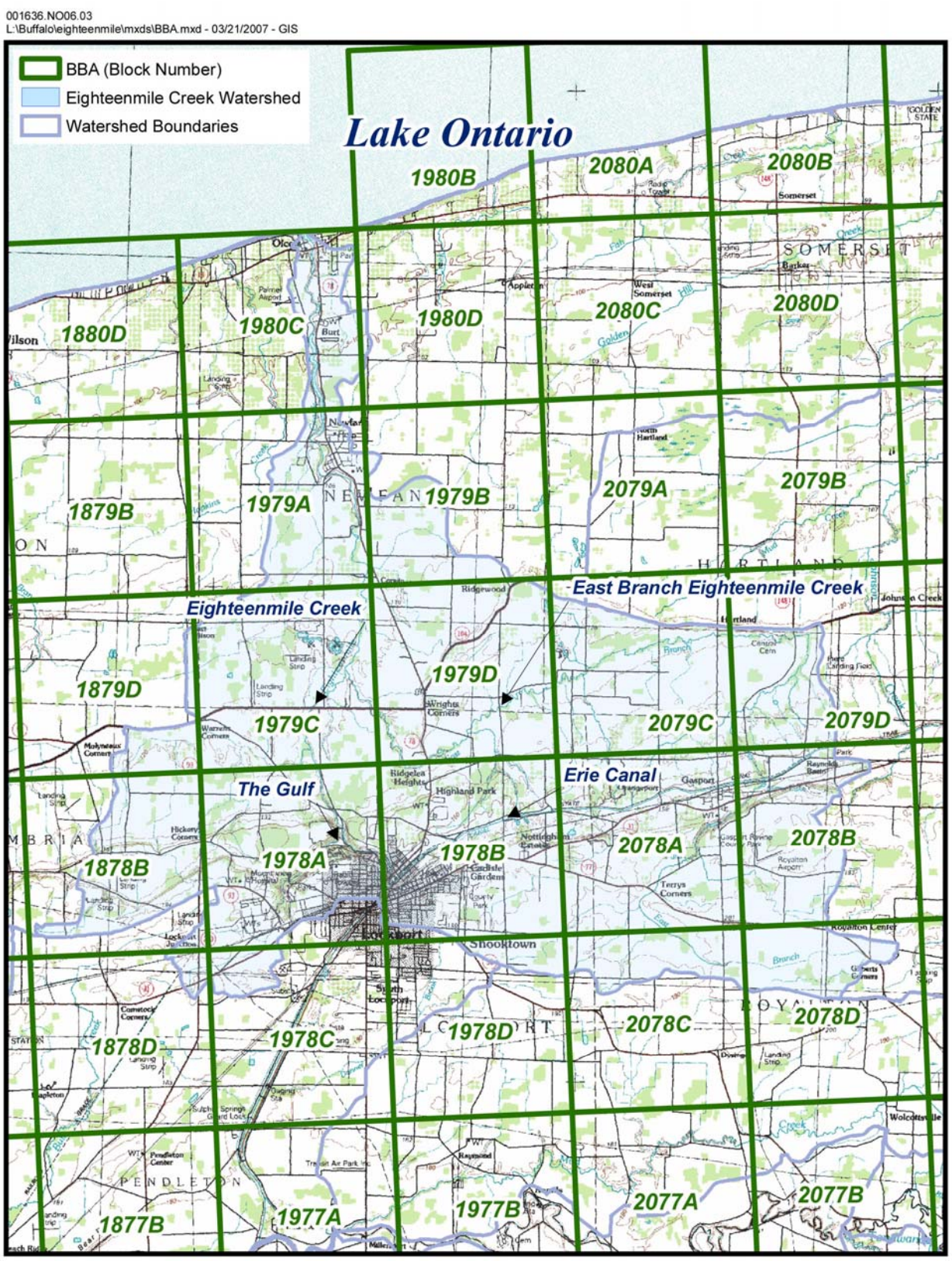


Figure 7-11 New York State Breeding Bird Atlas Blocks in the Watershed

Several state-listed species were included among the species documented in these blocks during the Atlas 2000 project. Two state-threatened species, the Least Bittern and Northern Harrier, were documented. Least Bittern was categorized as a possible breeder in block 2078C. Northern Harrier was categorized as a probable breeder in block 2078C and a possible breeder in blocks 1978D, 2078D, and 2079C. Species of special concern documented in the atlas blocks included Osprey (block 1980C), Sharp-shinned Hawk (blocks 1978A, 1978B; 1979B; 1980D; 2078A, 2078C; and 2079C, 2079D), Cooper's Hawk (blocks 1978B,1978D; 1979B,1979D; 1980D; 2078B; and 2079D), Red-headed Woodpecker (blocks 1980C and 2078D), Horned Lark (blocks 1978B, 1978D; 1980C; 2078A, 2078B; and 2079C, 2079D), Golden-winged Warbler (blocks 1978A, 1978D and 1980D), Vesper Sparrow (blocks 1980D and 2078A), and Grasshopper Sparrow (blocks 1978D; 1979A, 1979C, 1979D; 1980D; 2078A, 2078B, 2078D; and 2079D).

In 2003, requests were made to NYSDEC and USFWS for information on threatened and endangered species in proximity of the Restoration Project Area below Burt Dam. No avian species of concern were reported to occur in or near the project work area at that time. As of December 2006, neither the NYS Natural Heritage Program nor the United States Fish and Wildlife Service had changed status information, or added any avian species to the list of Threatened or Endangered species or the area.

There is roughly 230 miles of stream within the watershed, most of which are considered warm-water fisheries

Fish. The Eighteenmile Creek watershed comprises approximately 230 miles of streams, both perennial and intermittent (see Table 5-1). The vast majority of the available habitat in these streams is ideal for warm-water species. The section of Eighteenmile Creek, from the Burt Dam to the mouth of Lake Ontario is also ideal for adfluvial cold-water species, which spawn in the creek and spend the majority of their life in Lake Ontario. Natural reproduction of trout and salmon is believed to be virtually non-existent in Eighteenmile Creek, and the fishery is supported by the NYSDEC-stocking program (see below). In addition to containing a high-quality warm-water fishery, this area is an important location for major spawning runs of several Lake Ontario cold-water fish including chinook salmon (*Oncorhynchus tshawytscha*), coho

salmon (*Oncorhynchus kisutch*), rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*).

Cold-water species coming from Lake Ontario use Eighteenmile Creek downstream of Burt Dam.

The coldwater fish populations that use Eighteenmile Creek for their spawning runs originate from NYSDEC's Lake Ontario Fish Stocking Program. The population of native coldwater species in Lake Ontario was virtually non-existent by the mid-1960s due largely to over-harvesting and the effects of the introduced sea lamprey (*Petromyzon marinus*) (Niagara County 1982). In the late 1960s, NYSDEC began stocking cold-water species in Lake Ontario and its tributaries. By the early 1970s NYSDEC began controlling the sea lamprey population to decrease the negative effects lampreys were having on the success of the stocked fish. Currently NYSDEC stocks between 184,000 and 188,000 chinook salmon, coho salmon, rainbow trout, and brown trout in Eighteenmile Creek and Olcott Harbor each year. Chinook salmon comprise the largest portion of this stocking effort, with 122,000 stocked annually in Eighteenmile Creek. NYSDEC stocking numbers for 1999 to 2005 are presented in Table 7-5.

Table 7-5 NYSDEC Fish Stocking Records: Number of Fish Stocked for Eighteenmile Creek, 1999-2005

Fish Species	1999	2000	2001	2002	2003	2004	2005
Chinook	122,000	122,000	122,000	122,000	122,000	134,200	134,160
Coho	26,400	30,000	30,000	30,000	30,000	30,000	30,000
Rainbow Trout	13,000	12,500	8,850	11,500	12,500	12,000	19,500
Brown Trout	23,750	23,800	23,800	21,550	21,900	20,000	20,820
Total	**185,150**	**188,300**	**184,650**	**185,050**	**186,400**	**196,200**	**191,980**

In addition to NYSDEC stocking efforts, pen-rearing of Chinook salmon began in 2005 at the mouth of Eighteenmile Creek. This effort to raise numbers of Chinook salmon in the area was sponsored by numerous organizations including, Lake Ontario Trout and Salmon Association (LOTSA), Town of Newfane, Niagara County Legislature, Niagara County Sportfishing Development Board and Slippery Sinker Bait and Tackle Shop.

Approximately 25,000 Chinook salmon fry were raised and released at the site. In the Pacific Ocean, where Chinook salmon are native, the young fish undergo a smolting process, which allows them to, among other things (e.g. survive in a salt water environment), recognize the body of water that they hatched in. It is hoped that this smolting process will result in these Eighteenmile Creek pen-reared salmon returning to the Creek as adults when they are ready to reproduce. Similar efforts have been conducted in other Lake Ontario tributaries and have resulted in a more abundant return of adult salmon than is seen from stocking efforts alone (NYSDEC 2005c).

Warm-water species found in Eighteenmile Creek below Burt Dam include channel catfish, largemouth bass, smallmouth bass, black crappie, rock bass, perch, northern pike, sheepshead, bullhead, and other panfish (Sander 2004). In June and July of 1989, NYSDEC conducted a boat-electrofishing survey to collect fish to be tested for contamination as part of their Rotating Intensive Basin Survey (RIBS) initiative (Evans 2003). The most common species collected included American eel, carp, golden shiner, white sucker, brown bullhead, pumpkinseed, alewife, and gizzard shad. Results of the survey are presented in Table 7-6. The 2005 RIBS report did not contain data from the Eighteenmile Creek watershed, indicating that sampling did not occur in the area (NYSDEC 2005b).

Table 7-6 NYSDEC RIBS Sampling Results, June 27 and July 6, 1989

Species Name	Abundance	Species Name	Abundance
American eel	Common	Longnose gar (*Lepisosteus osseus*)	Rare
Gizzard shad	Common	Alewife	Common
Rainbow trout	Common	Muskellunge (*Esox masquinongy*)	Rare
Brown trout	Common	White perch (*Morone americana*)	Rare
Northern pike	Rare	White bass (*Morone chrysops*)	Rare
Carp	Common	Walleye (*Stizostedion vitreum*)	Rare
Goldfish (*Carassius auratus*)	Rare	Channel catfish	N/A
Golden shiner	Common	Common shiner (*Notropis cornutus*)	Common
White sucker	Common	Bluegill sunfish (*Lepomis macrochirus*)	Common
Redhorse sucker (*Moxostroma macrolepidotum*)	Common	Smallmouth bass	Common
Brown bullhead	Common	Largemouth bass	Common
Rock bass	Common	Black crappie	Common
Pumpkinseed sunfish	Common	Sheepshead	Common

The majority of Eighteenmile Creek (i.e., upstream of Burt Dam) receives only light fishing pressure. A combination of the cold-water spawning runs, the warm-water fishery, and the relative ease of access concentrates sport-fishing activities downstream of Burt Dam. The majority of this fishing pressure is focused on the cold-water (i.e., salmonids) species in the late summer through spring (Sander 2004).

As presented in Section 2, fish community surveys will be conducted during the spring and summer of 2007 within reach locations downstream of Burt Dam. These surveys will provide updated information on extant fish communities and will support the BUI investigation.

The Erie Canal is a manmade waterway that passes through the Eighteenmile Creek watershed. Though it is not connected directly to any waterway, during dry weather it provides an input of approximately 50 cubic feet per second (cfs) into Eighteenmile Creek. The canal is operated from early May to early November. In November the canal is drawn down, temporarily increasing the inflow of water into Eighteenmile Creek. The canal sustains a warm-water fishery with species similar to those found in Eighteenmile Creek.

7.5 Threatened and Endangered Species and Protected Habitat

Federally listed threatened and endangered plant and animal species are protected by the Endangered Species Act of 1973, which is administered by USFWS. State-listed threatened and endangered plant and animal species are protected by the New York State Environmental Conservation Law, Article 9 and Article 11, which are administered by NYSDEC. In addition to the legal protection afforded federal- and state-listed species, they are important natural resources within the watershed. Threatened and endangered species and significant habitats are valuable resources that warrant attention and protection when considering the long-term sustainability and environmental quality of the watershed.

An officially designated habitat within the watershed includes a significant coastal habitat area. These areas are protected under the Federal Coastal Zone Management Act and in New York State are designated and mapped under the authority of the Waterfront Revitalization and

Coastal Resources Act (Executive Law of New York, Article 42), which is administered by the New York State Department of State (NYSDOS).

The USFWS, NYSDEC's Natural Heritage Program, and NYSDOS were consulted in 2002 for the portion of Eighteenmile Creek below Burt Dam and then again in 2004 for the entire watershed to determine the potential occurrence of federal- and state-listed endangered and threatened species and significant and protected natural communities and habitats within the Eighteenmile Creek Watershed. More recent (late 2006) verbal discussions with representatives from NYSDEC indicate that the status of information has not changed since 2004.

The USFWS and NYSDEC provided data detailing the known occurrences of threatened, endangered, and rare species within the watershed. In addition to threatened and endangered species that are protected by law, existing databases also track species for which there is concern regarding their status or habitats they depend upon. These species are considered "species of concern." The existing databases also document and classify the status of significant habitat/communities. Although not specifically protected by law, these areas are recognized for their rare/unique features as well as their greater likelihood of providing habitat for protected species. NYSDOS provided data on significant coastal habitats (see below).

Federally-Listed Species

The USFWS indicated that except for the occasional transient individuals, no federally-listed or proposed endangered or threatened species are known to exist within the watershed. In addition, there is no habitat in the area that is currently a designated or proposed critical habitat.

The USFWS did indicate, however, that the Blandings turtle (*Emydoidea blandingii*) is found in the watershed. The USFWS considers the Blandings turtle a species of concern, and its status is being monitored throughout much of its range. Although species of concern do not receive substantive or procedural protection under the Endangered Species Act, the USFWS encourages considering these species during project planning.

New York State–Listed Species

NYSDEC identified six species within the project area and one significant habitat area. Table 7-7 lists the species reported and their state and federal status. A brief description of each species follows the table.

Table 7-7 New York State Listed Species

Common Name	Scientific Name	Federal Status	State Status
Yellow giant-hyssop (Herb)	*Agastache nepetoides*	NL	T
Pawpaw (Deciduous Tree)	*Asimina triloba*	NL	T
Short-eared owl (Bird)	*Asio flammens*	NL	E
Northern harrier (Bird)	*Circus cyaneus*	NL	T
Blanding's turtle (Reptile)	*Emydoidea blandingii*	NL	T
Wabash pigtoe (Bivalve Mollusk)	*Fusconaia flava*	NL	U

Key:
E = Endangered.
NL = Not listed.
T = Threatened.

Yellow giant hyssop (*Agastache nepetoides*) is an herb of the mint family, with pale greenish-yellow flowers that appear in summer. It grows in woods and thickets. The reported occurrences of this species within the watershed were in forested areas or thickets with rocky (limestone) soils.

Pawpaw (*Asimina triloba*) is an understory tree of the custard-apple family that occurs on the rich moist soils of floodplains and wet woods. The reported occurrences of this species within the watershed were on wooded stream banks.

The short-eared owl (*Asio flammens*) is a medium sized owl with small ear tufts that appear as two ridges along the top of the head. It feeds on small mammals and occasionally small birds. The young sometimes eat insects. It lives in open areas where small mammals are abundant and nests on the ground in a cup lined with grasses and down. Short-eared owls begin breeding in March and typically lay four to nine eggs that are incubated by the female for approximately one month. Unlike most owls that nest in holes or take over the abandoned nests of crows or other birds, the short-eared owl is unique within its family (Strigidae) in building a nest on the ground (New York Natural Heritage Program [NHP], http://www.acris.nynhp.org/guide.php?id=6949).

Historically these owls bred in eight or more northeastern states but today they nest only in Massachusetts, New York, Vermont, and Pennsylvania, probably due to the loss of open habitat that has come with reforestation. According to the NYSDEC the conservation of short-eared owls in New York depends on protecting relatively large, open sites that support small rodents. Except for a few large marshes, most of the nest sites recorded in recent years have been found on farms, typically in active hayfields or pastures where the nests and young birds are sometimes mowed or plowed. Once abandoned, agricultural sites rapidly become unsuitable for owls because they become woodlands or are replaced by development. In order to protect short-eared owls it will be necessary to identify suitable nesting sites that can be managed for small rodents and owls (NHP, http://www.acris.nynhp.org/guide.php?id=6949).

The northern harrier (*Circus cyaneus*) is a 16-24 inch, slender-bodied hawk with a long tail and wings, long yellow legs, distinct facial disks, and a conspicuous white rump patch. It feeds on rodents and small birds, which it detects using its extremely keen hearing. It winters in agricultural fields, abandoned fields, and salt marshes from southern Canada to northern South America and breeds in marshes, grasslands, and cultivated fields, preferring coastal habitats. The northern harrier builds a flimsy nest of sticks and grass on the ground, in dense vegetation, or in an elevated position. It typically lays five eggs, which are incubated for 30 - 32 days. The young fledge in approximately 30 - 41 days and remain dependent for approximately three to four weeks.

Historically, northern harriers were widespread, but pesticides and loss of breeding habitat (reforestation and other changes in land use, wetland fill and coastal development) led to their decline. NYSDEC indicates that habitat protection is a critical need for protecting northern harriers. Population size and reproductive success of this species are dependent upon prey populations. It has been well documented that northern harrier populations and populations of their prey follow similar patterns of fluctuation. Therefore management efforts should focus on strategies for habitat restoration/protection that include both northern harriers and prey populations (NHP, http://www.acris.nynhp.org/guide.php?id=6812).

Blanding's turtle (*Emydoidea blandingii*) is a medium-sized turtle with a shell length of approximately seven to ten inches, a domed upper shell with light or yellow flecks, and a bright yellow chin and throat. These turtles are omnivores and eat fish, plants, invertebrates, and carrion. Blanding's turtles typically live in coves and weedy bays, ponds, and shallow

marshes. They overwinter in mud or under vegetation under or near water. They may live up to 70 years and take 18 to 22 years to reach sexual maturity. Nesting begins in early June with clutches of five to twelve eggs in New York.

The major problem facing the Blanding's turtle in New York State is the destruction of its habitat through the construction of housing developments, shoreline property and other summer recreation facilities. Roads are also problems as they can fragment migration routes between spring/summer and winter habitats and can lead to fatalities of individuals (NHP, http://www.acris.nynhp.org/guide.php?id=7508).

Wabash pigtoe (*Fusconaia flava*) is a bivalve mollusk. This species is not threatened or endangered and may be taken at any time without limit, but a license to take may be required.

This species has been included here since NYSDEC reported one significant habitat area within the Eighteenmile Creek watershed. The habitat area is a warm water fish concentration area that includes the stream habitat of Eighteenmile Creek and associated wetlands, from the Route 18 bridge south to the Burt Dam. This corresponds to the significant habitat area identified by NYSDOS and is discussed below. This stretch of the creek contains zebra mussels which may pose current or future threats to the stability and presence of any existing populations of this species.

NYSDOS Significant Coastal Fish and Wildlife Habitats

NYSDOS was contacted to determine whether significant coastal fish and wildlife habitat occurs within the watershed. The portion of Eighteenmile Creek from the Burt Dam to Lake Ontario is identified and designated as significant fish and wildlife habitat (Figure 7-12). Eighteenmile Creek, which empties into Lake Ontario at the Hamlet of Olcott in the Town of Newfane is the

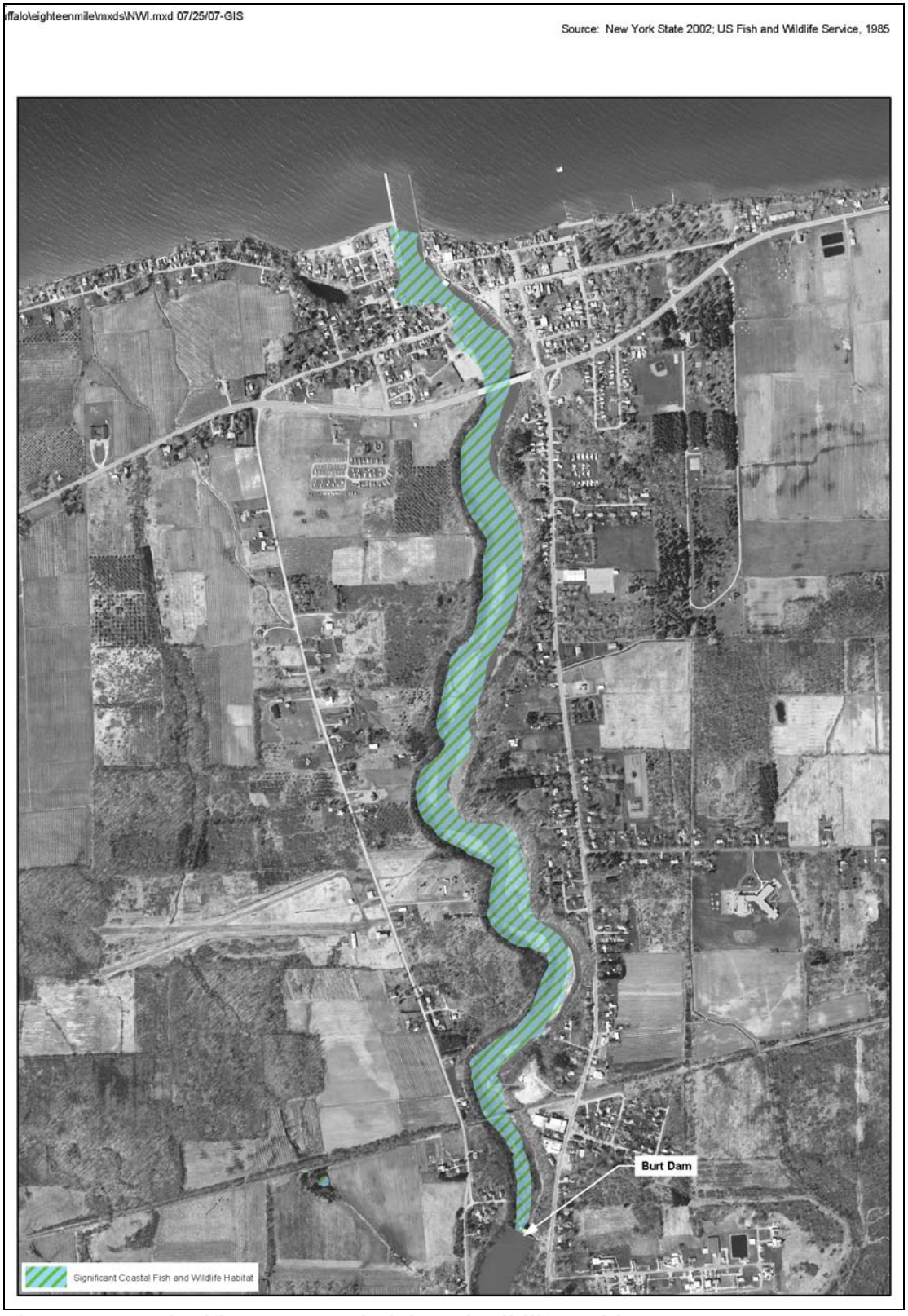


Figure 7-12 Significant Coastal Fish and Wildlife Habitat

largest stream in Niagara County and one of ten tributaries in the Great Lakes region. It is recognized that undisturbed tributary streams provide habitat for major spawning runs by salmonids and other lake-based fish populations are therefore especially important in this region of Lake Ontario. The estimated 65 acres of extensive beds of emergent and submergent aquatic vegetation is one of the largest coastal wetlands in the western portion of Lake Ontario.

Eighteenmile Creek is considered a significant resource due to the large concentrations of coho and chinook salmon and brown trout that migrate into the creek from Lake Ontario each fall, when the salmonids ascend to the streams to spawn. In addition, steelhead (*Oncorhynchus clarki*) migrate into the creek during the fall and between February and April. These fish are a result of the ongoing effort of NYSDEC to establish a major salmonid fishery in the Great Lakes through stocking. The area also supports a substantial natural reproduction of smallmouth bass, northern pike, rock bass, black crappie, brown bullhead, and largemouth bass.

Unlike other Niagara County coastal regions, Eighteenmile Creek provides valuable habitats for wildlife. A variety of bird species inhabit the area including great blue heron, green-backed heron, mallard, wood duck, belted kingfisher, marsh wren, common yellowthroat, red-winged blackbird, and swamp sparrow (see discussion of birds in Section 7.4). Other wildlife species that inhabit the Eighteenmile Creek area include resident furbearers such as muskrat, mink, and raccoon.

Eighteenmile Creek is also important for a significant amount of recreational use. Fishermen from all over the area come to fish in the creek, primarily because of the large salmonid runs in the area. Small boats and canoes are used to fish for the abundant warm water species in the area.

7.6 Aquatic and Terrestrial Invasive Species

The Eighteenmile Creek watershed is hydrologically connected to the Great lakes drainage basin at it's confluence with Lake Ontario in Olcott, New York. The Erie Canal provides source water in the in the southernmost portion of the watershed in Lockport New York. The tradition and

history of agricultural and trade within the watershed have allowed non-indigenous plants and animals to colonize terrestrial and aquatic habitats in the watershed. Some of these introduced species are considered invasive due to their aggressive growth, dominance or elimination of native species, and disruption of natural ecological processes within native biological communities.

The effects of invasive species on native communities and agriculture are becoming better understood and there is a growing awareness that detection and control policies need to be implemented. In response to the growing problem of invasive species, in 2003, Governor Pataki signed legislation sponsored by Senator Marcellino and Assemblyman DiNapoli. Chapter 324 of the Laws of New York of 2003 called for an Invasive Species Task Force (ISTF) to explore the invasive species issue and to provide recommendations to the Governor and the Legislature by November 2005. The statute describes the intended membership of the Task Force and directs that it be co-led by two New York State agencies: Department of Environmental Conservation (DEC) and Department of Agriculture and Markets (DAM) (NYSDE and NYS Department of Agriculture and Markets 2005).

Definition

Invasive species (plants, animals and other organisms) are non-native species that can cause harm to the environment or to human health. The Invasive Species Task Force adopted the definition of invasive species contained in the federal Executive Order 13112, signed in 1999. Thus, for the purpose of this Report, an invasive species is a species: 1) that is non-native to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. In the latter case, the harm must significantly outweigh any benefits.

"On a global basis...the two great destroyers of biodiversity are, first habitat destruction and, second, invasion by exotic species"
E.O. Wilson

The Problem. Invasive species are a form of biological pollution. They have caused many problems in the past, are causing problems now, and pose threats to our future. A wide variety of species are problematic for many sectors of our world: our ecosystems, including all natural systems and also managed forests; our food supply,

including not only agriculture but also harvested wildlife, fish and shellfish; our built environments, including landscaping, infrastructure, industry, gardens, and pets. Invasive species may have serious implications on the vitality of recreational opportunities and for human health.

Invasive species affect every region of the U.S. More than 4,500 non-indigenous species have established self-sustaining populations in the U.S; 160-plus non-indigenous aquatic plants and animals are established in the Great Lakes Basin; hundreds more are in our coastal estuaries and marine coastal waters. These organisms pose a serious threat to the ecological integrity of our lands and waters; about 15% have already caused severe harm. Society pays a high price for invasive species in direct negative economic costs, and environmental degradation, aesthetic, and public health and safety costs.

The National Aquatic Nuisance Species Clearinghouse, founded and maintained by New York State Sea Grant (NYSG), facilitates information sharing by researchers worldwide. Through a website, library and publications, the Clearinghouse disseminates research findings, and facilitates invasive species prevention and control technology transfer between researchers and stakeholder audiences. NYSG coordinated the redesign of www.invasivespecies.gov, making the federal government's premier invasive species website more user-friendly than ever with a new species of the month feature.

A plethora of organisms have been listed as alien and invasive by the Cooperative Agricultural Pest Survey (CAPS). The CAPS program is managed by the U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS).

Plant Protection and Quarantine (PPQ) surveys are conducted to detect or delimit exotic plant pests- insects, weeds and diseases that are not known to occur in the U.S or have been recently introduced through U.S. ports of entry or other pathways. CAPS surveys and other monitoring activities strive to protect agriculture and natural resources and to prevent economic loss.

The CAPS Survey Committee in New York serves as an advisory group for CAPS survey activities in the state. Committee members meet several times per year to provide input on upcoming exotic pest surveys, discuss survey results and share relevant information on pest occurrences in New York. Pest distribution data from surveys and other sources provided by State Survey Committee members is submitted to a national database.

The Niagara County 2006 NY-CAPS data files include survey data on species that have been documented to occur in the Niagara County and those species that have been surveyed for but not detected. A summary prepared by CAPS indicated the detection of the pine shoot beetle (1993), swede midge in four crucifer fields (2004), European crane fly at a Niagara Golf Course and a state park (2004), giant hogweed located in numerous sites (2004-2005), and sirex wood wasp (2006). A significant discovery was the detection of plum pox virus (PPV) in Niagara County in 2006.

Plum Pox is a viral disease of stone fruit trees such as plums, peaches, and apricots. Plum Pox Virus (PPV) has been a devastating disease in Europe since the early 1900s. PPV reduces the quality of stone fruit and, over a period of time, renders the tree useless for fruit production. It was first reported in Bulgaria and spread throughout Europe. In 1992, PPV was reported for the first time in the Americas in Chile. Shortly afterwards it was found in Adams County, Pennsylvania in 1999, in Ontario and Nova Scotia, Canada in 2000, and Argentina in 2004. In the continental United States, the disease remained localized, and it was hoped that it was contained before it had a chance to spread to the other parts of the North American continent. However, in July 2006, the virus was identified in 2 plum trees in Niagara County and a short time later (August 2006) it was identified on peach tree in Niagara County. (Cornell University; http://plantclinic.cornell.edu/FactSheets/plumpoxvirus/plumpox.htm)

NY-CAPS has several years of negative survey results in Niagara County for many other invasive organisms including hemlock woolly adelgid, fruit tree tortrix moth, white fly biovar Q, exotic wireworm, emerald ash borer, and others.

This information is available for retrieval upon request from the NYS Department of Agriculture and Markets at http://www.agmkt.state.ny.us/PI/PIHome.html. More information is available on the invasive species noted below from links listed on the following web sites:

- http://www.agmkt.state.ny.us/PI/capslinks.html
- www.ipcnys.org Invasive Plant Council of NYS

The New York ISTF has initiated a Partnership for Regional Invasive Species Management (PRISM) to address invasive species control and management issues on a regional basis across the state. This program will establish a western New York (WNY) PRISM that will coordinate state and federal program funding and technical assistance through the New York Invasive Species Coordinator from the NYSDEC Habitat Bureau. Funding for invasive species eradication projects for 2007 has been increased to $2,000,000. It is expected the WNY PRISM program will facilitate municipalities and local stakeholders to identify and prioritize projects within the WNY region.

Invasive Species within the Watershed. A number of invasive plants, and insects and other organisms have been identified as occurring within the Eighteenmile Creek watershed. The economic impacts related to invasive species can be severe to the agricultural production industry. Riparian areas in the watershed are especially vulnerable. Invasive plant species cause extensive habitat destruction by dominating native plant communities and displacing wildlife species by altering natural ecological processes and species associations. The proximity of Niagara County and the Eighteenmile Creek watershed to Lake Ontario and the Erie Canal, which serve as pathways for transmission of invasive plants and organisms, warrant the concern and continued participation in local, state and federal monitoring programs.

Invasive Plants Identified within the Watershed

- Japanese knotweed (*Fallopia japonica*)
- Garlic mustard (*Aliaria petiolata*)

- Bush honeysuckle (*Lonicera tarrtarica*)
- Common reed (*Phragmites autralis*)
- Purple loosestrife (*Lythrum salicaria*)
- Glossy buckthorn *Rhamnus frangula*)
- Tree of heaven (*Alianthus*)
- Mugwort (*Artemisia vulgaris*)
- Giant hogweed (*Heracleum magantezium*)

In particular, giant hogweed is a public health hazard more than a cause of habitat degradation. The sap of the hogweed plant can cause a skin reaction known as photo-dermatitis when the sap makes contact with the skin and is exposed to sunlight. This reaction with skin cells can cause permanent cell damage to skin tissue. Niagara County has embarked on an early detection and eradication program in cooperation with Niagara County Soil and Water Conservation District.

Insects and Other Organisms Identified within the Watershed

- Asian long horned beetle
- Bacterial wilt
- Brown marmorated stinkbug
- Chrysanthemum white rust
- Emerald ash borer
- Golden nematode
- Hemlock woolly adelgid
- Leek moth
- Pine shoot beetle
- Sudden oak death

P. Fuhrmann – The Gulf Creek

- Swede midge
- Viburnum leaf beetle
- Zebra mussel
- Quagga mussel

Source: U.S. Geological Source/photograph by Myriah Richerson

Of note, the introduction of exotic zebra and quagga mussels has dramatically altered Lake Ontario's aquatic food web. Once numbering thousands of organisms per square meter, Lake Ontario's keystone benthic organism, the amphipod Diporeia, previously was a major source of food for native fish. Diporeia has now disappeared from most nearshore waters. It is suspected that exotic mussels caused the decline in Diporeia by outcompeting it and other native organisms for nutrients. Recently introduced exotic predatory zooplankton may also be altering the structure of other native communities. These changes threaten the viability of Lake Ontario's fisheries, as well as efforts to restore naturally reproducing populations of lake trout. A better understanding of the magnitude of these changes is needed to determine whether the fishery's current management goals and objectives are sustainable given the changes brought about by the invasion of exotic mussels and zooplankton. Additional information on alien aquatic nuisance and invasive species can be found at: The Sea Grant Nonindigenous Species Site (SGNIS) (http://www.sgnis.org/index.htm), and US EPA Invasive Species Impacts on Lake Ontario (http://www.epa.gov/futureofscience/promote/lakeontario.html)

Source: U.S. Geological Source/photograph by S. Van Mechelen

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8 Air Quality

Like anywhere else, pollutants entering the watershed from the air have the potential to affect the Eighteenmile Creek watershed and its ecosystems. Pollutants introduced to the atmosphere in other parts of the United States or in Canada may travel with air currents to the Eighteenmile Creek watershed. These substances may affect the ecosystem while in the atmosphere or may, when added to emissions that originate within the watershed, cause air quality criteria to be exceeded. In addition, the pollutants may drop out of the atmosphere and affect water quality within the watershed. Mercury deposition is a good example of an pollutant that becomes a contaminant that affects water and sediment quality in streams and can cause detrimental effects on fish and watershed wildlife. Therefore, an understanding of what is being introduced into the atmosphere from sources outside and within the Eighteenmile Creek watershed can enhance awareness of the potential relationships between air quality, pollutant sources evaluations, and ecosystem health and status of function.

Niagara County and the area including Eighteenmile Creek watershed are in attainment for established air quality standards with the exception of ozone.

NYSDEC regularly monitors ambient air quality throughout the state to ensure that established air quality standards are being met. The air is sampled for ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), lead, and particulate matter (NYSDEC 2006). The general area encompassed by the Eighteenmile Creek watershed is considered to be an attainment area for the above-listed pollutants, with the exception of ozone (USEPA 2006b). Attainment areas are those areas meeting national ambient air quality standards for a particular pollutant.

Niagara County is listed as being in non-attainment for the 8 hour ozone standard because air quality sampling has violated or contributed to violations in the standard over a three-year period. Ozone is typically a pollutant more prevalent during the summer months, as it is formed

when volatile organic compounds (VOCs) and oxides of nitrogen in the air react with sunlight. Non-attainment of ozone standards in New York State, as in all northeastern states, is primarily a problem resulting from the mix and transport of pollutants from distant sources and emissions from large urban areas. Ozone non-attainment in the Eighteenmile Creek watershed is generally a result of pollutants transported in from upwind states and urban areas.

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Buffalo District

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Scope of Work

Eighteenmile Creek Sediment Investigation, Upstream of Area of Concern (AOC)

November 2007

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SCOPE OF WORK (SOW)

EIGHTEENMILE CREEK SEDIMENT INVESTIGATION
UPSTREAM OF AREA OF CONCERN (AOC)

1. INTRODUCTION

a. Location and Setting.

(1) *Area of Concern (AOC)*—The Eighteenmile Creek AOC is located in the lower reach of Eighteenmile Creek near its mouth on Lake Ontario, in the hamlet of Olcott, Niagara County, New York (Figure 1). The creek flows from the south into the lake through Olcott Harbor, about 18 miles east of the Niagara River mouth at Lake Ontario. The AOC was identified by the International Joint Commission (IJC) in 1985, and includes that portion of the creek between Olcott Harbor, upstream to the farthest point at which backwater conditions exist during Lake Ontario's highest monthly average lake level (generally, about 2 miles upstream, just downstream of Burt Dam in Burt, New York) (U.S. Environmental Protection Agency [USEPA] 2001). Just downstream of the dam, an active railroad bridge crosses the creek and two old fruit storage buildings are situated adjacent to the creek on its east bank. Land immediately adjacent to the AOC is comprised of mostly of residential, orchard/grove/vineyard/nursery/ornamental horticulture (ORN), cropland/pasture and commercial uses (County of Niagara 2006). Depending on flows, the creek's width within the AOC varies widely, with maximum depth of about 35 feet in the Burt Dam impoundment. Bottom substrate varies and can be comprised of clay/silt, sand, gravel or shale. Riverine/palustrine wetlands are located in various areas of the creek channel within the AOC. The AOC provides high quality aquatic habitat for both cold and warmwater fish species, and the State-threatened Blanding's turtle (*Emydoidea blandingii*). The AOC attracts over 15,000 anglers annually mainly through fall salmonid runs (Niagara County Soil & Water Conservation District [NCSWCD] 2006).

(2) *Upstream Reach of Eighteenmile Creek*—The upstream reach of Eighteenmile Creek starts at Burt Dam and ends at the Erie Canal (Figure 2). Burt Dam is an unreinforced concrete gravity structure operated by Burt Dam Power Company for the generation of hydroelectric power. The dam is approximately 328 feet long and has a maximum height of 54.5 feet. Normally, the dam holds an impoundment that is up to about 35 feet deep, between about 325 to 400 feet wide, and 8000 feet long (Burt Dam Power Company 1987). It has three operational intakes/reservoir outlets and an ogee spillway. A riverine/palustrine wetlands complex is located just upstream of the dam's impoundment near Ide Road. The abandoned, essentially submerged Newfane Dam is situated about 3 miles upstream of Burt Dam near Ewings Road. This dam results in no discernable impoundment. The East Branch and The Gulf confluences are about 4 and 7 miles upstream of the Newfane Dam, respectively. The Erie Canal traverses Eighteenmile Creek in Lockport about 1.5 miles upstream of The Gulf; however, the canal drains into the creek via an outlet. The Flintkote Plant Site (or Williams Street

Site), a site currently being investigated by the New York State Department of Environmental Conservation (NYSDEC) and Niagara County Department of Health (NCDOH), is located within this segment of the creek (NCSWCD 2006). Land adjacent to the creek is comprised of a mixture of residential, orchard/grove/vineyard/nursery /ORN, cropland/pasture, deciduous forest, mixed forest, and other urban/built up and industrial uses (County of Niagara 2006). Depending on flows, the creek's width within this reach varies widely and with a maximum depth of about 12 feet. Similar to the AOC, bottom substrate varies and can be comprised of clay/silt, sand, gravel or shale.

b. AOC Use Impairments. Three use impairments, and their causes and sources, have been identified for the AOC in a combined Stage 1/2 Remedial Action Plan (RAP) report (NYSDEC 1997):

- *Restrictions on fish and wildlife consumption due to polychlorinated biphenyl (PCB) and dioxin/dibenzofuran (PCDD/F) contamination* - Sources include upstream industrial discharges, inactive hazardous waste sites, contaminated sediments, air deposition and Lake Ontario. In 2005, the New York State Department of Health (NYSDOH) issued a fish consumption advisory for Eighteenmile Creek, recommending that the public eat no fish of any species that is collected from the creek, due to high PCB levels (NYSDOH 2007).
- *Degradation of benthos due to sediment contamination (see sources listed above)* - Sediment contamination (particularly metals) appears to be higher in surface sediments, which results in slight to moderate toxicity and degradation of the benthic community. In addition, benthos bioaccumulate PCBs and PCDD/Fs from the bottom sediments, and serve as vectors for trophic transfer in aquatic food webs.
- *Restrictions on dredging activities due to sediment contamination (see sources listed above)* – The concentration of pollutants such as the following metals: chromium, copper, lead, manganese, nickel, zinc, cyanide and mercury, and the polycyclic aromatic hydrocarbon (PAH) benzo(a)anthracene, preclude the open-lake placement of any sediments dredged just upstream of Olcott Harbor's Entrance Channel.

All of these use impairments are linked to bottom sediment contamination.

c. Contaminants of Concern (COCs) and Sources. The COCs associated with the above use impairments, and their respective perceived sources, are summarized in the following table:

PARAMETER GROUP	COC	POTENTIAL SOURCE(S) LOCATIONS
Organic compounds	PCBs	Flintkote Site; upstream of Burt Dam; Erie Canal; Lockport Sewage Collection System
	Chlorinated pesticides (∑DDT)	Non-point source watershed agriculture; old fruit storage buildings just downstream of Burt Dam
	PCDD/Fs	Erie Canal; possibly Flintkote Site
Heavy metals	Chromium	Upstream of Burt and Newfane Dams; Burt Dam
	Copper	Flintkote Site; between Newfane and Burt Dams; Burt Dam
	Lead	Flintkote Site; The Gulf; Newfane and Burt Dams
	Manganese	Unknown
	Mercury	Upstream of Burt and Newfane Dams
	Nickel	Upstream of Burt and Newfane Dams
	Zinc	Erie Canal; The Gulf; Flintkote Site; Burt and Newfane Dams
	Cyanide	Unknown

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d. Purpose and Need for this Scope of Work (SOW). Existing data on Eighteenmile Creek sediments indicate that most of the sources of contamination are located upstream of the AOC, between Burt Dam and the Erie Canal. Sediment quality data on this reach of the creek are limited. The major sources of sediment contamination are believed to be the Erie Canal, Flintkote Plant Site and City of Lockport Sewage Collection System (USEPA 2002). The Burt and Newfane Dams serve to accumulate contaminated sediments in the creek. Since NYSDEC and NCDOH are currently investigating the segment of creek near the Flintkote Plant Site, this SOW outlines a preliminary plan and cost estimate to sample and analyze sediments relative to all other suspected sources in the upstream reach.

2. SEDIMENT SAMPLING AND ANALYSES

a. Sampling Methodologies. The sediment sampling for this SOW will be accomplished by U.S. Army Corps of Engineers (USACE) personnel due to the uncertainties associated with the planned sediment sampling.

(1) *Sampling Vessel Launching, Mooring and Staging Area*—Facilities for boat launching and mooring will be required for two vessels. Mooring facilities need not exceed 50 feet in total length. A staging area in close proximity to the project site will be required to provide adequate parking area for sediment sampling personnel (and other government agencies) and visitor parking, and the necessary work area and utilities. The staging area will provide parking for a minimum of three passenger vehicles, two pickup trucks with boat trailers, and one 20x20 foot work area. Required utilities will consist of at least one 110V, 30A grounded electrical outlet.

(2) *Sample Collection and Processing*—A combination of core and surface grab sediment samples will be collected for analyses. This sampling protocol is described as follows:

(a) **Core.** Core samples will be collected in order to characterize the chemical contamination of the creek sediments with respect to depth. These samples will be collected using a vessel-mounted vibracore or hand-operated core sampler, depending on the conditions in the creek (primarily water depth, width of the channel and substrate) and available access. A global positioning system (GPS) will be used to locate the sampling locations. The core sampler will be penetrated to known virgin material or refusal, and dissected into two-foot sections from the bottom to top of the sample. The depth elevation, relative to Low Water Datum (LWD), will be recorded for each core sample interval. Material from each of core segment will be homogenized in a stainless steel pan. The following samples will be obtained from this homogenate: (1) a full one quart glass jar of sediment for bulk chemistry; and (2) a full one quart glass jar of sediment for particle size analyses, if required. The GPS coordinates, along with a physical description of the sampling site and sediment samples will be recorded in field notes. A minimum of three photographs will be taken of the sampling site.

It is important to note that it is anticipated that core sample recovery will vary tremendously throughout the reach of Eighteenmile Creek addressed in this SOW. For example, upstream of the old Newfane Dam impoundment and downstream of Burt Dam, core samples may often be less than two to three feet. In contrast, downstream of this dam, particularly within the Burt Dam impoundment, core samples may potentially be up to eight feet or greater. A preliminary linear estimate of total core sample recovery is 116 feet. When assuming that sediment samples will be analyzed from these cores every one to two feet, an average of 2.97 samples will be required to be analyzed per recovered core sample. Therefore, this SOW uses an average of three samples requiring analyses per core sample.

(a) **Surface Grab.** Surface grab samples will be collected for the bioaccumulation testing in order to determine the uptake and bioavailability of select organic contaminants at the benthic level. A Petite Ponar will be used to collect the surface grab samples. A GPS will be used to locate the sampling locations. At each of the sediment sampling sites, at least two surface grab samples will be collected within 10 feet of each other. A minimum of 1.75 gallons of sediment will be collected for the bioaccumulation testing at each site. The material will be placed in a stainless steel bowl and homogenized as a single sample. The following samples will be obtained from this homogenate: (1) a full one gallon polypropylene bucket of sediment for bioaccumulation testing; (2) a full one quart glass jar of sediment for select bulk organic chemistry; (3) a full quart glass jar of sediment for particle size analyses, and; (4) eight ounces of sediment in a 12 ounce glass jar for Quality Assurance testing (QA), if required (see below). The GPS coordinates, along with a physical description of the sampling site and sediment samples, will be recorded in field notes. A minimum of three photographs will be taken of the sampling site.

All samples will be labeled with the location, sample type, required analyses and date, and immediately placed on ice in a 48-quart cooler at 4±2°C for shipment to the analytical laboratory. The samples will be maintained under such conditions until they are processed for analyses.

(3) *QA Samples*—At least eight ounces of additional sediment from four sites (see below) will be contained in separately labeled (with the location, sample type, date, and designated "QA Sample for [analyte]") glass jars for QA testing purposes.

b. Sample Sites and Analyses.

(1) *Sampling Limits*—This SOW is limited to the reach of Eighteenmile Creek situated upstream of the AOC, between Burt Dam and the Erie Canal (see Figure 2). This SOW focuses on this reach of the creek based on the following information and factors:

(a) **Eighteenmile Creek Sediment Quality Data**. In 1994, NYSDEC (2006) showed levels of chromium, copper and lead that exceed 10x the severe effect levels (SELs) (see NYSDEC 1999), and cadmium, nickel and zinc concentrations that exceed the SEL at the sites upstream of both Burt and Newfane Dams. In addition, PCDD/F TEQs and ∑4,4'-dichlorodiphenyldichloroethane (DDT) concentrations at these two sites exceeded the wildlife bioaccumulation criteria (NYSDEC 1999), and PCB levels exceeded the SEL and PEL at the sites upstream of the Burt and Newfane Dams, respectively. Further evaluation of this reach by NYSDEC in 1999 (NYSDEC 2006) suggested that the Flintkote Site, The Gulf (a tributary that feeds into Eighteenmile Creek near Lockport) and Erie Canal were significant upstream sources of contamination (the East Branch and areas upstream of the Erie Canal suggested that they were not major sources). The SELs (and at times 10xSELs) for cadmium, chromium, copper, lead, mercury, nickel, silver and zinc were exceeded at sites upstream of both the Newfane and Burt Dams. The SELs for copper, lead, silver and mercury were also exceeded at the Flintkote site. Lead and zinc concentrations at The Gulf and Erie Canal sites exceeded

the SELs. Radiometric dating indicates that the highest metal concentrations upstream of both dams date from the 1950s and 1960s (NYSDEC 2006). With respect to organics, PCDD/F TEQs at the sites upstream of the Newfane and Burt Dams, and Flintkote and Erie Canal all exceeded the wildlife bioaccumulation criteria. In addition, high levels of PCBs (i.e., about 25 mg/kg) were found upstream of Burt Dam and downstream of the Flintkote Site, and ∑DDT exceeded the lowest effect level (LEL) upstream of Burt Dam (NYSDEC 2006). Total PAHs levels upstream of Burt Dam, near the Burt Dam and Flintkote Site and The Gulf ranged from 13.3 to 24.1. However, total PAH levels in the Erie Canal and upstream of the Erie Canal were higher, ranging from 25.6 to 29.8 mg/kg (NYSDEC 2006).

(b) **AOC Sediment Quality Data.** Preliminary findings of USACE (2006) show high levels of lead, zinc (both exceeding the Severe Effect Level [SEL] threshold [NYSDEC 1999]) and chromium (exceeding the Probable Effect Level [PEL]), at the base of Burt Dam, suggesting upstream sources. This investigation also indicated upstream sources of PCBs, 4,4'-dichlorodiphenyldichloroethylene (DDE]) (a metabolite of DDT) (and ∑DDT) and PCDD/Fs. Both PCBs and DDE were very bioavailable in sediments at the base of the dam, and the PCB concentration was almost two times the equilibrium partitioning (EqP)-based sediment criteria for wildlife bioaccumulation (NYSDEC 1999). Regarding PCDD/Fs, sediments at this site yielded the highest toxic equivalent (TEQ) in the investigation (16 pg/g), which was 1.7 fold the wildlife bioaccumulation criteria.

(c) **Burt and Newfane Dams.** These dams upstream of the AOC in Eighteenmile Creek serve to detain or accrue contaminated sediments on their upstream side, and also eventually release some of these contaminated sediments downstream toward the AOC. In this way, they have incidentally become "subsidiary sources" of sediment contamination.

Based on the above information, the weight-of-the-evidence indicates that there are significant sources of contamination upstream of Burt Dam, including the Flintkote Site, The Gulf, Erie Canal at Lockport and agricultural runoff. All are suspected of contributing to sediment contamination within the AOC, therefore adversely influencing the designated use impairments. The downstream migration of contaminated sediments associated with these sources has been affected by the two dams, since they have developed into secondary sources of sediment contamination to the AOC and Lake Ontario.

(2) *Sample Locations and Analyses*

(a) **Sampling Sites.** The sampling sites for this SOW were located based on the following criteria:

- Historic sediment quality surveys (mainly NYSDEC 2006 [two surveys] and USACE 2006);

- Data gaps;

- Perceived primary and subsidiary sources of COCs;

- Sediment depositional or amassing areas in the creek; and

- Assessed need for bioaccumulation data.

The sediment sampling sites under this SOW are shown in Figures 2 and 3. Table 2 includes the latitude and longitude of each site location.

(b) **Analyses.** Table 2 specifies the type of sample to be collected at each location and the required sediment testing with supporting rationale. All sediment testing will be completed by a USACE contractor. A brief summary of the sediment analyses is as follows:

- Bulk Chemistry—These analyses will be performed on both core and surface sediment samples to characterize the contamination in the sediments. Core sample chemistry will be used to assess contamination in the sediments with respect to depth, and surface grab chemistry will be used to determine the levels of contaminants to which the aquatic community is exposed. All sediment contaminant concentrations will be reported on a dry weight basis and will be required to conform to specified laboratory reporting limits (LRLs). The specific analytical parameters and methods are included in Table 3.

- Bioaccumulation of Organic Contaminants—The standard bioaccumulation test for select organic contaminants using the aquatic earthworm *Lumbriculus variegatus* will be applied to the surface sediment samples according to the protocol contained in the Great Lakes Dredged Material Testing and Evaluation Manual (USEPA/USACE 1998). Worm masses will be exposed to sediment samples contained in aquaria equipped with an intermittent flow system for overlying water renewal to maintain adequate exposure conditions. Five replicate exposures will be run per treatment (sediment sample) over a period of 28 days. Each tissue replicate will be analyzed for select organic contaminants and lipid. A sediment sample obtained from the composite will be analyzed for the same organic contaminant(s) measured in the tissues, and total organic carbon (TOC). All sediment and tissue parameter concentrations will be reported on a dry and wet weight basis, respectively, and will be required to conform to specified LRLs. The specified organic parameters and analytical methods are included in Table 3.

(3) *QA Testing*—Each sample specified below will be shipped to a separate analytical laboratory for bulk sediment testing.

(a) **Metals.** An eight-ounce sample of sediment from Site EMU-21 (core sample) will be contained in a 12-ounce glass jar and subjected to metals QA testing.

(b) **PCBs.** An eight-ounce sample of sediment from Site EMU-20 (core sample) will be contained in a 12-ounce glass jar and subjected to PCB QA testing.

(c) **DDT/DDE/DDD.** An eight-ounce sample of sediment from Site EMU-18 (core sample) will be contained in a 12-ounce glass jar and subjected to DDT/DDE/DDD QA testing.

(d) **PCDD/Fs.** An eight-ounce sample of sediment from Site EMU-10 (core sample) will be contained in a 12-ounce glass jar and subjected to PCDD/F QA testing.

(4) At each sampling site, a single "representative" sub-sample from each core sample will be contained in a separate 32-ounce glass jar for particle size analyses.

c. Issues/Contingency Plans. The notable uncertainties associated with the SOW are gaining access to the sampling sites and sediment core recoveries, such that the sediment obtained samples are representative. For example, some of the sediment sampling sites between the Newfane and Burt Dams may be accessible to a vessel-mounted vibracore sampler, while other sites in the more upstream reach of the creek may be obtainable only by a hand-driven core sampler. In order to address such contingencies, an additional 15 man/days of USACE labor is being included as a contingency to allow for additional field reconnaissance and work.

3. REPORTING

Data generated as a result of this SOW will be reported in two phases as follows:

a. Analytical Data. Draft and final versions of the analytical report (report) will be required from the sediment testing contractor. The report will contain project information and summary of the sampling effort, sampling figures and photographs, field notes, test methods, summary tables of the test results, and the actual laboratory reports. The draft report will be submitted to the USACE and other entities for technical review, and all comments will be resolved prior to the finalization of the report. After approval, five copies of the final report, and an electronic version in Adobe (PDF) format, will be furnished to the USACE. In addition, a copy of all generated data in summary tables will be required on a separate diskette.

b. Sediment Investigation. Following the receipt of the final report from the testing contractor, a sediment quality assessment in the form of a sediment investigation report will be completed by USACE personnel to interpret the data contained in the analytical report. This report will be presented in the general form of a scientific manuscript with the following Chapters: (1) Summary; (2) Materials and Methods; (3) Results and Discussion; (4) Conclusion; and (5) Literature Cited.

4. COST ESTIMATE

Table 3 summarizes a preliminary cost estimate for this SOW. The total cost is estimated at $507,585 ($519,585 when including a USACE labor contingency).

5. REFERENCES

Burt Dam Power Company. 1987. Burt Dam Hydrologic Project—Containment of Sediments in Headpond. Report prepared by Shawinigan Integ Inc.

County of Niagara. 2006. Geographic Information System (GIS) maps of Eighteenmile Creek watershed maintained by Niagara County.

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USEPA and USACE. 1998. Great Lakes Dredged Material Testing and Evaluation Manual. http://www.epa.gov/glnpo/sediment/gltem

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FIGURE 1. Eighteenmile Creek Great Lakes AOC.

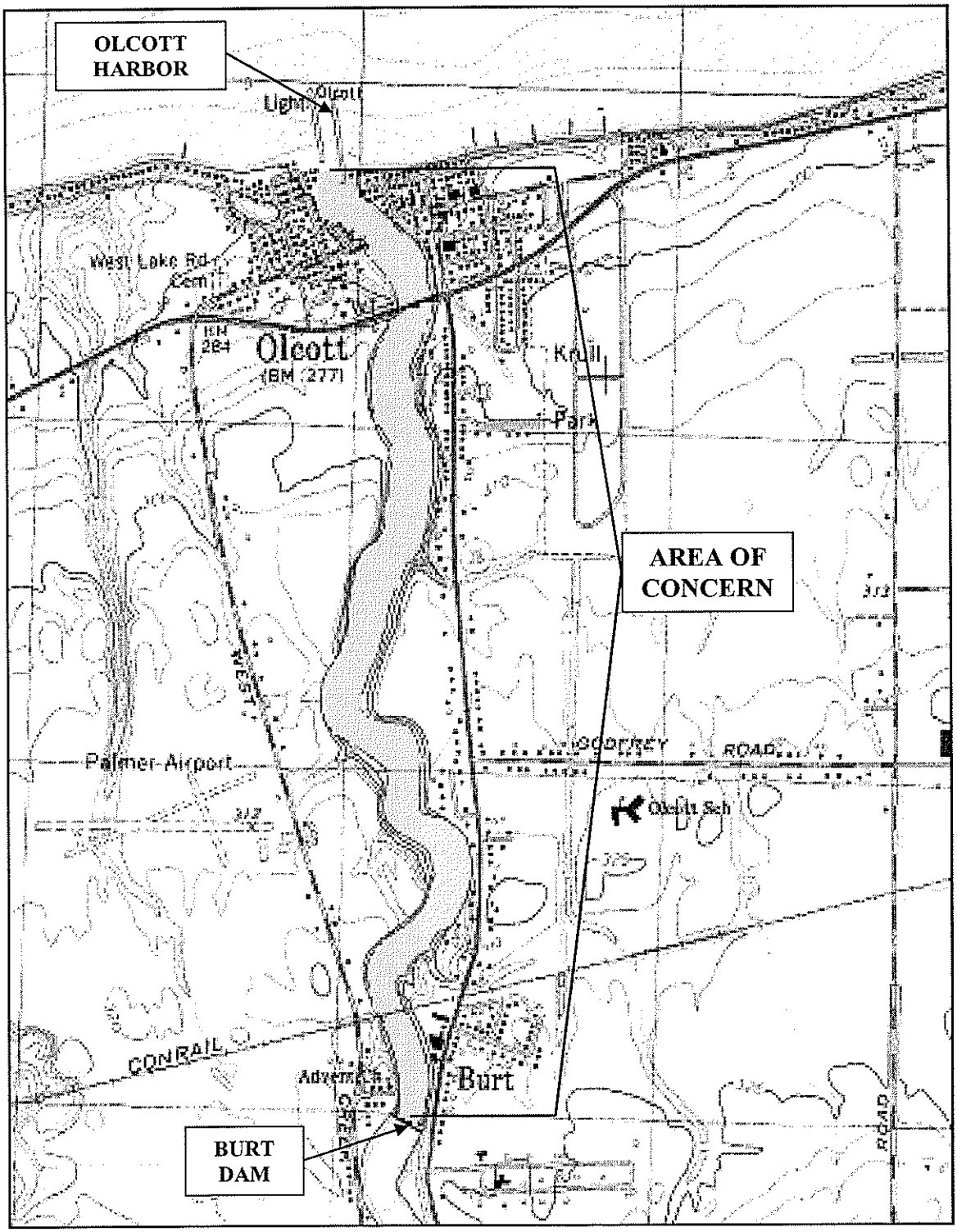

FIGURE 2. Sediment sampling sites in Eighteenmile Creek between Burt Dam in Burt and Jacques Road in Corwin, New York.

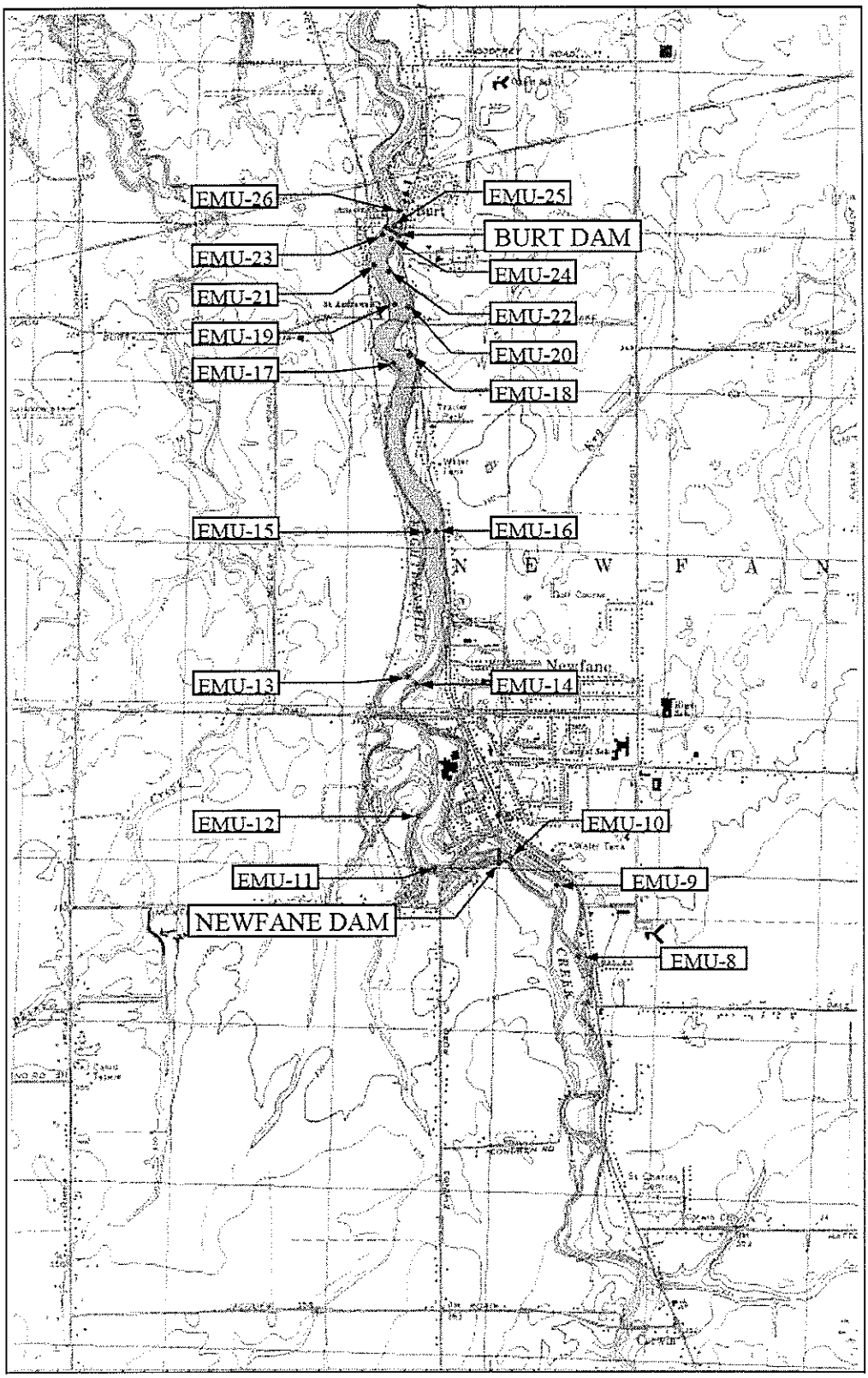

FIGURE 3. Sediment sampling sites is Eighteenmile Creek, between Jacques Road in Corwin to the Erie Canal at Lockport, New York.

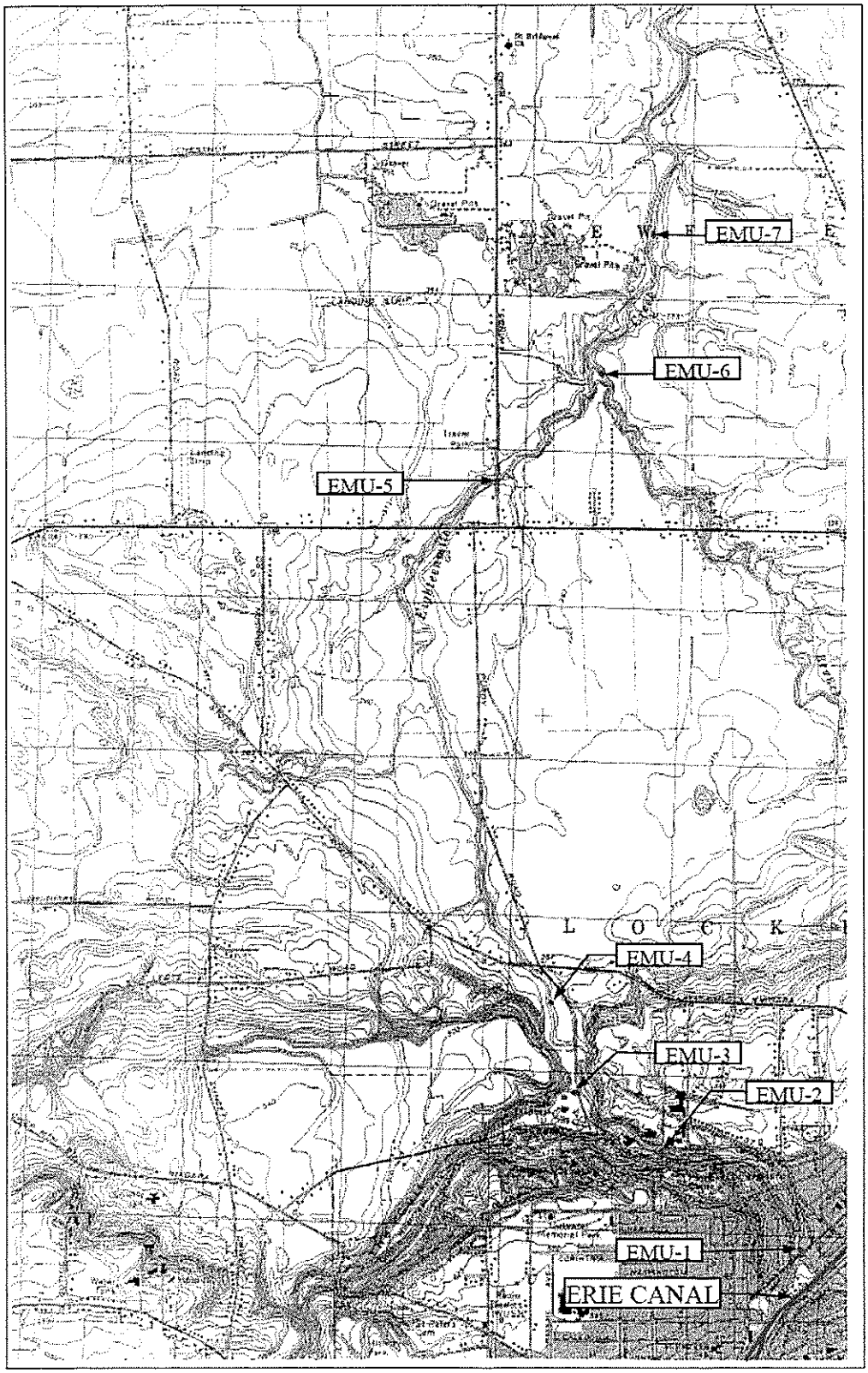

TABLE 2. Preliminary cost estimate for the sediment sampling and analyses outlined in this SOW. This estimate assumes: (1) a total of 26 core samples with three discrete sub-samples per core sample, regardless of length (3 to 9 feet); (2) bioaccumulation testing on composite surface sediment samples collected from 16 of the 24 sites; (3) particle size analyses will be performed on a single, representative sample from each of the 26 sampling sites, as well as each of the 16 samples to be subjected to bioaccumulation testing.

Item Description/ Method	Unit	Cost/unit ($)	Required Laboratory Reporting Limit (dry weight)	Number of Units	Cost ($)
SEDIMENT SAMPLING					
Labor (USACE)	Day	800	-	3x10	24,600
Labor contingency	Day	800	-	3x5	12,000
Vibracore sampler (USEPA Mudpuppy)	Week	No cost	-	-	0
Lexan core tubes	Foot	8	-	10x20	1,600
Overnight shipment of coolers	Each	100	-	12	1,200
Supplies/equipment (ice, jars, buckets, tools, camera, etc.)	Lump sum	-	-	-	1,500
SEDIMENT ANALYSES					
Particle size/hydrometer – ASTM Procedure D422	Each	120	-	26 14	4,800
Metals (TAL) – Method 6010B (7000 Series 7471 for mercury)	Each	210	0.050 mg/kg Mercury – 0.025	3x26	16,380
PCBs (209 congeners, A-DRBC List)	Each	990	0.005 mg/kg	3x25	74,250
Pesticides – Method 8081A (for ∑DDT)	Each	125	0.005 mg/kg	3x24	8,250
PCDD/Fs – Method 8290	Each	890	0.000002 (2 pg/g)	3x23	64,080
28-Day *L. variegatus* bioaccumulation test	Each	2,350	-	16	37,600
L. variegatus tissue/sediment PCDD/Fs analyses – Method 8290	Each	890	Tissue – 2 pg/g Sediment – See above	5x16 1x16	85,440
L. variegatus tissue/sediment PCB analyses - 209 Congeners, A-DRBC List	Each	990	Tissue – 1 to 2 µg/kg Sediment – See above	5x14 1x14	83,160

TABLE 2 (Continued).

Item Description/ Method	Unit	Cost/unit ($)	Required Laboratory Reporting Limit (dry weight)	Number of Units	Cost ($)
L. variegatus tissue/sediment pesticides analyses – Method 8180A	Each	125	Tissue – 2 to 5 µg/kg Sediment – See above	5x13 1x13	9,750
L. variegatus tissue lipid analyses	Each	66		5x16	5,280
TOC – Method 9060	Each	65	250 (%)	3x26 1x16	10,400
QA Sediment samples					
Metals (TAL)	Each	210	0.050	1x210	210
PCBs (209 congeners, A-DRBC List)	Each	990	0.005	1x990	990
PCDD/Fs	Each	890	2 pg/g	1x890	890
Pesticides	Each	125	0.005 mg/kg	1x125	125
PROJECT MANAGEMENT, SUPERVISION/ADMINISTRATION, CONTRACTING AND REPORTING					
Labor ("Level 1")	Hour	70	-	24	1,680
Labor ("Level 2")	Hour	55	-	56	3,080
Labor (Technician)	Hour	40	-	48	1,920
Reproduction	Page	0.15	-	4000	600
Contracting (in-house labor)	Hour	100	-	10	1,000
Contract execution/oversight (in-house labor)	Hour	100	-	160	16,000
Data interpretation and sediment quality assessment report (in-house labor)	Hour	100	-	240	24,000
Project Management	Hour	80	-	240	19,200
Supervision/administration	Hour	120	-	80	9,600
TOTAL COST ESTIMATE ($)					507,585 (519,585 with labor contingency]

B Mapped Soil Types within the Eighteenmile Creek Watershed

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Table B-1. Soil Types Found Within the Eighteenmile Creek Watershed

Map Symbol	Name	Hydric	Prime Farmland	Farmland of Statewide Importance	Erosion Potential [1]	Adjacent to Eighteenmile Creek	Percent Coverage
Ad	Alluvial land	Hydric				*	6.50%
Af	Altmar loamy fine sand			*			6.17%
Am	Altmar gravelly fine sandy loam			*		*	4.60%
AnA	Appleton gravelly loam, 0-3% slope	Potential inclusions	Drained areas only			*	4.31%
ApA	Appleton silt loam, 0-3% slope	Potential inclusions	Drained areas only			*	4.16%
ArB	Arkport very fine sandy loam, 0-6% slope		All occurrences			*	3.50%
ArC	Arkport very fine sandy loam, 6-12% slope			*			3.43%
AsA	Arkport fine sandy loam, gravelly substratum, 0-2% slope		All occurrences			*	3.32%
AsB	Arkport fine sandy loam, gravelly substratum, 2-6% slope		All occurrences			*	3.30%
BoA	Bombay fine sandy loam, 0-2% slope		All occurrences			*	3.04%
BoB	Bombay fine sandy loam, 2-6% slope		All occurrences			*	2.97%
BrA	Brockport silt loam, 0-4% slope	Potential inclusions		*		*	2.67%
Ca	Canandaigua silt loam	Hydric					2.53%
CcA	Cayuga and Cazenovia silt loams, 0-2% slope		All occurrences				2.18%
CcB	Cayuga and Cazenovia silt loams, 2-6% slope		All occurrences			*	1.99%
CcC	Cayuga and Cazenovia silt loams, 6-12% slope			*		*	1.96%
CeA	Cazenovia gravelly silt loam, 0-3% slope		All occurrences			*	1.76%
CeB	Cazenovia gravelly silt loam, 3-8% slope		All occurrences			*	1.72%
CgA	Cazenovia gravelly silt loam, shale substratum, 0-3% slope		All occurrences			*	1.61%
CgB	Cazenovia gravelly silt loam, shale substratum, 3-8% slope		All occurrences			*	1.56%
Ch	Cheektowaga fine sandy loam	Hydric	Drained areas only	*			1.54%

Table B-1. Soil Types Found Within the Eighteenmile Creek Watershed

Map Symbol	Name	Hydric	Prime Farmland	Farmland of Statewide Importance	Erosion Potential [1]	Adjacent to Eighteenmile Creek	Percent Coverage
ClA	Churchville silt loam, 0-2% slope	Potential inclusions					1.46%
ClB	Churchville silt loam, 2-6% slope	Potential inclusions				*	1.36%
CmA	Claverack loamy fine sand, 0-2% slope		All occurrences				1.33%
CmB	Claverack loamy fine sand, 2-6% slope		All occurrences			*	1.24%
CnA	Collamer silt loam, 0-2% slope		All occurrences			*	1.21%
CnB	Collamer silt loam, 2-6% slope		All occurrences			*	1.18%
CoB	Colonie loamy fine sand, 0-6% slope		All occurrences			*	1.08%
Cs	Cosad fine sandy loam	Potential inclusions	Drained areas only			*	0.98%
Cu	Cut and fill land	Potential inclusions				*	0.97%
DuB	Dunkirk silt loam, 2-6% slope		All occurrences			*	0.86%
DuC3	Dunkirk silt loam, 6-12% slope, eroded				Eroded	*	0.81%
DvD3	Dunkirk and Arkport soils, 12-20% slope, eroded				Steep slope, eroded	*	0.81%
ElA	Elnora loamy fine sand, 0-2% slope		All occurrences			*	0.80%
ElB	Elnora loamy fine sand, 2-6% slope		All occurrences				0.80%
FaA	Farmington silt loam, 0-8% slope			*		*	0.79%
Fo	Fonda mucky silt loam	Hydric				*	0.79%
Fr	Fredon gravelly loam	Potential inclusions	Drained areas only			*	0.75%
GnA	Galen very fine sandy loam, 0-2% slope		All occurrences			*	0.73%
GnB	Galen very fine sandy loam, 2-6% slope		All occurrences			*	0.70%
Ha	Hamlin silt loam		All occurrences			*	0.68%
HgA	Hilton gravelly loam, 0-3% slope		All occurrences			*	0.65%
HgB	Hilton gravelly loam, 3-8% slope		All occurrences			*	0.65%

Table B-1. Soil Types Found Within the Eighteenmile Creek Watershed

Map Symbol	Name	Hydric	Prime Farmland	Farmland of Statewide Importance	Erosion Potential [1]	Adjacent to Eighteenmile Creek	Percent Coverage
HlA	Hilton silt loam, 0-3% slope		All occurrences			*	0.59%
HlB	Hilton silt loam, 3-8% slope		All occurrences			*	0.58%
HmA	Hilton and Cayuga silt loams, limestone substratum, 0-3% slope		All occurrences			*	0.53%
HmB	Hilton and Cayuga silt loams, limestone substratum, 3-8% slope					*	0.52%
HoA	Howard gravelly loam, 0-3% slope		All occurrences			*	0.51%
HoB	Howard gravelly loam, 3-8% slope		All occurrences			*	0.50%
HoC	Howard gravelly loam, 8-15% slope			*			0.50%
HsB	Hudson silt loam, 2-6% slope					*	0.47%
HtC3	Hudson silty clay loam, 6-12% slope, eroded						0.46%
HuF3	Hudson soils, 20-45% slope, eroded					*	0.45%
LaB	Lairdsville silt loam, 0-6% slope			*		*	0.45%
Lc	Lakemont silty clay loam	Hydric		*		*	0.43%
Ld	Lamson very fine sandy loam	Hydric	Drained areas only				0.43%
Lg	Lamson fine sandy loam, gravelly substratum	Hydric	Drained areas only				0.42%
Lo	Lockport silt loam	Potential inclusions		*		*	0.42%
Ma	Madalin silt loam	Hydric		*			0.41%
Md	Madalin silt loam, loamy subsoil variant	Hydric		*		*	0.41%
Me	Made land	Potential inclusions					0.41%
Mf	Massena fine sandy loam	Potential inclusions	Drained areas only				0.35%
Mn	Minoa very fine sandy loam	Potential inclusions	Drained areas only			*	0.34%
Ms	Muck, shallow	Hydric					0.34%
NaA	Niagara silt loam, 0-2% slope	Potential inclusions	Drained areas only			*	0.32%

Table B-1. Soil Types Found Within the Eighteenmile Creek Watershed

Map Symbol	Name	Hydric	Prime Farmland	Farmland of Statewide Importance	Erosion Potential [1]	Adjacent to Eighteenmile Creek	Percent Coverage
NaB	Niagara silt loam, 2-6% slope	Potential inclusions	Drained areas only			*	0.32%
OdA	Odessa silty clay loam, 0-2% slope	Potential inclusions				*	0.31%
OdB	Odessa silty clay loam, 2-6% slope	Potential inclusions					0.28%
OnB	Ontario loam, 2-8% slope		All occurrences			*	0.26%
OnC	Ontario loam, 8-15% slope			*			0.25%
OnC3	Ontario loam, 8-15% slope, eroded						0.25%
OnD3	Ontario loam, 15-30% slope, eroded				Steep slope, eroded	*	0.24%
OoA	Ontario loam, limestone substratum, 0-3% slope		All occurrences				0.24%
OoB	Ontario loam, limestone substratum, 3-8% slope		All occurrences				0.24%
OsA	Otisville gravelly sandy loam, 0-3% slope					*	0.22%
OsB	Otisville gravelly sandy loam, 3-8% slope						0.21%
OvA	Ovid silt loam, 0-2% slope	Potential inclusions	Drained areas only			*	0.19%
OvB	Ovid silt loam, 2-6% slope	Potential inclusions	Drained areas only			*	0.17%
OwA	Ovid silt loam, limestone substratum, 0-3% slope	Potential inclusions	Drained areas only			*	0.17%
OwB	Ovid silt loam, limestone substratum, 3-8% slope	Potential inclusions	Drained areas only				0.14%
PsA	Phelps gravelly loam, 0-5% slope		All occurrences			*	0.12%
Pt							0.11%
Qu							0.11%
RbA	Rhinebeck silt loam, 0-2% slope	Potential inclusions	Drained areas only				0.10%
RbB	Rhinebeck silt loam, 2-6% slope	Potential inclusions	Drained areas only			*	0.10%
RoA	Rock land, nearly level						0.10%
RoF	Rock land, steep					*	0.09%
ShB	Schoharie silty clay loam, 2-6% slope					*	0.09%
St	Stafford loamy fine sand	Potential inclusions		*			0.08%

Table B-1. Soil Types Found Within the Eighteenmile Creek Watershed

Map Symbol	Name	Hydric	Prime Farmland	Farmland of Statewide Importance	Erosion Potential [1]	Adjacent to Eighteenmile Creek	Percent Coverage
Su	Stafford loamy fine sand, gravelly substratum	Potential inclusions		*			0.08%
Sw	Sun silt loam	Hydric		*		*	0.07%
Ua							0.06%
W	Water	Hydric					0.05%
Wa	Wayland silt loam	Hydric				*	0.03%

Natural Resource Conservation Service (NRCS) 2004. www.nrcs.usda.gov. Accessed March 25, 2004.

[1] Erosion potential was assessed only for those soils located adjacent to Eighteenmile Creek, East Branch of Eighteenmile Creek, and The Gulf.

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C Brownfields within the Eighteenmile Creek Watershed

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Table C-1 Identified Brownfield Locations in the Vicinity of the Eighteenmile Creek Watershed

Label ID	Brownfield	Area (Acres Unless Specified)	Municipality	Address	Zoning Class	Past and Present
97	Eighteenmile Creek Junkyard	4.1	City of Lockport	330 Mill Street	Industrial	Auto Repair/ Junkyard
73	70 Mill Street site	1.1	City of Lockport	70 Mill Street	340 Vacant Industrial	Past - Industrial Present - Unknown
143	Agway	6.2	Royalton	7637 Canal Road	Industrial	Distribution: fertilizer
92	Bancroft Property	89	City of Lockport	400 South Niagara	Single Family Residential	Past - Unknown Present - Unknown
75	Dussault Foundry Corporation	3.9	City of Lockport	2-4-6 Washburn Street	710 Manufacturing.	Past - Factory; Present - Unknown
76	Dussault Foundry Corporation	1.7	City of Lockport	10 Washburn	340 Vacant Industrial	Past - Factory; Present - Unknown
131	Elecktruck Battery	1.4	Lockport	4922 IDA Park Drive	Manufacturing	Manufacturing
89	Flintkote	1.2	City of Lockport	198 Mill Street *	710 Manufacturing	Past - Industrial Present - Unknown
94	Flintkote	4.9	City of Lockport	300 Mill Street *	710 Manufacturing	Past - Factory Present - Unknown
80	Former Dahl Oil Site	1	City of Lockport	Bristol & Niagara	Commercial	Feed mill & oil distributor
116	Former Gas Station	1.1	Newfane	2097 Lockport Olcott Road	Village Business	Garage
118	Former Gas Station	82.5 x 165 feet	Newfane	2780 South Main	Village Business	Garage
133	Former Gas Station	0.25	Middleport	8503 Rochester Road	Residential	Garage/Diner
78	Former Lockport Cotton Batting Company	5.75	City of Lockport	294 Elmwood Avenue	R-3	Manufacturing/ warehouse
79	Former Lockport Cotton Batting Company	3.2	City of Lockport	331 Elmwood Avenue	R-3	Manufacturing/ warehouse
91	Former Lockport Cotton Batting Company	0.56	City of Lockport	305 Elmwood Avenue	R-3	Manufacturing/ Fitness Club

Table C-1 Identified Brownfield Locations in the Vicinity of the Eighteenmile Creek Watershed

Label ID	Brownfield	Area (Acres Unless Specified)	Municipality	Address	Zoning Class	Past and Present
88	Former Power Generation Facility	27,000 square feet	City of Lockport	109 Mill Street	340 Vacant Industrial	Parking Lot
96	Former Power Generation Facility	2.11	City of Lockport	89 Mill Street	340 Vacant Industrial	Power Generation Facility
93	Junkyard & Quarry	22.7	City of Lockport	Old Niagara Road		Past - Quarry Present - Junkyard
135	Kuglers Junkyard - active	108	Cambria	5222 Lockport-Junction	Industrial	Salvage/ Processing of junk
117	Lockport Felt Company	15	Newfane	West Ave., Newfane	Industrial Park	Felt Manufacturing Company/Storage
120	Lockport Felt Company	15	Newfane	West Ave., Newfane	Industrial Park	Felt Manufacturing Company/Storage
84	Old Upper Mt. Road site	1.3	City of Lockport	101 Upper Mt. Road	340 Vacant Industrial	Past - Unknown Present - Vacant
129	Old Upper Mount Road site	4.1	Lockport	5279 Old Upper Mount	311 Residential Vacant	Farming/ Hazardous Waste Disposal
90	Plaslok site	2	City of Lockport	225 Mill Street	710 Manufacturing	Past - Factory Present - Vacant
83	South Niagara Quarry site	1.8	City of Lockport	456 South Niagara	340 Vacant Industrial	Past - Unknown Present - Vacant
119	Taylors Hardware	2.3	Newfane	7121 Ridge Road	Rural Residential	Hardware Store/Gas
130	Town Landfill	18.4	Lockport	7250 Canal Road	Landfill & Dump	Past - Farming & Landfill
74	White Transportation	1.1	City of Lockport	34 Mill Street	330 Vacant Commercial	Parking Lot for Trucks
81	White Transportation	25,218 square feet	City of Lockport	38 Mill Street	447 Truck Terminal	Parking Lot for Trucks
82	White Transportation	7,451 square feet	City of Lockport	30 Mill Street	438 Parking Lot	Parking Lot for Trucks
95	White Transportation	14,400 square feet	City of Lockport	40 Mill Street	438 Parking Loot	Parking Lot for Trucks

D Evaluation of Recreational Fishing Activity at Fisherman's Park in Newfane, New York

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Evaluation of Recreational Fishing Activity at Fisherman's Park in Newfane, New York

Introduction

This section of the baseline overview of the Watershed provides a summary and evaluation of recreational fishing activity for the Fisherman's Park fishing area located near Burt Dam on Eighteenmile Creek (See Picture Below). Fisherman's Park represents a publicly accessible outlet for fresh water anglers. Anglers pay a two dollar per person ticket fee to the Town of Newfane to fish at the Park.

Source: Fisherman's Park, Town of Newfane, http://olcott-newfane.com/html/burt_dam.html

The Town of Newfane keeps records of vehicles by license plate number, state of origin, and total dollars amounts collected for each day for the fall fishing season (spanning from October through November). These records enabled a census count of vehicles and angler trip days by residency to be completed. Supplemented with this analysis are estimates of fishing effort and economic impacts associated with this recreational activity. While not reflective of the entire fishing resource available to anglers (i.e. the entire length of the Creek), the data from Fisherman's Park does provide an indication of the importance of this waterbody to the Watershed and New York State that can be compared to other angler surveys and reports for Lake Ontario tributaries. Eighteenmile Creek flows into Lake Ontario at Olcott. It should be noted that the Town of Newfane also provides boat access and collects ticket revenues associated with using the Marina and boat launch. These marina records have not yet been evaluated in this draft but are mentioned because fishing and boating activities at this public access site are popular and highlight the Creek's role in linking boaters and anglers to the Lake Ontario resource.

Eighteenmile Creek is a popular, highly productive tributary of Lake Ontario and is popular for Salmon, Steelhead and Trout fishing. The Creek will hold salmon and trout all through October and November. By December, the Creek will contain primarily Steelhead and Rainbow Trout (Town of Newfane). The Fall 2005 Lake Ontario Tributary Survey showed that Eighteenmile Creek was ranked number one in angler hours for all Non-Salmon River tributaries (2005, Prindle, Bishop, Penney). This section of the Watershed natural resource baseline first describes the Fisherman's Park dataset and then shows key angler activity summaries for 2004-2005. The dataset was then supplemented with other local data and surveys to estimate effort (angler hours) and economic impacts associated with this Park.

Description of Dataset

The dataset was assembled from hard copy records maintained by the Town of Newfane reflecting Fall seasonal recreational fishing activity at Fisherman's Park. The records were entered into an MS Access database. The summaries produced from the records are meaningful because they depict two years of historical participation for a productive segment of the Creek, and can be compared to Lake Ontario tributary creel survey estimates as well as other estimates of recreational angler participation and fresh water fishing economic impact for New York State. The dataset contained a total of 11,111 records for the fishing period spanning October – November of 2004 and 2005. Each record consisted of a fishing date, a vehicle license plate number, the state of origin, and the total amount of ticket revenue paid by all fishermen over the age of 16 within the fishing party associated with the respective vehicle. The summarized records show that the Town of Newfane collected $18,939 from Fisherman Park anglers in 2004. Collections grew by 9% to $20,637 for 2005.

Angler Residency

The majority of vehicles were from New York, Pennsylvania and Ohio. However, Fisherman's Park is a popular destination and attracts anglers from throughout the United States. It should be noted that Western New York was recently ranked as the number one fall fishing destination site for recreational fishing by Outdoor Life Magazine (Outdoor Life,). Over the course of the two-year period evaluated, vehicles from a total of 41 of the 50 states in the U.S. visited Fisherman's Park, attesting to its popularity.

Table 1

Summary of Vehicles By State* for Fisherman's Park (18 Mile Creek)
from Town of Newfane, NY License Records-In 2005 Descending Order Rank

	State/Province	2004	%	2005	%	Absolute Change 2004-2005	Percent Change 2004-2005
1	New York	736	38.3%	851	39.2%	115	16%
2	Pennsylvania	452	23.5%	459	21.2%	7	2%
3	Ohio	249	13.0%	217	10.0%	(32)	-13%
4	Ontario	98	5.1%	137	6.3%	39	40%
5	New Jersey	99	5.2%	123	5.7%	24	24%
6	Virginia	39	2.0%	84	3.9%	45	115%
7	West Virginia	64	3.3%	77	3.6%	13	20%
8	Maryland	33	1.7%	43	2.0%	10	30%
9	Massasschussetts	23	1.2%	38	1.8%	15	65%
10	Connecticut	16	0.8%	32	1.5%	16	100%
11	No ST given	16	0.8%	30	1.4%	14	88%
12	Others	97	5.0%	78	3.6%	(19)	-20%
	Total:	**1,922**	**100%**	**2,169**	**100%**	**247**	**12.9%**

Note: * Represents tally of unique license plates (vehicles) by state.

Table 1 summarizes the tally of unique license plates/vehicles traveling to Fisherman's Park in 2004-2005. Unique vehicles are not the same as vehicle counts (i.e. the same vehicle frequenting the Park at numerous dates - see below). New York accounted for 39.2% of the unique license plates/vehicles in 2005, while Pennsylvania and Ohio accounted for almost one third. The Province of Ontario accounted for 6.3% of the vehicles in 2005, and visitation grew by 40% between 2004 and 2005. The largest year to year percentage increases in visitation were recorded for the states of Virginia (115%) and Connecticut (100%). Table 1 shows an overall 13% increase in unique vehicles between 2004 and 2005 for the Park.

Vehicle Trips

Vehicle trips represent a count of all days for each vehicle. Figure 1 shows the distribution of vehicle trips by fishing party size associated with that vehicle. Most vehicles carried an average of two anglers to the Park. Vehicle trips represent the tally of license plates by state across all fishing days. In 2004, there were a total 5,410 vehicle trips to Fisherman's Park. Vehicle trips rose 5.4% to reach 5,701 in 2005.

Figure 1

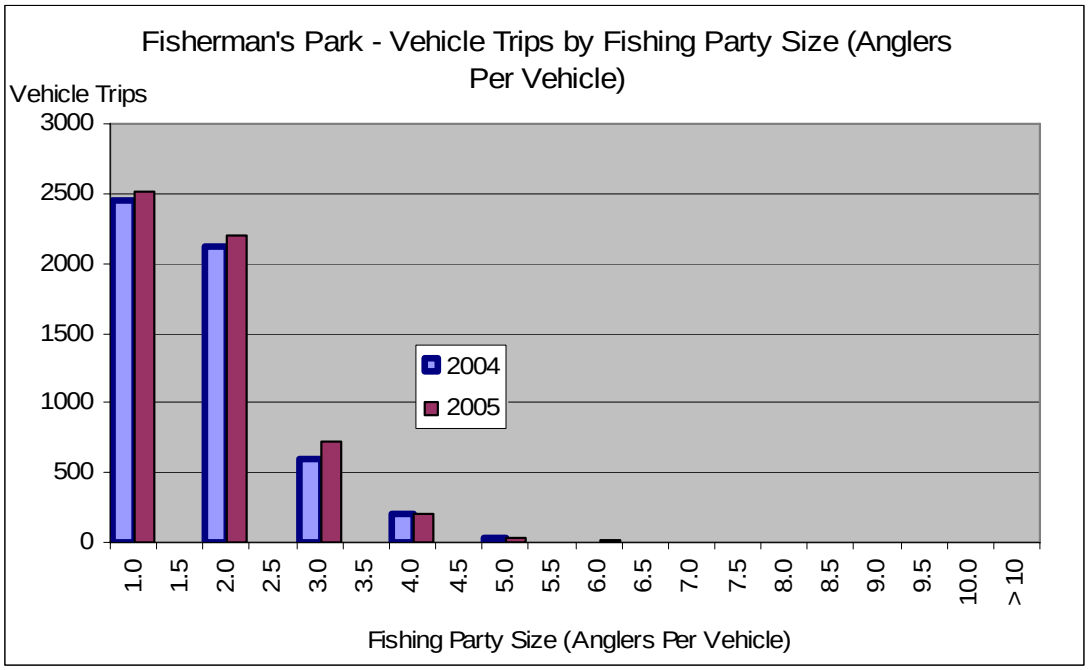
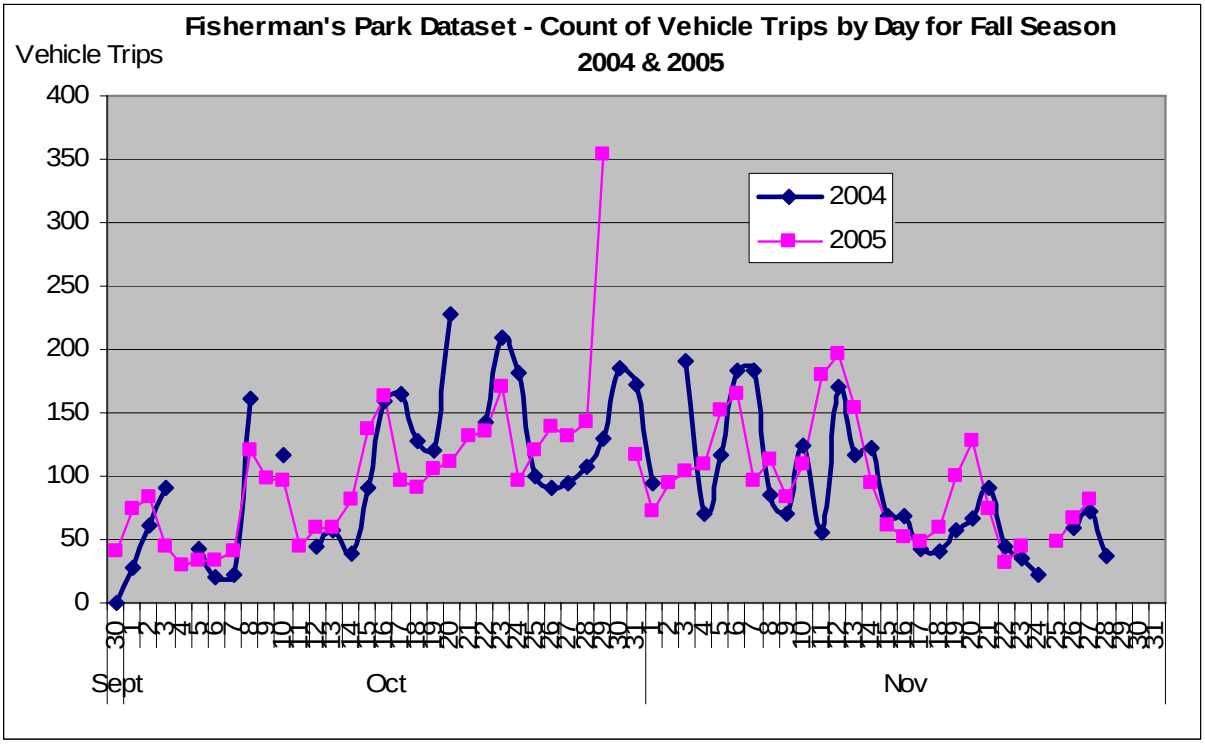


Figure 2 depicts the seasonal pattern of vehicle trips for each day within the Fall season records provided by the Town of Newfane. The height of the Fall fishing season for the Park spans the period from mid-October to mid-November after which participation declines. The spike visible for October 29, 2005 (354 vehicles), most likely represents a response by anglers to notice of a large run of fish (Wilson, 2007). The vehicle pattern on that day follows the most popular distribution of states by angler residency with a few notable exceptions. On this particular day while there were 220 vehicles from New York, 62 from Pennsylvania, and 22 from Ohio, there were also 11 cars from West Virginia, with two vehicles coming from as far away as Texas and Alabama.

Figure 2



Angler Trips by State

Angler fishing trips to the Park were estimated by dividing the total dollar amount of fees collected, per vehicle, by the $ 2 dollar/person fee and summing over all records within the dataset. This estimate was based on inferring the number of anglers associated with the trip made and was used in the absence of fishing party size data that is not collected by the Town in their records. However, it should be noted that children under the age of 16 pay no fee so that the fishing party size calculated is an approximate estimate. It was not possible to estimate the unique number of anglers for the dataset, only unique license plates or vehicles.

Table 2

Estimated Number of Angler Trips by State/Province in Descending Order (2005)

Fisherman's Park, Newfane, NY

	State/Province	2004	%	Average Party Size	2005	%	Average Party Size	Absolute Change 2004-2005	Percentage Change 2004-2005
1	New York	4,974	52.4%	1.5	5,254	50.9%	1.6	280	5.6%
2	Pennsylvania	2,252	23.7%	2.1	2,296	22.3%	2.1	45	2.0%
3	Ohio	811	8.5%	2.2	734	7.1%	2.1	(77)	-9.4%
4	Ontario	299	3.1%	1.9	466	4.5%	2.0	167	55.7%
5	New Jersey	324	3.4%	2.3	378	3.7%	2.3	54	16.5%
6	West Virginia	189	2.0%	1.9	270	2.6%	2.3	81	42.9%
7	Virginia	98	1.0%	1.9	223	2.2%	2.2	126	128.7%
8	Not Provided	30	0.3%	1.9	183	1.8%	4.6	153	510.0%
9	Massachussetts	75	0.8%	2.2	116	1.1%	2.1	41	54.7%
10	Connecticut	47	0.5%	1.0	113	1.1%	2.7	66	140.4%
11	Maryland	140	1.5%	2.5	112	1.1%	2.1	(28)	-20.0%
12	Michigan	65	0.7%	1.7	62	0.6%	1.9	(3)	-4.6%
13	Others	193	2.0%	1.9	113	1.1%	1.7	(80)	-41.5%
	Total:	**9,496**	**100%**	**1.8**	**10,319**	**100%**	**1.8**	**823**	**8.7%**

In 2005 an estimated 10,319 angler trips were recorded at Fisherman's Park over the two month October through November season. The 2005 angler trip estimate was 9% above 2004's level of 9,496. About one half of the angler trips (51%, 5254 angler trips) were recorded for New York State residents while 49% are from out of state. Outside of New York, most anglers (22.3%, 2296 angler trips) traveled from Pennsylvania. Virginia, the Province of Ontario and Connecticut showed the greatest year to year growth in angler visitation between 2004 and 2005. The average party size is about 2 persons.

The estimated 5,024 angler trips originating from outside of the state illustrate that Eighteenmile Creek serves to attract a large number of seasonal visitors and with them associated "new spending" to the Olcott/Town of Newfane area. To place the perennial non-resident visitation in perspective, the total population of the Town of Newfane was 9,657 in 2000, so the seasonal increase in non-resident visitation (5024) represents 52% of the estimated permanent resident population.

Angler Effort Measured in Hours

Using a sample survey, the Fall 2005 Lake Ontario Tributary Angler Survey estimated a total of 32,295 angler trips, and 69,111 angler hours. In this survey, angler trips were estimated by dividing the estimates of angler hours by the mean length of the completed trips for the tributary, or 2.14 hours. For vehicles, the creel survey measured angler hours by taking the product of vehicles, mean size of the angler party and daylength. Daylength was the number of hours from ½ hour before sunrise to ½ hour after sunrise on the respective day (Prindle, Bishop, Penny, 2005).

To measure the daylength associated with each fishing day within the Town of Newfane's Fisherman's Park dataset, a dataset from the U.S. Naval Observatory Astronomical Observations Department was obtained. This dataset recorded historical daily sunrise and sunset times for Olcott, NY for 2004 and 2005. Daylength was calculated by subtracting the sunrise times in hours and minutes from the sunset times. Each fishing day within the Town of Newfane database was then assigned a daylength in hours and minutes from the U.S. Naval Observatory dataset for Olcott. A range of angler hours was estimated since this information is not directly available within the Town's records. Average angler trip hours were calculated by multiplying the number of angler trips by the mean trip length taken from the 2005 Creel Survey of 2.14 hours. This first estimate of effort was compared to a maximum or ceiling angler hours in a fishing day that was calculated using the total daylength using the following equation:

$$\text{Maximum Angler Hours} = \sum_{i=1}^{n}\left(\frac{[Amount\ Collected\ \ per\ Vehicle]_{i,j}}{[per\ \ person\ \ fee, \$2]} \times daylength_{i,j}\right)$$

, where *i* represents the number of fishing trip days in a year and *j* represents the particular state of residency. The two measures are shown in Table 3 below.

Table 3

Estimated Angler Hours for Fisherman's Park, 2004-2005

		Average Hours			Maximum Potential Hours		
1	State	2004	2005	% Change 2004-05	2004	2005	% Change 2004-05
2	New York	10,644	11,243	5.6%	52,135	54,889	5.3%
3	Pennsylvania	4,818	4,913	2.0%	23,534	23,951	1.8%
4	Ohio	1,734	1,571	-9.4%	8,530	7,699	-9.7%
5	Prov. of Ontario	640	996	55.7%	2,892	4,627	60.0%
6	New Jersey	693	808	16.5%	3,313	3,813	15.1%
7	West Virginia	404	578	42.9%	2,004	2,807	40.0%
8	Virginia	209	477	128.7%	1,006	2,319	130.6%
9	Not Provided	64	392	510.0%	306	1,926	530.2%
10	Massachussetts	161	248	54.7%	755	1,161	53.8%
11	Connecticut	101	242	140.4%	463	1,157	149.9%
12	Maryland	300	240	-20.0%	1,483	1,146	-22.8%
13	Michigan	139	133	-4.6%	695	644	-7.4%
14	Florida	32	39	20.0%	156	187	20.0%
15	Colorado	156	34	-78.1%	731	158	-78.3%
16	New Hampshire	13	30	133.3%	62	139	125.6%
17	Others	212	139	-34.3%	1,025	678	-33.9%
18	**Total**	**20,320**	**22,082**	**8.7%**	**99,090**	**107,302**	**8.3%**

Average angler hours were 20,320 in 2004, and grew by 9% to 22,082 in 2005. Given the number of anglers and the maximal day lengths the maximum potential fishing hours grew to 107,302 in 2005.

Estimated Catch and Harvest

The 2005 Lake Ontario Tributary Survey contained estimated catch and harvest rates for 2005 for Eighteenmile Creek. The catch and harvest rates reflected the fishing period covering September 19, through November 30th, a time period that dovetails with the Fisherman's Park records provided by the Town of Newfane. Table 4 applies the 2005 catch and harvest rates to the estimated angler hours shown in Table 3 above.

Table 4

Estimated Catch and Harvest for Eighteenmile Creek's Fisherman's Park

	2004		2005		
Species	Average	Maximum	Average	Maximum	2005 Rates
Chinook salmon					
Catch	3,962	19,323	4,306	20,924	0.195
Harvest	101.6	495.4	110.4	536.5	0.005
Steelhead					
Catch	2,093	10,206	2,274	11,052	0.103
Harvest	244	1,189	265	1,288	0.012

Brown Trout					
Catch	6,665	32,501	7,243	35,195	0.328
Harvest	508	2,477	552	2,683	0.025

Direct Economic Impact

The direct economic impact can be estimated by using data compiled for a 2003 study of the economic impact associated with Lake Erie tributaries from Erie County, Pennsylvania (Erie, 2004). This study focused on trip spending by Erie Steelhead anglers and contained expenditure data for lodging, transportation, food, and bait and gear for "out of county" and "in-county" anglers. The out of county total spending per trip was updated to 2004 and 2005 prices and applied to the estimated non-resident trips associated with Fisherman's Park (Eighteenmile Creek), while the in-county per trip spending was also escalated to later years and applied to resident New York State angler trips. The estimated economic impacts do not consider the complete multiplicative impacts associated with this spending on other firms, suppliers, industries and establishments in Olcott, Newfane, or Niagara County.

Table 5 shows the results of the impact estimates. Fishing activity at Fisherman's Park resulted in at least $366,000 in direct fishing trip related expenditures in 2005.

Table 5

Estimated Direct Expenditures Associated with Angler Trip Spending at Fisherman's Park

	2004	**2005**
Resident trips	$33,703	$36,804
Non-resident trips	$284,410	$329,391
Total:	$318,112	$366,195

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E Results of the Qualitative Habitat Characterization Field Studies at Selected Locations with the Eighteenmile Creek Watershed: Relative Abundance of Vegetation Species

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Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed. **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Tree Layer – T									
Common Name	**Scientific Name**	**Fishermans Park**	**Ide Rd**	**Jacques Rd**	**Ewings Rd**	**Plank Rd**	**Gulf Park**	**East Branch @ 104**	**East Branch @ Wheeler Rd**
American basswood	*Tilia americana*		O	R	C		O		
American elm	*Ulmus americana*		R	C					
American hornbeam	*Carpinus caroliniana*								
Apple	*Malus spp*		C	C					
Austrian pine	*Pinus nigra*			C					
Basswood	*Tillia spp.*					O	O		
Beech	*Fagus grandifolia*						R		
Big-tooth aspen	*Populus grandidentata*		R						
Black cherry	*Prunus serotina*		O	O	D	C	R	C	
Black walnut	*Juglans nigra*		C	C			O		R
Black willow	*Salix nigra*		D	D	D	D		D	C
Box elder	*Acer negundo*		C		C	D		C	D
Butternut	*Juglans cinerea*						O		
Green ash	*Fraxinus pennsylvanica*	D	C	O	C	C		C	C
Hawthorn	*Crataegus spp*		D	C	C			D	D
Hop-hornbeam	*Ostrya virginiana*		O				O		
Norway spruce	*Picea abies*			C					
Pignut hickory	*Carya glabra*					C	O		
Red cedar	*Juniperus virginiana*		R						
Red maple	*Acer rubrum*		O		C	C	O		C
Red oak	*Quercus rubra*	C	C			D	D		
Silver maple	*Acer saccharinum*			D		C			
Slippery elm	*Ulmus fulva*				O				
Staghorn sumac	*Rhus typhina*		O				R		
Sugar maple	*Acer saccharum*	C	O				O		
Sweet cherry	*Prunus avium*	C	O	O		R	O	O	

Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed (continued). **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Common Name	Scientific Name	Fishermans Park	Ide Rd	Jacques Rd	Ewings Rd	Plank Rd	Gulf Park	East Branch @ 104	East Branch @ Wheeler Rd
Tree Layer - T									
Sweet gum	*Liquidambar styraciflua*					O	R		
Sycamore	*Platanus occidentalis*		O			C			
Tree-of-heaven	*Ailanthus altissima*		R				R		
Wild apple	*Malus spp.*							R	
Shrub Layer - S									
American elder	*Sambucus canadensis*		C						
Buttonbush	*Cephalanthus occidentalis*				C	C			C
Canadian yew	*Taxus canadensis*			R					
Catalpa	*Catalpa speciosa*		R						
Cottonwood	*Populus deltoides*		O		C				
Glossy buckthorn	*Rhamnus frangula*			O					
Honey locust	*Gleditsia triacanthos*	C	R						
Honeysuckle	*Lonicera tartarica*	O	C	O	C			C	
Multiflora rose	*Rosa multiflora*		D	D	D	C	C	D	
Pagoda dogwood	*Cornus alternifolia*	C				O	O		R
Red elderberry	*Sambucus pubens*					C	C		
Red-osier dogwood	*Cornus stolinefera*		C	O	O	O	R		
Silky dogwood	*Cornus amomum*		C	C	D	D	D	D	D
Spicebush	*Lindera benzoin*					O	C		O
Stiff dogwood	*Cornus foemina*				O			C	
Winterberry	*Ilex verticillata*					R			
Herbaceous Layer - H									
American bittersweet	*Celastrus scandens*						O		
Angelica	*Angelica atropurpurea*			R		R			
Aster	*Aster spp.*	C			C		C		C

Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed (continued). **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Herbaceous Layer - H									
Common Name	**Scientific Name**	**Fishermans Park**	**Ide Rd**	**Jacques Rd**	**Ewings Rd**	**Plank Rd**	**Gulf Park**	**East Branch @ 104**	**East Branch @ Wheeler Rd**
Autumn olive	*Eleagnus umbellata*		**O**	**O**					
Bedstraw	*Galium spp*							**C**	
Beggar's tick	*Bidens spp.*								**C**
Bind weed	*Convolvulus arvensis*		**O**						
Black nightshade	*Solanum nigrum*		**R**						
Bloodroot	*Sanguinaria canadensis*					**O**	**R**		
*Blue cohosh	**Caulophyllum thalictroides*					**D**			
Boneset	*Eupatorium perfoliatum*		**C**	**C**					
Broad-leaf arrowhead	*Sagittaria latifolia*				**O**				**D**
Burdock	*Arctium spp.*	**O**						**C**	
Burr reed	*Sparganium spp*				**C**				
Buttercup	*Ranunculus spp.*						**O**		
Canada anemone	*Anemone canadensis*		**R**	**R**		**R**	**R**		
Canada goldenrod	*Solidago canadensis*		**C**						
Cattail	*Typha latifolia*		**C**		**O**	**D**		**C**	
Christmas fern	*Polystichum acrostichoides*					**C**			
Colt's foot	*Tussilago farfara*					**C**			
Common reed	*Phragmites australis*					**C**			
Cow parsnip	*Heracleum maximum*					**R**			
Cuckoo flower	*Cardamine pratensis*			**C**					
Dames rocket	*Hesperis matronalis*	**C**	**C**	**O**	**O**	**C**		**C**	
Day lilly	*Hemerocallis spp*			**C**					
Enchanted nightshade	*Circaea pacifica*						**O**		
False nettle	*Boehmeria cylindrica*		**O**	**O**				**C**	
False solomon's seal	*Smilacina racemosa*					**O**	**O**		
Fescue	*Festuca spp.*		**C**						

Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed (continued). **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Herbaceous Layer – H									
Common Name	**Scientific Name**	**Fishermans Park**	**Ide Rd**	**Jacques Rd**	**Ewings Rd**	**Plank Rd**	**Gulf Park**	**East Branch @ 104**	**East Branch @ Wheeler Rd**
Foam flower	*Tiarella cordifolia*						R		
Fox grape	*Vitis labrusca*								R
Fringed loosestrife	*Lysimachia ciliata*		C					O	O
*Garlic mustard	**Alliaria petiolata*	O	D	O	D	D	C	D	D
Giant hogweed	*Heracleum mantegazzianum*	C							
Goldenrod	*Solidago canadensis*	O							D
Great angelica	*Angelica atropurpurea*								
Herb Robert	*Geranium robertianum*					O			
Honeysuckle	*Lonicera spp.*						O		
Japanese knotweed	*Polygonum cuspidatum*			C		C		C	
Joe-pye weed	*Eupatorium maculatum*		C					C	C
Lady's thumb	*Polygonum persicaria*					R			
Lizzard's tail	*Saururus cernuus*							R	C
*Marsh marigold	**Caltha palustris*					C			
Marshpepper smartweed	*Polygonum hydropiper*		C						
Mugwort	*Artemisia vulgaris*	C	D	C	C	O	O	C	O
Ox-eyed sunflower	*Heliopsis helianthoides*		O	O	D	O	O		
Partridge berry	*Mitchella repens*			O					C
Poison hemlock	*Conium maculatum*		C	R					
Poison ivy	*Toxicodendron radicans*	O	O	D	C	O	C	C	C
Pokeweed	*Phytolacca americana*			R		O	R		
Purple loosestrife	*Lythrum salicaria*		C	C		R			O
Queen Anne's lace	*Daucus carrota*				O				
Raspberry	*Rubus spp.*		C	C	C	O			O
Reed canary grass	*Phalaris arundinacea*		C		C			D	C
River bullrush	Scirpus fluviatilis								O

Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed (continued). **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Herbaceous Layer – H									
Common Name	**Scientific Name**	**Fishermans Park**	**Ide Rd**	**Jacques Rd**	**Ewings Rd**	**Plank Rd**	**Gulf Park**	**East Branch @ 104**	**East Branch @ Wheeler Rd**
Riverbank grape	*Vitis riparia*	**O**			**C**	**C**		**C**	**C**
Rough-leaf goldenrod	*Solidago patula*		**C**						
Sedge	*Carex spp.*			**R**		**O**			**R**
Sensitive fern	*Onoclea sensibilis*			**R**		**C**			
Shady sedge	*Carex spp.*							**O**	
Skunk currant	*Ribes glandulosum*				**O**				
Spotted jewelweed	*Impatiens capensis*	**C**	**D**	**C**		**C**		**C**	
Spotted knapweed	*Centaurea maculosa*		**O**						
*Spring beauty	**Claytonia virginica*					**C**			
Stinging nettle	*Urtica dioica*		**C**						
Sunflower	*Helianthus spp*							**O**	
Swamp dock	*Rumex verticillatus*								**O**
Swamp milkweed	*Asclepias incarnata*							**O**	**R**
Tall meadow rue	*Thalictrum polygamum*							**R**	
Teasel	*Dipsacus sylvestris*				**C**				
Thin-leaf coneflower	*Rudbeckia triloba*					**C**		**O**	**O**
Thistle	*Cirsium spp*		**O**						
*Trillium	**Trillium spp.*						**R**		
Viginia wild rye	*Elymus virginicum*		**C**			**O**	**O**	**C**	**C**
Virginia creeper	*Parthenocissus quinquefolia*	**O**		**O**		**R**		**C**	**O**
Whirled boneset	*Eupatorium perfoliatum*								**O**
White baneberry	*Actaea pachypoda*					**O**			
White snakeroot	*Ageratina altissima*				**R**			**R**	
Wild ginger	*Asarum canadense*					**R**	**R**		
Wood anemone	*Anemone quinquefolia*				**R**		**O**		
Wood fern	*Drypoteris spp.*			**O**		**C**			

Table E-1. Relative Abundance of Terrestrial Vegetation at the Sampling Sites Above Burt Dam in the Eighteenmile Creek Watershed (continued). **Key – D=Dominant, C=Common, O=Occasional, R=Rare, and *=Spring Ephemeral.**

Herbaceous Layer – H									
Common Name	**Scientific Name**	**Fishermans Park**	**Ide Rd**	**Jacques Rd**	**Ewings Rd**	**Plank Rd**	**Gulf Park**	**East Branch @ 104**	**East Branch @ Wheeler Rd**
Wood nettle	*Laportea canadensis*		**D**	**O**	**C**	**O**		**C**	
Woodland sunflower	*Helianthus divaricatus*								**D**
Yellow flag iris	*Iris pseudacorus*	**C**	**O**		**O**	**D**			**C**