Black River Watershed Management Plan

Black River Watershed Management Plan

Final Report Part I:

Watershed Characterization, Recommendations, & Implementation

May 2010

Bergmann associates
architects // engineers // planners

This watershed management plan was prepared for the New York State Department of State Division of Coastal Resources with funds provided under Title 11 of the Environmental Protection Fund, Local Waterfront Revitalization Program.

TABLE OF CONTENTS

Black River Watershed Management Plan

Part I – Watershed Charaterization, Recommendations & Implementation

Part II – Appendices

1 Introduction and Overview

1.1 The Importance of Watershed Planning

Water has always drawn people to it – it is not only a source of drinking water, but also provides food, can be used to irrigate crops, is a medium for transportation and a source of economic activity. Given all the benefits that water provides, it should come as no surprise that communities are seeking ways to maintain high water quality while also balancing the need for economic growth and development.

Watershed planning provides communities this opportunity. By focusing on the connection between the land and water quality, watershed planning allows for the management of land uses in a way that recognizes the relationship between economic, social, and natural processes. This recognition of the trade-offs that must be made provides for an accurate assessment of development's impacts to water quality and allows communities to build support for the various water quality improvement strategies among residents, businesses, and other relevant stakeholders. This has led many communities to realize that the development of a comprehensive watershed management plan is an effective way for improving water quality and overall watershed health, educating the public on watershed issues, and informed decision-making.

The Black River watershed is no exception. Draining the western slope of the Adirondack Mountains and the eastern edge of the Tug Hill Plateau, the Black River watershed is a major destination for scenic viewing, camping, hiking, fishing, kayaking, boating, snowmobiling and other outdoor recreational pursuits, all of which are significant contributors to the local economies of the region. The river is a major tributary of Lake Ontario and also serves as the drinking water supply for the City of Watertown. Other waters in the basin also provide a source of drinking water to its residents.

To ensure the continued sustainability of the watershed, the overall goal of this planning effort is to ensure that the quality of water within the Black River watershed is protected and improved wherever possible and that the resource continues to provide for the needs of those that depend on it for their livelihoods, well-being and recreational opportunities. As such, the *Black River Watershed Management Plan* was developed according to the following format:

- *Section 1* – provides an overview of the planning process and an introduction to the Black River watershed
- *Section 2* – characterizes the existing conditions of the Black River watershed in terms of those factors affecting water quality.
- *Section 3* – summarizes the primary issues facing the Black River watershed and each of its 19 subwatersheds
- *Section 4* – presents a series of general recommendations that provide an overarching framework of actions that should be taken to improve and maintain good water quality.
- *Section 5* – provides subwatershed-specific recommendations for each of the 19 subwatershed in the Black River watershed.

- *Section 6* – discusses the role that municipalities play in the Black River watershed and provides regulatory recommendations for each of the watershed's communities.
- *Section 7* – identifies the steps necessary to implement the *Black River Watershed Management Plan* and provides a list of those high priority actions that should be accomplished during the first five years of implementation.

1.2 The Planning Process

The purpose of the Black River Watershed Management Plan is to examine the existing physical and regulatory conditions of the natural and built environments within the Black River watershed, identify those factors negatively impacting water quality, and recommend strategies that focus on the protection (where water quality is already high) and restoration of water quality and ensure compatible land use development in the watershed.

Watershed residents attend the final public meeting for the Black River Watershed Management Plan on March 17, 2010

Preparation of the Black River Watershed Management Plan began in 2007 after the Town of Greig received funding in the form of two grants from the New York State Department of State (NYSDOS) Division of Coastal Resources for Title 11 Environmental Protection Funds (EPF), as well as matching funds from the Beaver River Advisory Committee Fund and NYS Senator Griffo, for the preparation of a comprehensive watershed management plan. A National Fish & Wildlife Foundation grant was also secured by the Tug Hill Commission to conduct two additional studies in the Black River watershed (i.e.,groundwater assessment and socioeconomic characterization and assessment reports), as well as to fund additional public outreach throughout the planning process. Once the funding was in place, the Town selected a Project Advisory Committee (PAC) to guide the project and issued a Request for Proposals from consultant teams to assist them in completing the Watershed Management Plan. In February 2008, Bergmann Associates, in association with the Academy of Natural Sciences, was selected as the project consultant team. Preparation of the Black River watershed plan was coordinated by the Lewis County Soil & Water Conservation District and overseen by the PAC, which included numerous agencies and stakeholders from each of the Black River watershed counties

A variety of forums and outreach mechanisms were used to engage interested persons in the development and preparation of the Black River Watershed Management Plan, including public

Timeline of Public Outreach Efforts

meetings, community visioning workshops, stakeholder meetings/focus groups, and PAC meetings. The schedule of these outreach efforts is depicted in the graphic above. Additionally, a summary of each of these efforts is provided in Section 8.9.

1.3 What is the Black River Watershed?

1.3.1 The Watershed

The Black River drains approximately 1.2 million acres of the western slopes of the Adirondack Mountains and the eastern edge of the Tug Hill Plateau before emptying into Lake Ontario near Watertown (see Map 1). The Adirondack portion of the watershed is drained, for the most part, by two large watercourses – the Beaver River and the Moose River – and several smaller tributaries (e.g., Independence River, Otter Creek, Woodhull Creek). The Tug Hill region of the Black River watershed, however, is characterized predominantly by numerous small tributaries flowing over steep slopes.[1] As a whole, there are approximately 4,000 miles of rivers and streams within the watershed, as well as more than 500 lakes and ponds covering approximately 35,000 acres.

Traversed by this 1.2 million acre watershed are portions of five counties – Hamilton County, Herkimer County, Jefferson County, Lewis County, and Oneida County – and their associated city, towns, and villages (see Map 2). In all, one city (Watertown), 37 towns, and 18 villages are wholly or partially located within the Black River watershed:

Table 1.1. Communities of the Black River Watershed

Hamilton County	Herkimer County	Jefferson County	Lewis County	Oneida County
Town of Arietta	Town of Ohio	City of Watertown	Town of Croghan	Town of Ava
Town of Inlet	Town of Russia	Town of Brownville	Town of Denmark	Town of Boonville
Town of Lake Pleasant	Town of Webb	Town of Champion	Town of Greig	Town of Forestport
Town of Long Lake		Town of Hounsfield	Town of Harrisburg	Town of Remsen
Town of Morehouse		Town of Le Ray	Town of Lewis	Town of Steuben
Village of Speculator		Town of Pamelia	Town of Leyden	Village of Boonville
		Town of Rutland	Town of Lowville	
		Town of Watertown	Town of Lyonsdale	
		Town of Wilna	Town of Martinsburg	
		Town of Worth	Town of Montague	
		Village of Black River	Town of New Bremen	
		Village of Brownville	Town of Pinckney	
		Village of Carthage	Town of Turin	
		Village of Deferiet	Town of Watson	
		Village of Dexter	Town of West Turin	
		Village of Glen Park	Village of Castorland	
		Village of Herrings	Village of Constableville	
		Village of West Carthage	Village of Copenhagen	
			Village of Croghan	
			Village of Lowville	
			Village of Lyons Falls	
			Village of Port Leyden	
			Village of Turin	

1.3.2 Subwatersheds

Subwatersheds are those areas from which groundwater and surface water drain and contribute to the flow of a larger watershed or drainage basin. Nineteen subwatersheds comprise the Black River watershed (see Map 3). Table 1.2 provides a list of the subwatersheds, as well as the size, percent of the total watershed land area, and HUC-11 (Hydrologic Unit Boundary) identification numbers for each. Developed by the U.S. Geological Survey (USGS), hydrologic unit boundaries provide a hierarchical method for delineating and identifying drainage basins to ensure a working, seamless dataset across community lines. Each watershed is assigned a unique hydrologic unit code according to its size and location, with the larger 8-digit sub-basins (e.g., the Black River watershed) subdivided into smaller 11-digit subwatersheds (e.g., the 19 subwatersheds within the Black River watershed).

Table 1.2. Subwatersheds of the Black River Watershed

SUBWATERSHED	HUC IDENTIFICATION NO.	ACRES	PERCENT OF TOTAL LAND
Beaver River	04150101150	98,761	8.1%
Crystal Creek	04150101130	17,085	1.4%
Cummings Creek	04150101030	14,212	1.2%
Deer River	04150101170	62,270	5.1%
Fish Creek	04150101080	14,966	1.2%
Independence River	04150101110	61,074	5.0%
Lower Black River	04150101190	39,532	3.2%
Lower Black Middle River	04150101180	51,985	4.3%
Middle Black River	04150101160	81,353	6.7%
Middle Branch Moose River	04150101060	94,880	7.8%
Mill Creek	04150101120	22,512	1.8%
Moose River	04150101070	46,711	3.8%
Otter Creek	04150101090	42,181	3.5%
South Branch Moose River	04150101050	135,713	11.1%
Stillwater Reservoir	04150101140	109,992	9.0%
Sugar River	04150101040	44,732	3.7%
Upper Middle Black River	04150101100	102,016	8.4%
Upper Black River	04150101020	115,439	9.5%
Woodhull Creek	04150101010	62,661	5.1%
BLACK RIVER WATERSHED	**04050101**	**1,218,075**	**100%**

Source: 11- Digit Hydrologic Unit Boundary GIS Data Layer, NYSDEC

1.4 History of the Watershed

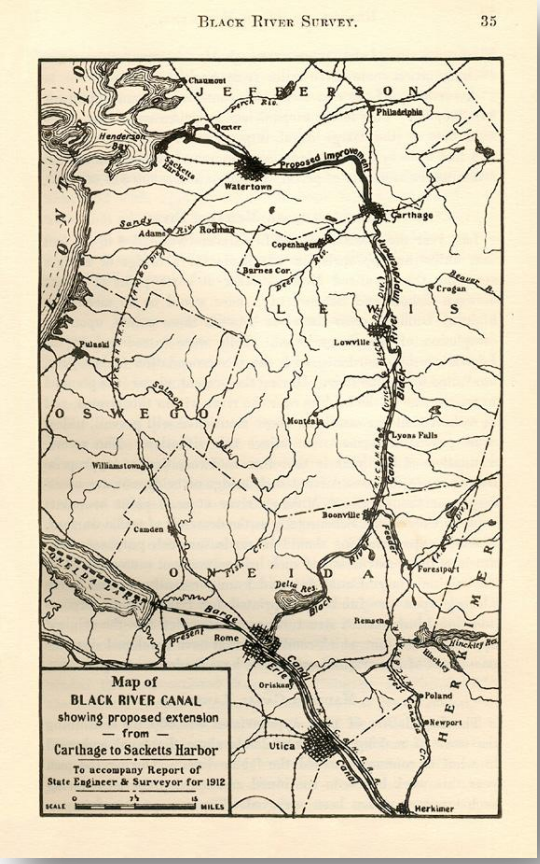
The latest glacial episode in New York State was most extensive approximately 21,000 years ago, when the entire state was covered by glaciers. As the climate began to warm around 19,000 years ago, the glaciers began to retreat. By 11,000 years ago, glaciers had disappeared entirely from the state. This glacial retreat resulted in the creation of the Adirondacks, the Finger Lakes, and many other natural features located throughout New York State.[2]

Following the retreat of the glaciers, the first settlers were the Paleo-Indians, making their way to the region between 8,000 and 11,000 years ago. By the middle of the 13th century, peoples that can be positively identified as Iroquoian were known to inhabit the areas in and around the Black River watershed as this was a primary transportation corridor between Canada and the Hudson River valley.[3] The first European to visit was likely French explorer Samuel de Champlain during the fall of 1615.

The areas around Watertown were first explored during the 1790's, with French surveyor Pierre Pharoux charting boundaries of land claims for French aristocrats hoping to flee Europe.[4] The first settlement in the region occurred soon thereafter in 1797 in what is now Ellisburg Township in Jefferson County. Many of the settlers that made their way to the areas in and around the Black River watershed during this time were mostly from Vermont and Connecticut.[5]

As the region continued to grow, many settlers were drawn to the area by the abundance of timber and cheap, natural power. Dams, sawmills and gristmills were constructed along many of the creeks and streams, particularly along the Black River itself.[6, 7] Throughout the 19th century, Watertown was a prosperous industrial center, producing most of the nation's newsprint and a variety of other paper products.[8] However, following the introduction of new manufacturing techniques and the depletion of the Adirondack pulp wood supply, the paper producing industry in Watertown began to fade.

The development of transportation facilities (e.g., roads, canals, railroads) intensified during the early and middle of the 19th century as settlement of the region continued.[9] One of the most significant transportation developments of the time was the construction of the Erie Canal, which began in 1817 and was completed in 1825. Following completion of the Erie Canal, Governor DeWitt Clinton proposed that an additional canal be constructed to link the



Map of the Black River Canal (1912)
Source: www.eriecanal.org

Mohawk River with Lake Ontario, making use of water supplied by the Black River.[10] The purpose of this Black River canal was to open up the sparsely populated North Country to commerce and to tap the region's abundant rivers and lakes as a reliable source of water.

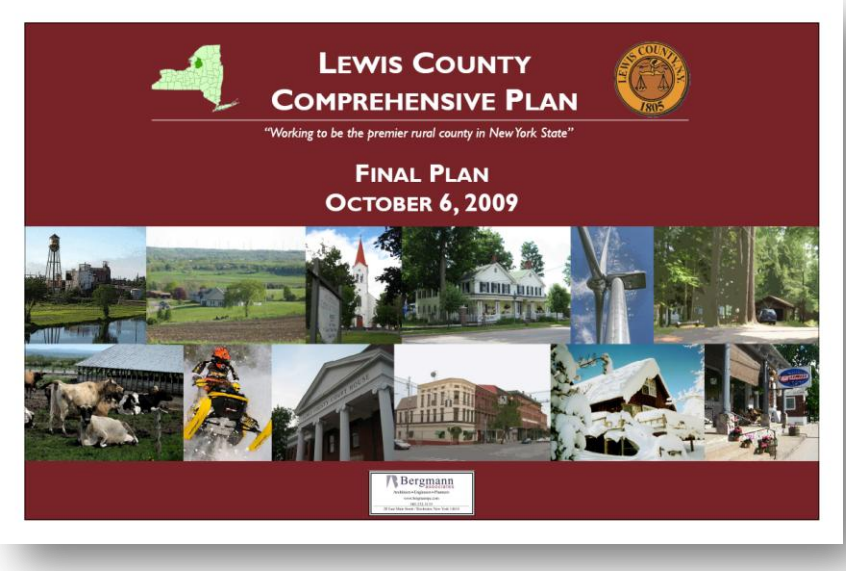
Construction of the Black River canal began in 1837 and by 1855 the overland canal was fully operational.[11] The completed canal brought much prosperity to the Black River Valley, making it profitable to harvest the softwood forests of the western Adirondacks in Lewis and Herkimer counties. Throughout the region, the canal resulted in new warehouses, shipping houses, hotels, taverns, foundries, and harness shops along its shores. Over time, as timbering activities cleared the area of forests, farming became an increasingly important industry. The primary agricultural exports included cheese, butter, wheat, rye, maize, and root vegetables. To this day, the Black River Valley is one of the most intensively farmed areas in the region.

1.5 Planning in the Watershed

1.5.1 Local Planning

As the New York State Constitution provides for home rule, the primary authority for guiding community planning and development is vested in cities, towns and villages. This provides local municipalities with the power to define how their community grows, or doesn't grow. Confronted with both the opportunities and challenges of development, communities are recognizing that local planning and zoning laws are valuable tools that can be used to ensure the vision for their community is fulfilled.

These land use planning tools may include comprehensive plans, zoning and subdivision regulations, site plan review regulations, and the creation of planning boards/commissions. While some municipalities in the watershed have a comprehensive set of land use regulations and guidelines, other communities have zoning but lack other planning tools. They may have no comprehensive plan to provide an overall vision for future land use and/or no planning board or commission to assist in the decision-making process with regards to new development and other activities that can influence the character of the community. This directly affects the watershed planning project because land uses can have a direct impact on water quality within



Lewis County Comprehensive Plan

the watershed. Understanding existing land use regulations and the tools that are in place in each of the municipalities is important as considerations are given to how land use changes and development has the potential to influence water quality within the watershed.

A more detailed discussion and analysis of the land use planning and regulatory tools used by the city, town, and village governments within the watershed can be found in Section 6.

1.5.2 Regional Planning

In addition to the 61 units of government within the watershed, the study area also falls within the purview of four regional planning bodies:

- The Adirondack Park Agency;
- The Black River – St. Lawrence Resource Conservation & Development Council;
- The Herkimer-Oneida Counties Comprehensive Planning Program (also known as the Regional Planning Board); and
- The Tug Hill Commission;

The Adirondack Park Agency (APA) was created in 1971 by the State Legislature to develop and administer long-range plans for both public and private lands within the Adirondack Park. The primary purpose of the APA is to insure conservation, protection, preservation, development and use of the unique scenic, aesthetic, wildlife, recreational, open space, historic, ecological and natural resources of the Park. Additionally, the APA is responsible for developing long-range park policy that takes into consideration the needs of the entire state. In contrast to the Tug Hill Commission, the APA is a regulatory body that strives to ensure that current and projected future pressures on the park's resources are provided for in a land use plan that recognizes matters of local concern, as well as those of the surrounding region and New York State.

The mission of the Black River – St. Lawrence Resource Conservation & Development Council (RC&D) is to work with partners to provide local leadership and coordination for projects devoted to environmental conservation, community improvement, economic development, and the wise use of natural resources. The RC&D encompasses Franklin, St. Lawrence, Jefferson, Oswego, Lewis, Oneida and Herkimer counties and was officially formed in April of 1974 when it adopted a constitution and by-laws. The function of the RC&D is to seek both financial and technical assistance from the best qualified sources available (e.g., federal, state, local, industry or private foundations) to implement locally developed plans. Comprised of a pool of volunteers with a wide range of expertise, the RC&D promotes agriculture, forestry, recreation and renewable energy in the communities it serves.

The Herkimer-Oneida Counties Comprehensive Planning Program (HOCCPP) is a Regional Planning Board jointly formed by Herkimer and Oneida Counties, with Oneida County serving as the formal employer of HOCCPP employees. This unique situation is the result of the interrelationship of three major planning organizations that are housed in one location, the programmatic emphasis of various planning activities, and the common link of the professional staffs. Focusing on Transportation Planning, Land Use and Zoning, Economic Development, Human Services Planning, Census and Statistics, Water Resources and Environmental Planning, GIS Mapping, and Economic Development, HOCCPP conducts planning activities at both the county and regional levels, with local assistance provided to the cities, towns & villages within both Counties.

Originally established in 1972 as a temporary body, the Tug Hill Commission (THC) was created to enable local governments, private organizations, and individuals to shape the future of the Tug Hill Region. This non-regulatory State Agency provides technical assistance to 62 local governments, economic development organizations, and other local groups in the areas of land use planning, community economic development, and natural resource management. The THC also provides training and information for local officials through workshops and issues papers on a variety of topics.

1.5.3 Regional Planning Initiatives

There are currently a great number of planning efforts underway within the Black River Watershed, ranging from local municipal projects to larger regional-based initiatives. The implementation of these initiatives could have implications on the watershed and should be considered and monitored to determine what potential impacts may be, and how they may be mitigated. In addition to over fifty locally-led municipal projects ranging from Main Street plans to infrastructure improvements to recreation planning, there are a series of regional planning initiatives occurring or projects, at least in part, within the watershed study area:

- Black River Blueway Trail
- Fort Drum Growth Management Initiative
- Four Town Comprehensive Plan
- Lewis County Comprehensive Plan
- Maple Ridge Wind Farm
- Route 28 Corridor Revitalization Study
- Watertown to Black River Recreational Trail
- Old Forge to Maine Canoe Trail
- Black River Scenic Byway
- Olympic Scenic Byway
- Maple Traditions Scenic Byway
- Adirondack Scenic Byway
- TOBIE Trail Extension
- RACOG Land Use Review and Comprehensive Plan
- Tug Hill Connectivity Project

Planning documents relevant to the watershed study area will be reviewed and considered more closely in latter phases of the Management Plan process.

2 The Black River Watershed Today

2.1 Introduction

To gain an accurate understanding of the issues and threats currently facing the Black River watershed, this watershed management plan examines the existing conditions of the basin and summarizes the physical conditions of the natural and built environments. This section of the plan documents the shifts in agriculture and other land use practices over time and examines how development patterns have and will continue to impact the natural resources and water quality within the watershed.

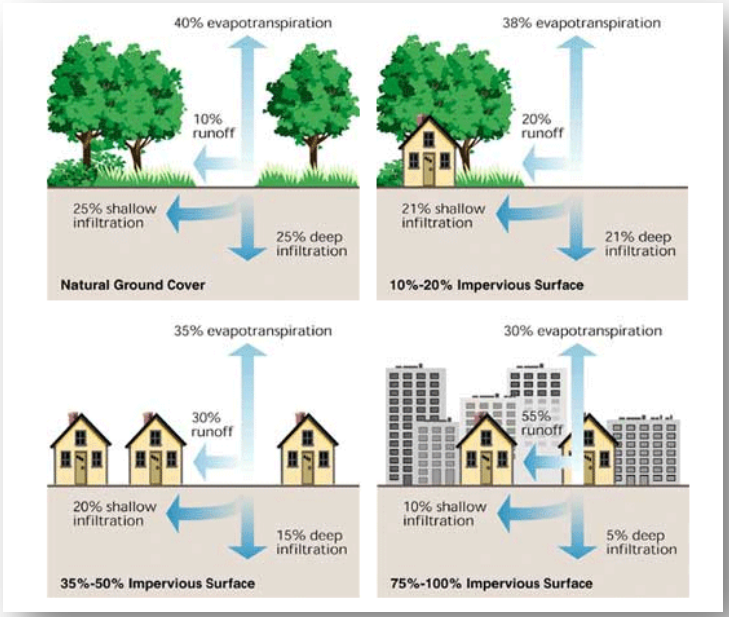
More specifically, this section encompasses the following topics as they relate to water quality:

- Land Use and Cover;
- Development Trends Impacting the Watershed;
- Topography and Soil Characteristics;
- Hydrologic Characteristics; and
- Vegetation, Fish, and Wildlife.

2.2 Land Use and Cover

Land use refers to how the land is used, often has a political dimension (i.e., zoning and decision-making process), and is primarily defined at the parcel level (i.e., only one use is assigned to each parcel).[12] Land use categories consist of general descriptions such as residential and commercial, as well as more detailed information including the type of residential or commercial use (e.g., single-family residential or highway commercial.)Land cover, however, describes both the vegetative and man-made features that characterize a particular area and reflects "the climate, topography, soils, geology, and other environmental features that have made various types of land use possible, and shaped settlement patterns and current economic activities".[13]

Land cover is determined based on the interpretation of aerial photography and is not constrained by parcel boundaries (i.e., one parcel could consist of multiple cover types). Examples of land



The impact of land cover on infiltration
Source: Federal Interagency Stream Restoration Working Group

cover types include forest, urban, or wetland, all of which can be further divided into more detailed subcategories (e.g., deciduous forest versus evergreen forest). Both land use and land cover are primary drivers affecting water quality, exerting considerable influence on the chemical, physical, and biological characteristics of waterbodies.[14] Agricultural land uses, as well as the built environment, often produce nonpoint source pollution (e.g., sediments, nutrients) through runoff, which negatively impacts water quality and results in changes in aquatic community structure and degradation of stream biota. Additionally, the infiltration rate for rainwater and snowmelt (i.e., the rate at which the soil is able to absorb water) is determined according to land cover and the amount of impervious surface, with higher infiltration rates typically associated with natural land cover types (e.g., forest, grassland). Removing natural land cover types diminishes the soil's ability to absorb nutrients and trap sediments, resulting in increased amounts of pollution washing into surface waterbodies. Thus, understanding land use and land cover, particularly how these factors change over time, is critical to assessing regional ecosystem impacts and developing the tools necessary to protect watershed health.[15]

2.2.1 Land Use

Land use is determined by the New York State Office of Real Property Services (NYSORPS) based on municipal-level property assessments. NYSORPS has identified nine land use categories that are used to classify lands within New York State (see Table 2.1 for a description of each land use category). It should be noted that because the land use data from NYSORPS is based on assessment information and assessments may not be updated on a regular basis, there is the possibility for a small margin of error associated with land use information.

Table 2.1. Land Use Type Descriptions

Agriculture	Property used for the production of crops or livestock
Residential	Property used for human habitation. Living accommodations such as hotels, motels, and apartments are in the Commercial category
Vacant	Property that is not in use, is in temporary use, or lacks permanent improvement
Commercial	Property used for the sale of goods and/or services, including hotels, motels, and apartments
Recreation & Entertainment	Property used by groups for recreation, amusement, or entertainment
Community Services	Property used for the well being of the community
Industrial	Property used for the production and fabrication of durable and nondurable man-made goods
Public Services	Property used to provide services to the general public
Wild, Forested, Conservation Lands & Public Parks	Reforested lands, preserves, and private hunting and fishing clubs

Source: Property Classification Codes, NYS Office of Real Property Services (http://www.orps.state.ny.us/assessor/manuals/vol6/ref/prclas.htm)

More than 53,000 parcels comprise the Black River watershed (see Map 4 and Table 2.2), with the average parcel size approximating 22.6 acres. The most predominant uses, in terms of total acreage, are those parcels classified as Wild, Conservation, Forest, & Parks, comprising almost 60 percent (722,347 acres) of the total watershed land area Additionally, of these more than 700,000 acres, approximately 82 percent (590,821 acres) are located within the Adirondack Park Blue Line. Also worth noting is the considerable amount of land classified as State Owned Forest Lands – approximately 55.7 percent (400,339 acres) of all Wild, Conservation, Forest, & Parks lands, or 32.7 percent of all land within the watershed. In terms of water quality, forested watersheds typically produce some of the highest quality water in the nation.[16] Deep-rooted trees and their complex root systems stabilize the soil, thus decreasing erosion, particularly along riparian areas. Trees also reduce runoff through the interception of rainfall and enhancement of the evaporative process (i.e, direct evaporation or evapotranspiration).[17]

Table 2.2. Black River Watershed Land Use

LAND USE CLASSIFICATION	NUMBER OF PARCELS	PERCENT OF TOTAL	TOTAL ACRES	PERCENT COVER
Agriculture	3,076	5.7%	172,066	14.1%
Residential	28,353	52.6%	185,490	15.2%
Vacant	11,607	21.5%	84,767	7.0%
Commercial	2,178	4.0%	5,247	0.4%
Recreation and Entertainment	198	0.4%	6,642	0.5%
Community Services	705	1.3%	6,426	0.5%
Industrial	188	0.3%	4,138	0.3%
Public Services	634	1.2%	11,595	1.0%
Wild, Conservation, Forest and Parks	4,820	8.9%	722,347	59.3%
No Data	2,186	4.1%	19,358	1.6%
TOTAL	**53,945**	**100%**	**1,218,075**	**100%**

Source: Property Parcel GIS Data provided by Hamilton, Herkimer, Jefferson, Lewis, and Oneida Counties

As previously noted, 19 subwatersheds comprise the larger Black River watershed. Of these 19 subwatersheds, five have less than 20 percent of their land classified as Wild, Conservation, Forest, & Parks:

- Lower Black River subwatershed – 1.4 percent (545 acres)
- Mill Creek subwatershed – 4.3 percent (976 acres)
- Lower Middle Black River subwatershed – 6.9 percent (3,574 acres)
- Sugar River subwatershed – 12.1 percent (5,402 acres)
- Middle Black River subwatershed – 13.4 percent (10,908 acres)

Additionally, five of the 19 subwatersheds have more than 80 percent of their land classified as Wild, Conservation, Forest, & Parks (note that these five subwatersheds are predominately located within the Adirondack Park and comprise approximately 50 percent of all lands classified as Wild, Conservation, Forest, & Parks):

- South Branch Moose River subwatershed – 97.2 percent (131,963 acres)

- Otter Creek subwatershed – 93.5 percent (39,436 acres)
- Moose River subwatershed – 90.0 percent (42,028 acres)
- Stillwater Reservoir subwatershed – 86.5 percent (95,091 acres)
- Woodhull Creek subwatershed – 80.1 percent (50,176 acres)

Residential uses are the second most predominant use, comprising approximately 15 percent (185,490 acres) of the watershed. These uses are primarily distributed along the periphery of the agricultural belt that follows the Black River, as well as adjacent to and within the watershed's numerous villages and hamlets. Some of the densest areas of residential development, however, are located in the northwest portion of the watershed in Carthage and Watertown. Residential land uses range from low-density single-family homes on large lots in rural areas to high-density multi-family apartment buildings in more urban areas, with an average residential parcel size of 6.4 acres. Approximately 40 percent of all residential land use occurs in five subwatersheds, of which four are located within, or along the periphery of the Black River valley:

Both land use and land cover are primary drivers affecting water quality, exerting considerable influence on the chemical, physical, and biological characteristics of waterbodies.

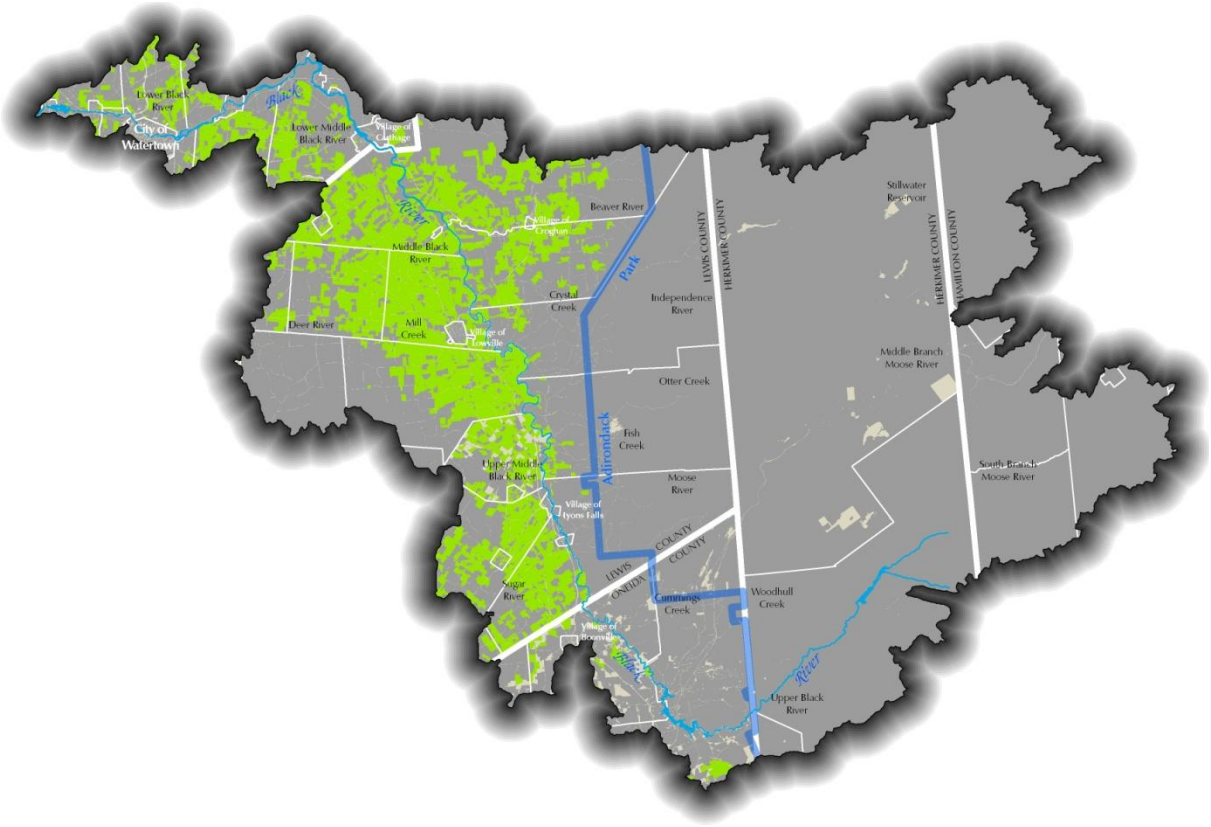
- Middle Branch Moose River subwatershed – 24,415 acres (25.7 percent of subwatershed)
- Lower Middle Black River subwatershed – 17,185 acres (33.1 percent of subwatershed)
- Independence River subwatershed – 16,016 acres (26.2 percent of subwatershed)
- Lower Black River subwatershed – 12,004 acres (30.4 percent of subwatershed)
- Crystal Creek subwatershed – 4,672 acres (27.3 percent of subwatershed)

This has important implications for watershed health as the use of septic tanks, sewage disposal systems, fertilizers and pesticides for lawn care, and runoff from driveways and parking lots in residential areas can all negatively affect water quality. [18] Note that residential acreage within the Independence River subwatershed may be skewed by the potential misclassification of one large parcel during the most recent tax parcel update.

Agricultural lands make up the third largest category of uses, with more than 172,000 acres (14.1 percent) located within the Black River watershed. As depicted in the figure on the next page, agriculture uses are concentrated primarily within the Black River valley, from the Lewis-Oneida County line northwest to Lake Ontario. Of the approximately 172,000 acres of agricultural use, almost half (43.4 percent, or 74,761 acres) is within the Middle Black River and Upper Middle Black River subwatersheds. As previously noted, agricultural land uses produce nonpoint source pollution in the form of soil erosion and sedimentation, nutrients, and pesticides. Irrigation practices associated with agriculture can also negatively impact water quality.

Thus, in terms of water quality, three subwatersheds comprise a considerable portion of their land in agricultural uses:

- Mill Creek subwatershed – 16,980 acres (75.4 percent)
- Middle Black River subwatershed – 46,938 acres (57.7 percent)
- Sugar River subwatershed – 19,524acres (43.6 percent)



Most of the agricultural parcels (green) in the Black River watershed are concentrated along the Black River valley

Almost one-half (79,973 acres) of all agriculture practiced within the watershed is directly related to livestock and its associated products This has important watershed management implications as the placement of livestock farming operations can severely impact water quality. Most livestock-related agriculture (53.5 percent or 42,778 acres) occurs in three of the nineteen subwatersheds:

- Middle Black River subwatershed – 21,864 acres (26.9 percent of subwatershed)
- Upper Middle Black River subwatershed –12,935 acres (12.7 percent of subwatershed)
- Mill Creek subwatershed – 7,979 acres (35.4 percent of subwatershed)

Worth additional note is the amount of land within the Black River watershed owned, or under the management of the New York State Department of Environmental Conservation (NYSDEC) (see Map 5 and Table 2.3). Almost 470,000 acres (38.5 percent) of the watershed comprises NYSDEC lands, most of which are located within the Adirondack Park. More specifically, Forest Preserve-Wild Forest and Forest Preserve-Wilderness make up the largest share of NYSDEC lands at 418,897 acres, or 89.6 percent of all NYSDEC lands. Wilderness lands are those areas of state land "having a primeval character, without significant improvement or protected and managed so as to preserve, enhance and restore, where necessary, its natural conditions".[19] Wild Forests, however, allow for a higher degree of human use than do wilderness lands while retaining an essentially wild character. Section 8.7 provides a detailed breakdown of land uses by subwatershed.

Table 2.3. NYSDEC Lands

DEC LAND CLASSIFICATION	ACRES
Administrative	1
Fishing Access	60
Forest Preserve	1,624
Forest Preserve – Intensive Use	1,085
Forest Preserve – Primitive	211
Forest Preserve – Wild Forest	260,111
Forest Preserve – Wilderness	159,786
State Forest	41,793
Waterway Access	34
Wildlife Management	3,733
TOTAL	**468,437**

Source: DEC Lands GIS Data Layer, NYSDEC

2.2.2 Land Cover

Using data provided by the Multi-Resolution Land Characteristics (MRLC) Consortium, land cover types from 2001 were mapped for the Black River watershed. As depicted in Map 6, seven general land cover types comprise the watershed – open water, agriculture, urban, barren land, forest, grassland/shrub, and wetlands (see Table 2.4 for a description of each cover type).

Table 2.4. Land Cover Type Descriptions

Open Water	all areas of open water, generally with less than 25 percent cover or vegetation or soil comprise this cover type
Agriculture	this represents areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle, as well as areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Pasture/hay or area crop vegetation accounts for greater than 20 percent of total vegetation
Urban	this represents all developed areas, from high intensity areas where people reside or work in high numbers, to open areas with a mixture of some constructed materials and vegetation in the form of lawn grasses and impervious surfaces less than 20 percent of total cover
Barren Land	barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover
Forest	all areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover comprise this cover type
Grassland/Shrub	this includes areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation, including true shrubs, young trees in an early successional stage or trees stunted from environmental conditions. This category also includes areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing
Wetlands	areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover, or where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover, and the soil or substrate is periodically saturated with or covered with water

Source: 2001 National Land Cover Data, Multi-Resolution Land Characteristics (MRLC) Consortium

Much of the watershed's agricultural production is limited to the Black River Valley, while urban development occurs in small nodes throughout the valley and in areas immediately adjacent to the Black River. Forested and wetland areas, however, occur primarily within the Adirondack Park Blue Line, as well as towards the higher elevations of the Tug Hill Plateau.

Based on the data provided in Table 2.5, forest comprises almost 700,000 acres and is the single largest land cover type in the watershed (57.4 percent of total area). Wetland and agricultural areas are the next largest cover types, comprising approximately 212,320 acres (17.4 percent) and 142,335 acres (11.7 percent), respectively. Areas classified as urban account for only 1.7 percent, or 20,806 acres, of land in the Black River watershed.

Table 2.5. Land Cover, Black River Watershed, 2001

LAND COVER TYPE	TOTAL ACRES	PERCENT COVER
Open Water	45,874	3.8%
Agriculture	142,335	11.7%
Urban	20,806	1.7%
Barren Land (rock, sand,clay)	1,665	0.1%
Forest	699,546	57.4%
Grassland / Shrub	95,528	7.8%
Wetlands	212,320	17.4%
TOTAL	1,218,075	100%

Source: 2001 National Land Cover Data, Multi-Resolution Land Characteristics (MRLC) Consortium

At the subwatershed level, the Lower Black River subwatershed has both the highest rate of urban area (18.5 percent or 7,308 acres) and the lowest rate forest cover (16.5 percent or 6,507 acres), while the South Branch Moose River subwatershed contains more than 103,000 acres of forest cover, or 76.5 percent of its total land area.

Section 8.7provides a detailed breakdown of land cover types by subwatershed.

RIPARIAN LAND COVER

Riparian areas are those lands adjacent to a body of water, serving as an interface between the surrounding upland areas and the waterbody itself. These areas often comprise a variety of land cover types, from forests and croplands in more rural areas, to commercial development in urban locations. Riparian areas are often located in floodplains and, as a result, can be highly productive for many agricultural uses. In the Black River Valley for example, many of these areas have been cleared to satisfy local demand for intensive cropping and grazing activities.

By trapping soil and sediments, riparian lands can reduce the amount of soil and nutrients moving from upslope areas into a given waterbody, thus improving water quality and reducing the loss of in-stream habitat through siltation.

Riparian land, however, also plays an important role in terms of water quality and other ecosystem services. By trapping soil and sediments, riparian lands can reduce the amount of soil and nutrients moving from upslope areas into a given waterbody, thus improving water quality and reducing the loss of in-stream habitat through siltation.[20] A 50- to 100-foot forested riparian zone in agricultural areas, for example, can reduce erosion, bank slumping, wetland siltation, stream turbidity, and nutrient loading that would otherwise result if plowing were to occur directly adjacent to streams. It has also been found that forested riparian areas regulate water temperature through shading and influences primary production through leaf litter inputs.[21] In terms of water quality at the watershed level, measuring riparian land cover may be a better predictor of water quality than is measuring land cover for the entire watershed.[22] Riparian areas also play an important role in the lifecycle of many native plants and animals by providing food, cover, corridors for movement, and refuge during time of drought or fire. [23]

To determine the amount of natural riparian land cover (i.e., forests, wetlands, grasslands) within the Black River watershed, as well as the individual subwatersheds, MRLC land cover data was analyzed within a 150-foot buffer on either side of all streams and waterbodies. Based on the results of this analysis, approximately 158,026 acres of land within the Black River watershed have been determined to be located within a riparian buffer zone, 124,431 acres (78.7 percent) of which are classified as forest, wetland, or grassland (see Table 2.6) (note that riparian areas make up 13.0 percent of the total Black River watershed). Based on the data presented in Table 18, the majority of subwatersheds are characterized by riparian areas with large amounts of natural land cover, with only four having less than 50 percent of their riparian areas comprising natural land cover:

- Lower Black River subwatershed – 1,602 acres (40.9 percent)
- Mill Creek subwatershed – 1,557 acres (47.3 percent)
- Lower Middle Black River subwatershed – 2,010 acres (48.3 percent)
- Middle Black River subwatershed – 4,332 acres (55.2 percent)

Additionally, six of the nineteen subwatersheds had more than 90 percent of their riparian areas comprised of natural land cover:

- Crystal Creek subwatershed – 1,540 acres (90.1 percent)
- Moose River subwatershed – 5,835 acres (90.1 percent)
- Cummings Creek subwatershed – 1,837 acres (91.0 percent)
- Independence River subwatershed – 7,151 acres (93.8 percent)
- Otter Creek subwatershed – 5,004 acres (94.1 percent)
- Fish Creek subwatershed – 1,905 acres (94.3 percent)

Further analysis indicates that percent riparian natural covers tends to increase as one moves out from the Black River valley and into the Adirondack foothills and Tug Hill Plateau.

Table 2.6. Natural Riparian Land Cover, Black River Watershed, 2001

SUBWATERSHED	TOTAL RIPARIAN ACRES	RIPARIAN NATURAL LAND COVER ACRES	PERCENT RIPARIAN NATURAL LAND COVER
Beaver River	11,320	8,338	73.7%
Crystal Creek	1,709	1,540	90.1%
Cummings Creek	2,019	1,837	91.0%
Deer River	9,557	8,135	85.1%
Fish Creek	2,021	1,905	94.3%
Independence River	7,622	7,151	93.8%
Lower Black River	3,919	1,602	40.9%
Lower Middle Black River	4,162	2,010	48.3%
Middle Black River	7,848	4,332	55.2%
Middle Branch Moose River	13,368	10,076	75.4%
Mill Creek	3,295	1,557	47.3%
Moose River	6,475	5,835	90.1%
Otter Creek	5,320	5,004	94.1%
South Branch Moose River	21,456	19,021	88.7%
Stillwater Reservoir	14,945	11,001	73.6%
Sugar River	6,286	4,373	69.6%
Upper Black River	14,590	13,026	89.3%
Upper Middle Black River	13,247	9,940	75.0%
Woodhull Creek	8,867	7,748	87.4%
BLACK RIVER WATERSHED	**158,026**	**124,431**	**78.7%**

Source: 2001 National Land Cover Data, Multi-Resolution Land Characteristics (MRLC) Consortium

LAND COVER CHANGE, 1992 TO 2001

In addition to mapping Black River watershed land cover types for 2001, MRLC data was also used to determine changes to land cover from 1992 to 2001. As with population, examining how land cover changes over time can provide a better understanding of the potential future impacts facing the watershed. Note that each land cover category both lost and gained acreage from 1992 to 2001. For example, one farm that allows its lands to revert to a more natural vegetative state would result in the loss of agricultural land within the watershed, while one farm that converts forest to agriculture would result in the gain of agricultural land within the watershed. The resulting net acres of change is a combination of these losses and gains. Table 2.7 provides a summary of the acres lost, acres gained, and net change for each category.

Table 2.7. Land Cover Change, 1992 to 2001

LAND COVER TYPE	ACRES LOST	ACRES GAINED	NET ACRES (1992 TO 2001)	PRESENT CHANGE (1992 TO 2001)
Open Water	1,398	3,759	2,361	4.9%
Agriculture	711	3,874	3,162	2.2%
Urban	232	1,260	1,028	4.7%
Barren Land (rock, sand, clay)	4	168	164	9.0%
Forest	9,532	1,272	-8,260	-1.2%
Grassland / Shrub	0	3,524	3,524	3.6%
Wetlands	5,540	3,557	-1,983	-0.9%

Source: 1992-2001 Land Cover Change Data, Multi-Resolution Land Characteristics (MRLC) Consortium

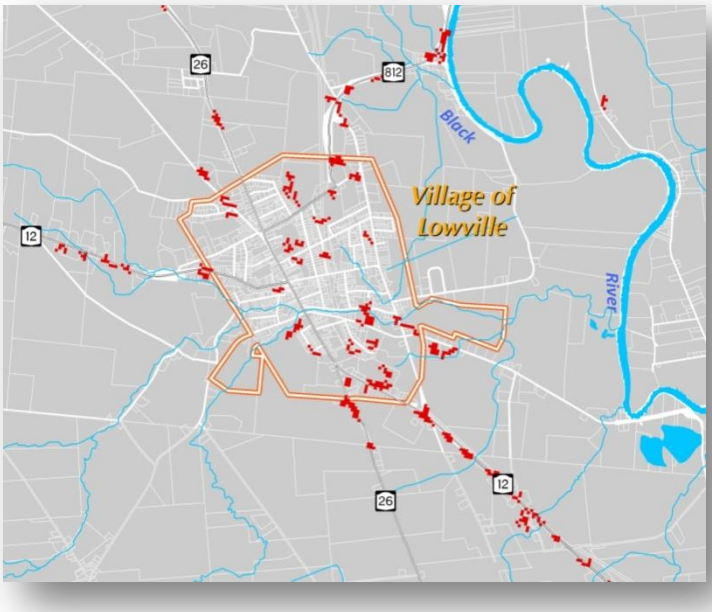
In terms of net change, only two land cover types realized a net loss, with forested areas realizing the biggest decline from 1992 to 2001 with more than 8,200 acres lost. This loss, however, represents a loss of only 1.2 percent of total forest cover in the watershed. Further analysis indicated that forested areas lost the greatest proportion of land to agriculture (3,027 acres, or 32 percent of acres lost). The largest loss of forest cover occurred in the Middle Black River subwatershed (2,408 acres or 8.5 percent of subwatershed forest cover), of which more than 1,400 acres (58.1 percent) of this were lost to agriculture. The Cummings Creek subwatershed, however, lost only six acres (0.1 percent) of its total forest cover from 1992 to 2001. While the loss of forested areas can have considerable water quality implications (forested areas often produce the highest water quality), more important is the conversion of forested areas to agriculture, which can result in negative impacts to water quality.

Wetlands lost approximately 1,983 acres (net), or 0.9 percent of the total land area between 1992 and 2001. The largest loss of wetland area was to open water (1,955 acres, or 35.3 percent of acres lost), which likely resulted from the loss of wetland vegetation along streams, lakes, and other waterbodies. It should be noted that wetlands lost to urban areas accounted for only 345 acres, or 6.3 percent of total wetland acres lost. As wetlands provide valuable services in terms of flood storage and pollution filtration, any impacts to these areas can result in impacts to overall water quality and watershed health.

While urban lands experienced only a minor increase of 5.2 percent, the population living within the watershed decreased by 2.6 percent, suggesting lower density land development patterns.

In relative terms, barren lands saw the largest increase in land area (10.9 percent), although in absolute terms this cover type only gained 164 acres. Open water areas also realized a considerable increase in acreage (2,361 net acres, or 5.4 percent) from 1992 to 2001. Further analysis of this change indicated that most of it occurred directly adjacent to existing waterbodies from areas classified as forest or wetland, suggesting that the loss of tree canopy cover and wetland vegetation is primarily responsible.

Finally, the amount of land classified as urban also increased from 1992 to 2001. While urban lands experienced only a minor increase of 5.2 percent (1,028 acres), the population living within the watershed decreased by 2.6 percent, which suggests lower density land development patterns. As an example, much of the increase in urban land area in and around the Village of Lowville occurred along existing transportation corridors, with direct frontage and access. This type of development is the product of simple land subdivision and can often lead to long term land and traffic management problems (see image to the right).



Urban land cover change in the Village of Lowville from 1992 to 2001. The red areas indicate locations where new development has occurred

The largest increases in urban area occurred in three subwatersheds:

- Lower Black River subwatershed
- Lower Middle Black River subwatershed; and
- Upper Middle Black River subwatershed.

The Lower Black River subwatershed realized the largest gain (353 acres), of which 214 acres were converted from forest cover and 139 acres were converted from wetlands. The next largest gain occurred in the Lower Black River subwatershed (276 acres) – 142 acres from forest cover and 134 acres from wetlands. Finally, the Upper Middle Black River subwatershed gained 118 acres of urban area, of which 81 acres were converted from forest cover and 27 acres were converted from wetlands.

Section 8.7 provides a detailed breakdown of land cover change by subwatershed.

2.3 Development Trends Impacting the Watershed

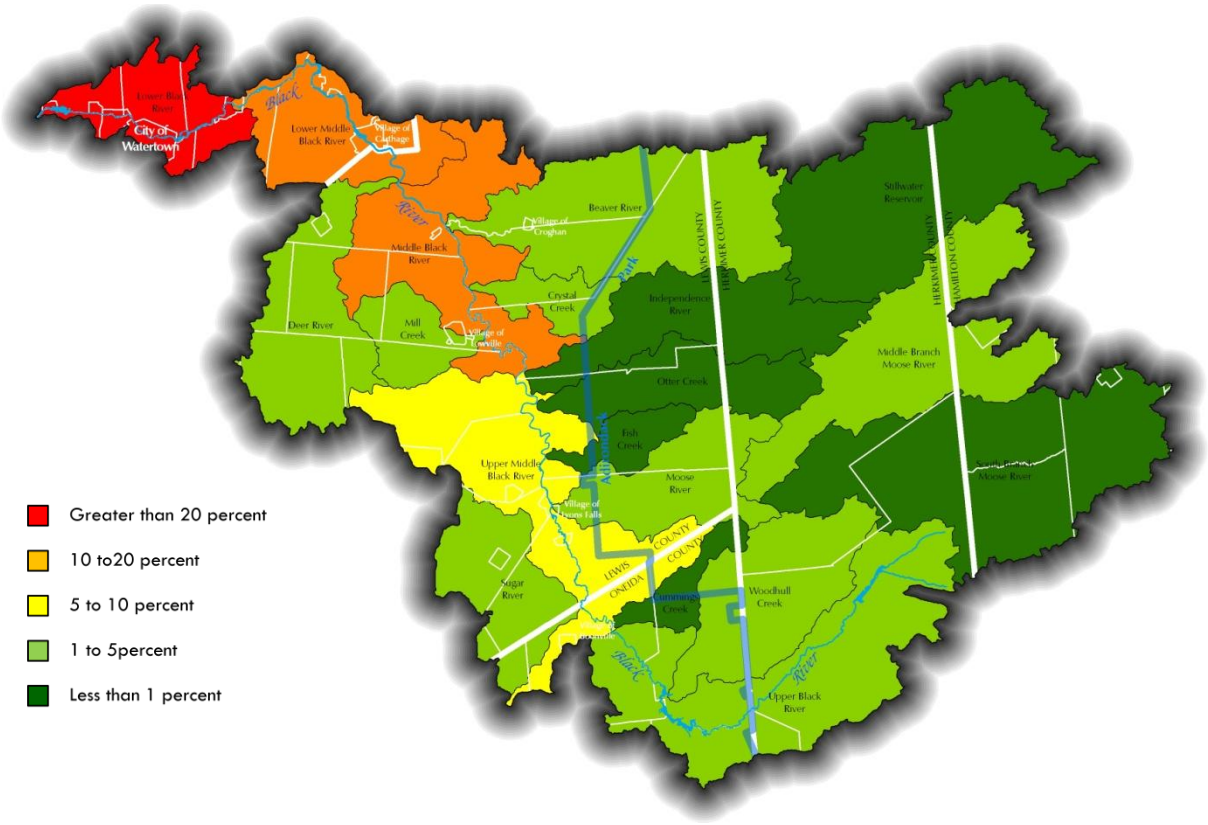
2.3.1 Population Characteristics

Planning for the future requires a clear understanding of both current conditions and recent trends. An understanding of trends allows community leaders to make informed decisions about future policies and land use decisions. An important trend to consider is population growth or decline.

Population growth is an important indicator of watershed health – too much growth can strain resources within the watershed and may result in an increase in both point and nonpoint source

pollution. Additionally, associated increases in housing developments, roads, shopping areas, and commercial and industrial facilities increases the amount of impervious surface and often results in the removal of native vegetation, resulting in increased occurrences of flooding. Population growth, coupled with limited land use regulation, can also lead to rural sprawl, which reduces critical habitat areas, wetlands, and riparian corridors that in many instances act as filtration systems and provide protection for the waterbodies.

Today, a majority of the Black River watershed's population is concentrated within the Black River valley (see Map 8). In the earliest days of settlement within the region, development occurred along the river valley as this was the primary transportation corridor along the Black River Canal system, connecting the river and the communities along it with the Erie Canal to the south and Watertown to the north. In addition to commerce and transport, the Black River also provided opportunities for hydropower in certain locations and the fertile floodplain offered prime agricultural lands.

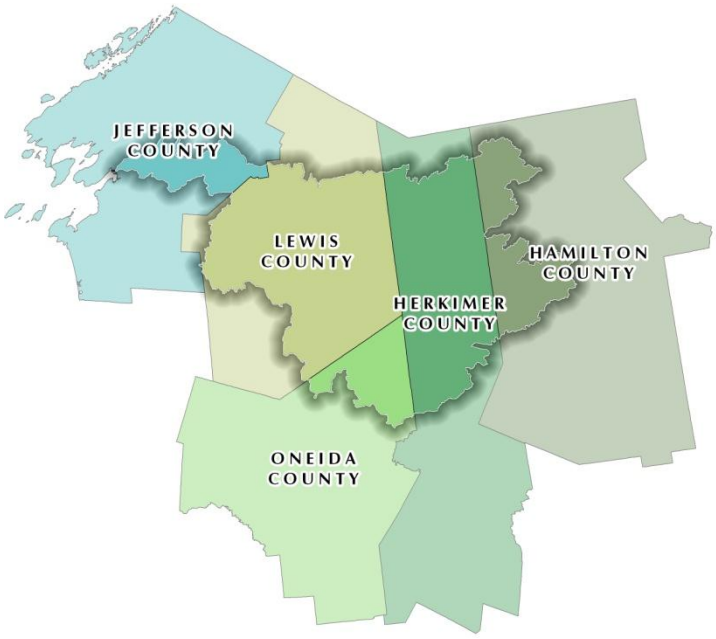


Percent of the total population residing in the Black River watershed by subwatershed

A review of population density maps for the watershed from 1990 to 2000 shows where population shifts have occurred (Maps 7 and 8). While the population density of Herkimer and Hamilton Counties has remained the same, with less than 10 people per square mile, Lewis County has seen an increase in population densities in a number of key areas. The population densities of the Independence River, Otter Creek, Fish Creek, and Moose River subwatersheds have experienced

population density increases from under 10 people per square mile to between 10 and 50 people per square mile. Other increases to population density have also occurred in the areas immediately outside the Town of Lowville. In contrast, farther outlying areas of Lowville, including portions of the Deer River and Mill Creek subwatersheds, have seen their population densities decrease to under 10 people per square mile, suggesting a population shift closer to the County seat.

As previously noted, five counties are traversed by the Black River watershed – Hamilton, Herkimer, Jefferson, Lewis, and Oneida. To gain an understanding of the watershed's population trends, historic and projected population data was investigated. Data collected from the Cornell University Program on Applied Demographics (see Table 2.8), the total population of these five counties is projected to decrease by almost seven percent from 2000 to 2020 (Year 2020 is the full build-out date for this plan). Additionally, although Jefferson County is expected to gain in total population from 2000 to 2020, it is projected that the County will actually begin to depopulate beginning in 2015 and continuing into 2020. The sparsely populated Hamilton County, located entirely within the Adirondack Park, is expected to lose almost 15 percent of its population from 2000 to 2020. The projections provided by Cornell University are based on current life expectancy and survival rates, age-specific fertility rates, and rates of net migration.



Counties traversed by the Black River watershed

Table 2.8. Historic and Projected Population for Watershed Counties

COUNTY	YEAR					PERCENT CHANGE (1990 to 2020)
	2000	2005	2010	2015	2020	
Hamilton	5,379	5,196	5,055	4,843	4,576	-14.9%
Herkimer	64,427	63,597	62,346	60,622	58,491	-9.2%
Jefferson	111,738	115,536	116,157	115,722	114,717	2.7%
Lewis	26,944	26,506	26,168	25,594	24,797	-8.0%
Oneida	235,469	233,969	226,880	219,490	211,544	-10.2%
TOTALS	**445,957**	**446,809**	**438,616**	**428,286**	**416,145**	**-6.7%**

Source: Cornell University Program of Applied Demographics

To determine the approximate year 2000 population for each subwatershed, data was collected from the U.S. Census Bureau at the block group level. Block group population data was then applied to

the appropriate subwatershed using a weighted average based on the percent of a given block group within each subwatershed. Subsequent to calculation of subwatershed populations for year 2000, county-level rates of population change were determined and applied to each subwatershed to determine the projected population for year 2020. The results of this analysis are provided in Table 2.9.

Table 2.9. Historic and Projected Population for Black River Watershed and Subwatersheds

SUBWATERSHED	POPULATION		POPULATION CHANGE (2000 to 2020)	PERCENT CHANGE (2000 to 2020)
	2000	2020		
Beaver River	2,674	2,460	-214	-8.0%
Crystal Creek	1,013	932	-81	-8.0%
Cummings Creek	544	489	-55	-10.1%
Deer River	1,816	1,672	-144	-7.9%
Fish Creek	309	284	-25	-8.1%
Independence River	657	604	-53	-8.1%
Lower Black River	26,285	26,986	701	2.7%
Lower Middle Black River	11,156	11,396	240	2.2%
Middle Black River	7,284	6,704	-580	-8.0%
Middle Branch Moose River	1,155	1,036	-119	-10.3%
Mill Creek	1,066	981	-85	-8.0%
Moose River	892	820	-72	-8.1%
Otter Creek	550	506	-44	-8.0%
South Branch Moose River	426	371	-55	-12.9%
Stillwater Reservoir	307	271	-36	-11.7%
Sugar River	2,030	1,858	-172	-8.5%
Upper Middle Black River	5,499	5,033	-466	-8.5%
Upper Black River	3,278	2,948	-330	-10.1%
Woodhull Creek	766	689	-77	-10.1%
BLACK RIVER WATERSHED	**67,707**	**66,040**	**-1,667**	**-2.5%**

Source: U.S. Census Bureau; Cornell University Program of Applied Demographics

While the raw population numbers provide an indication of the current and projected population levels within the watershed, more important is population change as it is indicative of potential future impacts to each subwatershed. As is depicted in Table 2.9, several interesting population trends are occurring within the watershed study area. First, the population of the entire watershed is projected to decrease by approximately 1,667 people, or 2.5 percent. Most of this loss will occur in three subwatersheds, all of which are located in the heavily populated areas of the Black River valley (predominantly in Lewis County):

- The Middle Black River subwatershed;
- The Upper Middle Black River subwatershed; and
- The Upper Black River subwatershed.

Only two subwatersheds are projected to increase in population by 2020 – the Lower Black River and Lower Middle Black River subwatersheds. Both subwatersheds are located predominantly in Jefferson County, in the vicinity of the Villages of Carthage and West Carthage, the City of Watertown, and Fort Drum.

It should be noted that this region of New York State also realizes seasonal shifts in population that are not accounted for in the population projections provided in Table 2.9. According to the demographic analysis provided in the Black River Watershed Socioeconomic Characterization and Assessment,[24] the percentage of housing units that are for seasonal, recreational, or occasional use increases in the eastern portion of the watershed, particularly in the Adirondack Park. The largest proportion of seasonal housing units occurs in those portions of the watershed located in Herkimer and Oneida Counties, with 64 percent of all housing units used for seasonal, recreational, or occasional use. Seasonal residents and users can benefit to the local economy by bringing outside dollars into the community, but may also be less integrated in the community, resulting in less participation in community planning and neighborhood-level.

2.3.2 Build-Out Analysis

Build-out analysis was used to evaluate potential future development intensities and patterns within the Black River watershed, as well as the 19 subwatersheds, at Year 2020. As previously noted, development intensities and patterns play a significant role in water quality and overall watershed health. Thus, evaluating potential future development impacts is a crucial step in defining and developing the appropriate tools to improve and maintain ecosystem health.

Development intensities and patterns play a significant role in water quality and overall watershed health.

For the purposes of this analysis, build-out refers to the amount of land cover classified as urban in 2020. A detailed discussion and explanation of land classifications can be found in Table 2.10. Note that urban lands are defined as all developed areas, from high intensity areas where people reside or work in high numbers, to open areas with a mixture of some constructed materials and vegetation in the form of lawn grasses and does not necessarily refer to urban city development.

The analysis was based on the projected populations for each of the subwatersheds and the relationship between population change and amount of land classified as urban. The first step in this analysis was to determine the change in lands classified as urban from 2001 to 2020 based on the projected change in population for those same years (see Table 2.10).

Table 2.10. Projected Population and Urban Area Change, 2000 to 2020

SUBWATERSHED	POPULATION CHANGE (2000-2020)	URBAN ACRES CHANGE (2000-2020)
Beaver River	-214	-151
Crystal Creek	-81	-23
Cummings Creek	-55	1
Deer River	-144	-84
Fish Creek	-25	30
Independence River	-53	3
Lower Black River	701	722
Lower Black Middle River	240	282
Middle Black River	-580	-500
Middle Branch Moose River	-119	-60
Mill Creek	-85	-27
Moose River	-72	-15
Otter Creek	-44	11
South Branch Moose River	-55	1
Stillwater Reservoir	-36	20
Sugar River	-172	-111
Upper Middle Black River	-466	-391
Upper Black River	-330	-261
Woodhull Creek	-77	-20
BLACK RIVER WATERSHED	**-1,667**	**-573**

Once the change in urban area was calculated for each subwatershed, this value was applied to the land cover values for 2001. As the total area for each subwatershed cannot change, any change to the amount of land classified as urban must result in changes to the remaining land cover types (e.g., forest, agriculture). To determine how the remaining land cover types changed as a result of changes in the amount of land classified as urban, rates of change were calculated for each cover type for each subwatershed for years 1992 to 2001. These rates were then used to determine the projected land cover values for year 2020 for the entire Black River watershed, as well as the 19 subwatersheds. Table 10 provides the projected land cover values for year 2020 for the Black River watershed.

Table 2.11. Projected Land Cover Change, 2001 to 2020

LAND COVER TYPE	TOTAL ACRES (2001)	TOTAL ACRES (2020)	ACRES CHANGE	PERCENT CHANGE
Open water	45,874	45,861	-13	0.0%
Agriculture	142,335	142,473	138	0.1%
Urban	20,806	20,233	-573	-2.8%
Barren Land	1,665	1,664	-1	0.0%
Forest	699,546	699,948	402	0.0%
Grassland / Shrub	95,528	95,528	0	0.0%
Wetlands	212,320	212,367	48	0.1%
Total	**1,218,075**	**1,218,075**	**--**	**--**

Source: 2001 National Land Cover Data, Multi-Resolution Land Characteristics (MRLC) Consortium

Although the watershed as a whole is projected to lose more than 570 acres of urban/developed area from 2001 to 2020, eight of the nineteen subwatersheds are projected to realize an increase in the amount of lands classified as urban within their drainage basins:

- Lower Black River subwatershed – 722 acre increase (9.9 percent increase)
- Lower Middle Black River subwatershed – 282 acre increase (7.7 percent increase)
- Fish Creek subwatershed – 30 acre increase (187.5 percent increase)
- Stillwater Reservoir subwatershed – 20 acre increase (32.3 percent increase)
- Otter Creek subwatershed – 11 acre increase (34.4 percent increase)
- Independence River subwatershed – 3 acre increase (20 percent increase)
- Cummings Creek subwatershed – 1 acre increase (2.5 percent increase)
- South Branch Moose River subwatershed – 1 acre increase (0.4 percent increase)

2.4 Topography and Soil Characteristics

2.4.1 Elevations

The Black River watershed comprises a wide range of topographies, from generally flat and rolling hills to steep slopes and rocky outcroppings (see Map 9).

As identified in Table 2.11, elevations within the watershed range from approximately 246 feet above mean sea level to 3,771 feet above mean sea level, with the mean elevation approximating 1,534 feet above mean sea level. Maximum, minimum, and mean elevations for each of the 19 subwatersheds are also presented in Table 2.11.

In terms of watershed protection, steep slopes can affect water quality as these areas have a greater tendency for erosion than more gently sloping areas. As is depicted on Map 10 and Table 2.12, most areas comprising steep slopes are located within the Adirondack Park Blue Line, in Hamilton and Herkimer Counties. A smaller area of steep slopes also occurs towards the upper reaches of the Black River, in the vicinity of Lyons Falls, as the river valley narrows towards the southern portion of Lewis County.

Table 2.11. Elevations

SUBWATERSHED	ELEVATION (feet)		
	MINIMUM	MAXIMUM	MEAN
Beaver River	720	2,271	349
Crystal Creek	724	1,367	1,034
Cummings Creek	1,021	1,877	1,415
Deer River	720	1,986	1,592
Fish Creek	741	1,662	1,300
Independence River	728	2,351	1,594
Lower Black River	246	1,101	515
Lower Black Middle River	529	1,250	807
Middle Black River	718	1,701	921
Middle Branch Moose River	1,496	2,929	1,918
Mill Creek	727	1,982	1,414
Moose River	799	2,245	1,458
Otter Creek	731	2,355	1,531
South Branch Moose River	1,496	3,771	2,161
Stillwater Reservoir	1,656	2,829	1,894
Sugar River	910	2,032	1,482
Upper Middle Black River	730	2,113	1,310
Upper Black River	1,040	2,704	1,649
Woodhull Creek	1,127	2,404	1,689
BLACK RIVER WATERSHED	**246**	**3,771**	**1,534**

Source: Digital Elevation Models, U.S. Geological Survey

Elevation and steep slopes can impact the land uses and cover types that are specific to a particular locality or region. Lower elevations are often characterized by broad flat plains traversed by meandering rivers and streams that deposit highly fertile soils during episodic flood events. The result is that these are often the most suitable areas for agriculture; the Black River valley provides an excellent example of this relationship. Additionally, the higher elevations of the Black River watershed comprise a considerable percentage of steep slopes (i.e., slopes greater than 8 percent), making urban-type development much more difficult than at the lower elevations. The result of these factors is that the subwatersheds located at lower elevations are much more intensively developed than those at the higher elevations. It should be noted that most of the higher elevation subwatersheds are located within the Adirondack Park, where land use and development regulations restrict the intensity of development.

2.4.2 Steep Slopes

As a rule, steep slopes are more erosive than flatter slopes. In considering erosive potential, slopes greater than 8 percent are considered to be steep; slopes greater than 15 percent are considered to be very steep. Table 2.12 summarizes the relative presence of steep slopes within the subwatersheds (also see Map 10). Note that the areas of steep slopes presented in Table 20 do not include areas of

exposed bedrock. Slightly less than one third of the entire Black River watershed has steep slopes. The subwatersheds having the most steep slopes include Middle Branch Moose River, South Branch Moose River, and Stillwater Reservoir, all situated along the easternmost portion of the watershed. Therefore it could be identified that these three subwatersheds have the most erosion potential. Conversely, the subwatersheds with the fewest steep slopes include Deer River, Lower Black River, Lower Middle Black River, Middle Black River, and Mill Creek. These five subwatersheds have the least erosion potential.

Table 2.12. Steep Slopes

SUBWATERSHED	SIZE (acres)	STEEP SLOPES			PERCENT OF SUBWATERSHED
		8 TO 15 PERCENT (acres)	> 15 PERCENT (acres)	STEEP SLOPE TOTALS (acres)	
Beaver River	98,761	20,271	14,486	34,757	35.2
Crystal Creek	17,085	3,569	1,720	5,289	31.0
Cummings Creek	14,212	2,520	1,462	3,982	28.0
Deer River	62,270	5,012	1,904	6,916	11.1
Fish Creek	14,966	2,098	1,190	3,288	22.0
Independence River	61,074	12,539	10,458	22,998	37.7
Lower Black River	39,532	2,821	1,903	4,725	12.0
Lower Middle Black River	51,985	4,256	2,363	6,619	12.7
Middle Black River	81,353	8,398	3,009	11,407	14.0
Middle Branch Moose River	94,880	18,017	24,407	42,424	44.7
Mill Creek	22,512	2,151	668	2,819	12.5
Moose River	46,711	7,799	5,015	12,814	27.4
Otter Creek	42,181	8,818	7,324	16,141	38.3
South Branch Moose River	135,713	27,526	37,234	64,760	47.7
Stillwater Reservoir	109,992	22,374	25,818	48,192	43.8
Sugar River	44,732	6,142	2,215	8,357	18.7
Upper Middle Black River	102,016	13,970	10,174	24,143	23.7
Upper Black River	115,439	21,790	16,489	38,279	33.2
Woodhull Creek	62,661	12,500	7,978	20,478	32.7
BLACK RIVER WATERSHED	**1,218,075**	**202,571**	**175,817**	**378,388**	**31.1**

Source: Digital Elevation Models, U.S. Geological Survey

2.4.3 Soils

The Black River watershed encompasses 28 soil series, of which three comprise approximately 53 percent of the total watershed land area – the Adams series, the Becket series, and the Potsdam series. Soil series characterize groups of soil types aggregated together according to similar pedogenesis (i.e., the process of creating soil), soil chemistry, and physical properties. Each series thus represents broad areas that have a distinctive pattern of soils that perform similarly for land use

purposes. It should be noted that detailed soil survey data is not available for the entirety of the Black River watershed, including Herkimer and Lewis Counties.

Soils in the Adams series, covering approximately 19.3 percent (234,943 acres) of the watershed, are located primarily along the Black River Valley west of the Black River. "The Adams series consists of very deep excessively drained or somewhat excessively drained soils on outwash plains, terraces, kames, eskers, and lake plains in the Adirondack region. The depth to bedrock is generally more than 6 feet."[25] Comprising approximately 23.7 percent (289,230 acres) of the watershed, the Becket Series consists of very deep, well drained soils on side slopes and hilltops on upland till plains in the Western Adirondack Foothills and Central Adirondacks.[26] The Potsdam Series, located geographically between the Adams and Potsdam series, consists of very deep, well drained soils on glacial till plains.[27] The series covers approximately 10.2 percent (124,268 acres) of the Black River Watershed.

Of direct importance to watershed management is the soils ability to absorb precipitation. Accordingly, the Natural Resource Conservation Service has classified soils into four Hydrologic Soil Groups based on the soil's runoff potential – A, B, C, and D. A brief discussion of each group, as well as its relation to the Black River watershed is provided in Table 2.13 and Map 11.

Table 2.13. Soil Hydrologic Group

SOIL HYDROLOGIC GROUP	DESCRIPTION	TOTAL ACRES	PERCENT COVER
A	sand, loamy sand or sandy loam types of soils. It has low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.	258,315	21.2%
A/D	combination of A and D	24,144	2.0%
B	silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.	184,507	15.1%
C	sandy clay loam. They have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.	644,709	52.9%
D	clay loam, silty clay loam, sandy clay, silty clay or clay. This HSG has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.	106,401	8.7%
TOTAL		**1,218,075**	

Source: Natural Resources Conservation Service (NRCS) Soils Website, USDA (http://soils.usda.gov/)

2.5 Hydrologic Characteristics

2.5.1 Climate

The climate of the Black River watershed is characterized by long cold winters and short cool summers. As a whole, the climate of the watershed is slightly cooler and realizes more precipitation than the rest of the state, although variations in the local climates do exist (i.e., average temperature, rainfall and snowfall vary locally and are affected by differences in elevation and location relative to mountain ranges, prevailing wind, and local bodies of water).[28] Variations in local climate are demonstrated in Table 2.14. Based on data provided by the National Climatic Data Center, the average annual temperature for the watershed ranges from 40.5 °F to 45.4 °F.

Table 2.14. Climate Data, 1971 to 2000

CLIMATE MONITORING STATION	TEMPERATURE (FAHRENHEIT)			AVERAGE ANNUAL PRECIPITATION (INCHES)	AVERAGE ANNUAL SNOWFALL (INCHES)
	WINTER AVERAGE (JAN)	SUMMER AVAERAGE (JULY)	ANNUAL AVERAGE		
Watertown AP	18.8	68.6	44.7	34.75	92.4
Watertown	18.6	70.2	45.4	42.57	103.4
Old Forge	13.7	64.1	40.5	50.39	194.7
Lowville	17.5	67.8	43.8	41.34	119.2
Boonville	16.3	66.0	42.4	59.76	220.5
Big Moose	NA	NA	NA	51.36	180.8

Source: National Climatic Data Center
NA = No data recorded

With one of the highest annual precipitation rates in New York State, the average annual precipitation for the Black River Watershed ranges from 34.75 inches in Watertown to 59.76 inches in Boonville (see Map 12 and Table 2.14 for a breakdown of precipitation by subwatershed). Although precipitation is distributed relatively uniformly throughout the year, the majority of annual precipitation occurs during the winter months as snowfall, with some areas receiving as much as 220 inches on average. Additional information on precipitation is provided in the Surface Hydrology section of this report.

The average annual snowfall over much of the watershed exceeds 100 inches, with some areas regularly receiving more than 200 inches.

As shown in Map 12, mean annual precipitation across the watershed ranges from a high of 65 inches to a low of 35 inches. The low of 35 inches is limited to a very small portion of the watershed downstream from Watertown. The high of 65 inches actually occurs at two different locations. One location is near the eastern-most watershed boundary in Hamilton County and the other location is near the watershed boundary southwest of Lowville in Lewis County. The aerial distribution of the precipitation is a function of the topographic relief and the general eastward-to-northeastward movement of storms. The watershed has a fairly uniform distribution of precipitation during the year, with no distinct rainy or dry season.

At the subwatershed level, the mean annual precipitation varies from a low of 38.0 inches in the Lower Black River to a high of 56.3 inches in Deer River (see Table 2.15). The mean annual precipitation exceeds 50 inches in a total of eight of the subwatersheds, including Cummings Creek, Deer River, Mill Creek, South Branch Moose River, Sugar River, Upper Middle Black River, Upper Black River, and Woodhull Creek. The eight subwatersheds encompass some 46 percent of the total watershed area.

The average annual snowfall over much of the watershed exceeds 100 inches. Each year, at least some of the snowpack remains unmelted in mid-March. At that time, as much as 10 inches of equivalent rainfall can lie stored in the snowpack. Thus, the greatest potential for flooding occurs during the spring, when substantial, relatively warm rains can cause rapid snow melting and produce episodes of significant runoff. As such, nearly half of the average annual runoff occurs from mid-February through mid-May. More local flooding generally occurs from summer thunderstorms in the smaller drainage catchments.

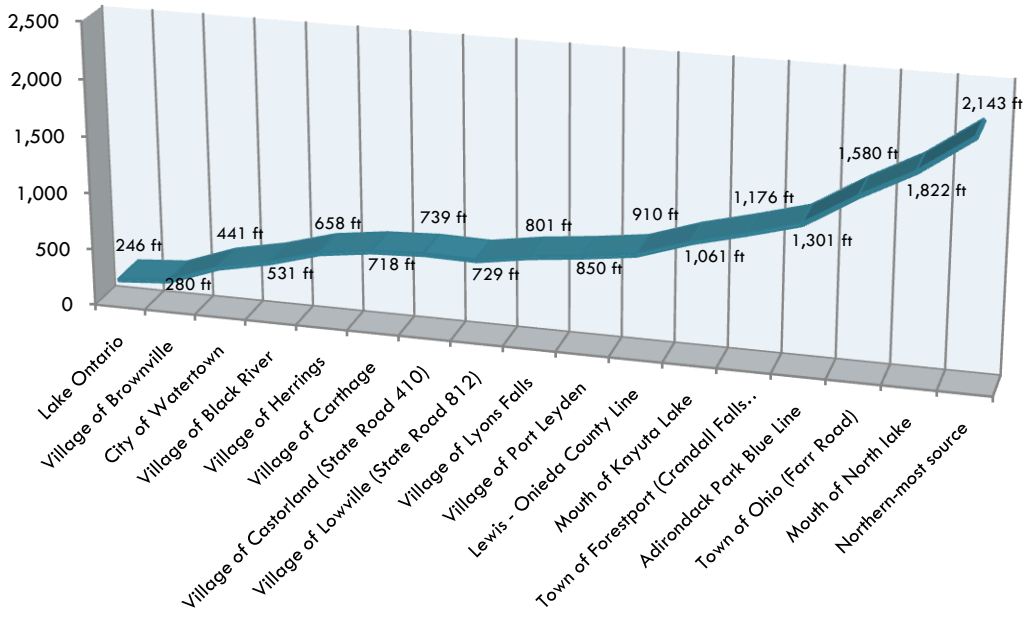
Table 2.15. Average Annual Precipitation by Subwatershed

SUBWATERSHED	AVERAGE ANNUAL PRECIPITATION (inches)
Beaver River	43.5
Crystal Creek	42.0
Cummings Creek	53.3
Deer River	56.3
Fish Creek	45.0
Independence River	45.0
Lower Black River	38.0
Lower Black Middle River	42.4
Middle Black River	41.4
Middle Branch Moose River	48.2
Mill Creek	52.6
Moose River	45.1
Otter Creek	45.0
South Branch Moose River	53.4
Stillwater Reservoir	46.2
Sugar River	55.7
Upper Middle Black River	50.9
Upper Black River	55.0
Woodhull Creek	55.0
BLACK RIVER WATERSHED	**48.7**

Source: NYS Average Annual Precipitation GIS Data Layer, Spatial Climate Analysis Service, Oregon State University; USDA - NRCS National Water and Climate Center

2.5.2 Surface Hydrology

In terms of surface hydrology, the watershed comprises approximately 4,000 miles of rivers and streams and approximately 35,000 acres of lakes and ponds. The Black River flows from the Adirondack Mountains northwest into Lake Ontario; the two primary tributaries are the Moose River and the Beaver River. The overall length of the main stream channel is approximately 128.7 miles and flows along an average slope of approximately 0.164 percent. Overall the average watershed slope is moderate at approximately 0.00167 percent.



Elevation profile of the Black River

While average slope of the Black River and overall watershed are important indicators of the surface hydrology conditions that may exist, calculating the watershed shape index provides additional information as it pertains to yield and response. Yield is total volume of water that passes through the river over a long time period (e.g., one year) and is very useful for water supply planning. Response indicates how stream flows react over time to a particular precipitation event, is expressed in terms of flow rate (e.g., cubic feet per second), and is often represented by a hydrograph.

The watershed shape index is the ratio of watershed length to width. All natural watersheds are shaped irregularly, so representative values for length and width must be determined. For example, a rectangular-shaped watershed ten miles long and one mile wide has a shape index of ten. This large value indicates a relatively high yield and low response. Further, the response takes longer as it must travel the full ten miles. If, instead, the watershed is one mile long and ten miles wide, it has a shape index of 0.1, indicating a relatively high response and low yield. The response is quicker as it travels only one mile. Based on an approximate length and width of 128.7 miles and 952 miles,

respectively, the irregularly shaped Black River watershed has a shape index of approximately 0.135, not atypical for major basins in the region.

The main stem of the Black River flows for more than 120 miles from the Adirondack Mountains to Lake Ontario along an average slope of 0.164 percent.

Directly related to surface hydrology within the Black River watershed is the Hudson River-Black River Regulating District (HRBRRD). Established by Article 15, Title 21 of the Environmental Conservation Law of New York State, the purpose of this river regulating district is to "regulate the flows of the Hudson River and Black River for the purposes of flood protection and flow augmentation".[29] This is accomplished through a series of dams and reservoirs designed to capture excess runoff during periods of high flow, with surplus water released gradually during periods of low river flow. The following dams and reservoirs comprise the infrastructure through which the HRBRRD regulates flows:

- Conklingville Dam on the Sacandaga River, a Hudson River tributary
- Indian Lake on the Indian River, another Hudson River tributary
- Stillwater Reservoir on the Beaver River, a Black River tributary
- The Fulton Chain of Lakes, with dams at Old Forge and Sixth Lake, are the headwaters of the Middle Branch of the Moose River, a Black River tributary

In terms of reservoir levels, Article 15, Title 21 of the Environmental Conservation Law of New York State states that the HRBRRD shall not permit the water in any reservoir to rise above the high flow line except during floods or other emergencies. Additionally, "no reservoir shall at any time be drawn off below the low flow line, or to such extent as to expose isolated pools which may cause unsanitary conditions, unless due provision is made for draining such pools into the lowest water level of such reservoir".

In general, the overall condition of the Black River can be classified as good. The major water uses include fishing, water contact recreation, aesthetics, municipal water supply, industrial water supply, irrigation, hydropower, and the support of riparian and aquatic habitat. On the Beaver River, the Hudson River – Black River Regulating District operates the Stillwater Reservoir, which has a 10.5-square-mile surface area and a 48-mile shoreline. The reservoir was originally flooded in 1876 to facilitate the logging industry by allowing logs to be floated down the Beaver River. Currently, the primary purpose of the reservoir is flood control for the Black River valley.

On the Moose River, the Regulating District operates the Fulton Chain of Lakes via dams at Old Forge and Sixth Lake. The combined storage capacity of these reservoirs is over forty billion gallons. Together, this network of dams and reservoirs has greatly reduced flooding and remains the source of water flow integral to the hydroelectric generating projects and industrial operations in Jefferson, Lewis, and Herkimer Counties. The Regulating District also owns and maintains a dam at Hawkinsville on the Black River in Oneida County. Other significant hydropower projects on the Black River include those operated by Brookfield Renewable Power at Beebee Island, National Grid (i.e.,Niagara Mohawk Power Corporation) in Jefferson County, and Black River Limited Partnership in Lewis County.

Table 2.16 summarizes the maximum known discharge and recurrence interval for six locations across the watershed according to data compiled and reported by the USGS. The drainage areas at the six locations range from 1.66 square miles to a maximum of 1,864 square miles. The maximum discharge ranges from 312 cubic feet per second up to 55,500 cubic feet per second. The recurrence intervals range from 50 years to more than 500 years.

Table 2.16. Maximum Known Discharge and Recurrence Intervals

LOCATION	COUNTY	DRAINAGE AREA	RECORD PERIOD	DATE	DISCHARGE	RECURRENCE INTERVAL
Black River near Boonville	Oneida	304	1911-2007	04-18-82	12,800	>50
Moose River at McKeever	Herkimer	363	1902-1970 1985-2007	06-03-47	18,700	>100
Independence River at Donnattsburg	Lewis	88.7	1928-2007	12-30-84	9,420	>100
Beaver River at Croghan	Lewis	291	1930-2007	05-21-69	5,100	50
Deer River at Deer River	Lewis	94.8	1930-1999	12-29-84	17,200	100
Black River at Watertown	Jefferson	1,864	1921-2007	01-10-98	55,500	>500

Source: USGS New York Water Science Center

Throughout the twentieth century, the Black River watershed has experienced a number of significant flood events, most notably in 1969, 1982, 1984, and 1998. The flood of June 3, 1947 on the Moose River at McKeever was the result of a dam failure. From other rather limited historic information, a significant flood event also occurred on April 23, 1869. On that date, a maximum discharge of 39,700 cubic feet per second was reached on the Black River at Watertown. This discharge has a recurrence interval of approximately twenty-five years. It is interesting to note that significant floods have occurred within the watershed before detailed measurements were taken and systematic records were kept.

Table 2.17. Discharges for Selected Recurrence Intervals

LOCATION	2-YEAR	10-YEAR	25-YEAR	50-YEAR	100-YEAR	500-YEAR
Black River near Boonville	5,720	9,030	10,900	12,500	14,100	18,400
Moose River at McKeever	7,600	11,600	13,600	15,200	16,800	20,800
Independence River at Donnattsburg	2,090	3,780	4,880	5,820	6,880	9,890
Deer River at Deer River	5,420	9,850	12,600	14,800	17,200	23,700
Black River at Watertown	21,700	31,500	36,600	40,500	44,800	54,500

Table 2.17 presents the peak discharges in cubic feet per second at six locations for selected recurrence intervals. It should be noted that peak flood stage may be affected by ice cover, ice jams, debris, and other obstructions in the affected channel. For any given recurrence interval, the discharge per unit area is highly variable. For example, the unit discharge for the 2-year flood varies

from approximately 10 cubic feet per second to more than 57 cubic feet per second per square mile. Likewise, the unit discharge for the 100-year flood varies from approximately 23 to more than 180 cubic feet per second per square mile. The smaller runoff rates apply to the lower, downstream portion of the watershed, while the highest rates generally apply to the uppermost portions of the watershed as they are subject to higher amounts of rainfall and snowfall.

Based on a preliminary analysis of data from water years 1920 through 2007, the annual mean flow of the Black River at Watertown is approximately 4,212 cubic feet per second. This is equivalent to approximately 30.7 inches of runoff annually. The highest annual mean of 6,392 cubic feet per second is from the 1976 water year, which is more than 51 percent greater than the long term annual mean. The smallest annual mean flow of 2,579 cubic feet per second is from the 1931 water year and is nearly 39 percent less than the long term annual mean. Thus, it is evident that considerable variability exists in the annual mean flow from year to year. The annual seven-day minimum flow is 637 cubic feet per second, recorded on August 15, 1923. Similar statistics are available for other selected locations in the watershed. Preliminary estimates of the annual mean flow at the mouth of each subwatershed is summarized in Table 2.18.

Table 2.18. Annual Mean Flow

SUBWATERSHED	SIZE (in acres)	ANNUAL MEAN FLOW (cubic feet per second)
Beaver River	98,761	350
Crystal Creek	17,085	60
Cummings Creek	14,212	50
Deer River	62,270	220
Fish Creek	14,966	53
Independence River	61,074	216
Lower Black River	39,532	140
Lower Middle Black River	51,985	184
Middle Black River	8,153	29
Middle Branch Moose River	94,880	335
Mill Creek	22,512	80
Moose River	46,711	165
Otter Creek	42,181	149
South Branch Moose River	135,713	479
Stillwater Reservoir	109,992	388
Sugar River	44,732	158
Upper Middle Black River	102,016	360
Upper Black River	115,439	408
Woodhull Creek	62,661	221

It should be noted that the New York State Canal Corporation exercises the right to withdraw all but 80 cubic feet per second from the Black River in Oneida County. The limit is intended to protect the

downstream fishery. The water is withdrawn from the Alder Pond Reservoir and transported via the Forestport Feeder Canal into the Erie Canal during the navigation season from May 1 through November 1. Because less depth is required during the non-navigation season, the allowable withdrawal is all but 140 cubic feet per second. Thus, during that non-navigation season, the withdrawals are 60 cubic feet per second smaller that they are during the navigations season.

2.5.3 Water Supply

Traditionally, water supply has come from two primary sources – surface water and groundwater. In terms of surface water, the New York State Water Quality Standards Program, administered by the NYSDEC, is responsible for classifying surface waters for their best use, including water supply, swimming, boating, fishing, and shellfishing. Specific to water supply, both Class A and Class AA are potentially suitable for municipal water supply. Class A and AA waters are those waters that can provide a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. Map 13 depicts the NYSDEC use classifications for surface streams, while the lengths of streams designated as Class A and Class AA are summarized by subwatershed in Table 2.19.

Table 2.19. Class A and AA Streams

SUBWATERSHED	CLASS A STREAMS (miles)	CLASS AA STREAMS (miles)	TOTALS (miles)	PERCENT OF ALL STREAMS
Beaver River	-	2.2	2.2	0.7%
Crystal Creek	0.9	2.4	3.3	7.4%
Cummings Creek	3.9	-	3.9	7.4%
Deer River	5.7	-	5.7	2.3%
Fish Creek	3.7	-	3.7	7.1%
Independence River	1.3	1.1	2.4	1.2%
Lower Black River	4.0	-	4.0	3.9%
Lower Middle Black River	2.2	-	2.2	2.0%
Middle Black River	-	-	-	-
Middle Branch Moose River	65.5	9.7	75.2	21.7%
Mill Creek	-	-	-	-
Moose River	-	2.4	2.4	1.4%
Otter Creek	-	-	-	-
South Branch Moose River	7.3	-	7.3	1.3%
Stillwater Reservoir	4.8	0.01	4.8	1.2%
Sugar River	1.2	0.5	1.7	1.0%
Upper Middle Black River	-	10.8	10.8	3.2%
Upper Black River	11.6	2.5	14.1	3.8%
Woodhull Creek	2.5	-	2.5	1.1%
Total Black River	114.7	31.8	146.5	3.6%

Source: Water Quality Classifications GIS Data Layer, NYSDEC

It should be noted that not all of the subwatersheds contain streams classified as Class A or Class AA. The Middle Branch Moose River subwatershed, with 75.2 miles, by far has the most miles of stream designated as Class A and Class AA. The Upper Black River subwatershed has 14.1 miles, the next highest length of Class A or Class AA streams. These subwatersheds may be suitable for municipal water supply. The Middle Black River, Mill Creek, and Otter Creek subwatersheds have no Class A or Class AA streams. The Black River watershed as a whole contains 114.7 miles of Class A streams and 31.8 miles of Class AA streams.

Depending upon a number of factors, including both water quantity and water quality, other streams also may be suitable for municipal water supply. For example, streams that are not too polluted and have sufficient flows may be suitable for municipal water supply.

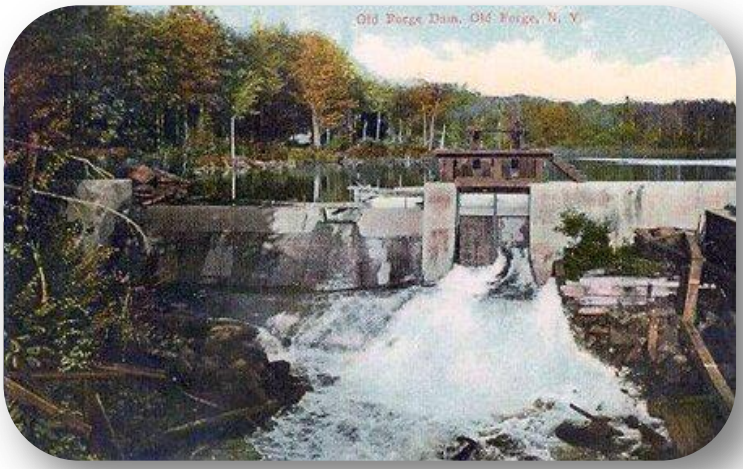
Map 14 depicts the assigned use classification for the other surface water bodies in the watershed. Class A designates suitability for municipal water supply. A total of 130.5 acres of water bodies in the watershed are designated Class A, of which 112.0 acres occur in the Independence River subwatershed and 18.5 acres occur in the Middle Branch Moose River subwatershed.

Groundwater is also a significant source of water supply in the watershed. Much of the withdrawals currently are in the unconsolidated alluvial aquifers situated along the river valleys which are capable of producing from 10 to 100 or more gallons per minute.

A potential, rather non-traditional source of future water supply is stormwater reuse. Known as the beneficial use of stormwater, reuse consists of storing stormwater runoff for future uses, such as landscape irrigation, firefighting, aesthetics, recreation, or other grey water uses (grey water is defined as non-industrial wastewater from domestic processes such as dish washing, laundry, and bathing). Grey water may be used for any non-potable use. Typically, stormwater is stored in lakes and ponds, tanks, cisterns, rain barrels, or some combination of facilities.

DAMS

There are 178 dams located within the Black River watershed, of which only 150 have the completion year reported in the official New York State Dam Inventory. Of those 150, the oldest is the Crystal Creek Dam in Lewis County, which was completed back in 1840. The Kings Fall Dam, also located in Lewis County, is the youngest, having been completed in 1989. The tallest dam in the watershed is the Soft Maple Terminal Dam in Lewis County, which measures 120 feet in height. Four dams are tied for the shortest height (two feet):



Old Forge Dam, late 1800s
Source: Boonville Black River Canal Museum

- The Little Moose Lake Dam in Herkimer County;
- The Village of Turin Water Supply Dam in Lewis County;
- The Shingle Shanty Pond Dam in Hamilton County; and
- The Big Moose Lake Dam in Herkimer County.

In terms of ownership, 20 of the dams are owned by local governments, 19 are owned by New York State, and 132 dams are in private hands; only one dam is owned by a public utility. The ownership of the remaining six is unreported and therefore unknown. There are also a variety of purposes associated with these 178 dams, including:

- 57 dams are used mainly for recreation;
- 49 are used primarily for hydroelectric power generation;
- 11 are used for water supply;
- 5 are used for navigation purposes;
- 3 are used for flood control;
- 2 are used for irrigation; and
- 12 report multiple uses.

There also are a variety of dam types within the Black River watershed. Fifty-seven are classified as earthen dams, forty-eight are gravity dams, twenty-one are timber structure, eight are buttress type dams, six are masonry structures, two are rock filled, two are made concrete, and twenty-nine dams have different combinations of the aforementioned types.

One of the primary purposes of the New York State Dam Inventory is to determine the hazard classification for each dam structure. The hazard classification is a function of the height of the dam, the maximum capacity, the physical characteristics, and the location of downstream facilities. The hazard classification is not a measure of the likelihood of failure; rather, it is a measure of the consequences of failure. Hazard classifications are defined as follows:

- *Low Hazard (A)* – Dam failure can only damage isolated farm buildings, vacant land, or rural roads.
- *Moderate Hazard (B)* – Dam failure can damage homes, major roads, minor railroads, or interrupt use or service of relatively important public utilities.
- *High Hazard (C)* – Dam failure can cause loss of life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways, and railroads.
- *No Hazard (D)* – Dam not built, or is breached, or failed to the extent that it no longer functions as a dam. Structure impounds no normal pool, and it does not unduly impede the flow of water.

Based on the data provided by the New York State Dam Inventory, 28 dams are classified as *No Hazard*, 118 are classified as *Low Hazard*, 23 are classified as *Moderate Hazard*, and 8 are classified as *High Hazard* (see Map 14). The *High Hazard* dams are located in the following subwatersheds (see Table 2.20):

- Beaver River subwatershed (4)
- Stillwater Reservoir subwatershed (1)
- Middle Branch Moose River subwatershed (1)

- Upper Black River subwatershed (1)
- Upper Middle Black River subwatershed (1)

Table 2.20. New York State Dam Hazard Classifications, Black River Watershed

SUBWATERSHED	DAM HAZARD CLASSIFICATION					TOTAL DAMS
	NO HAZARD (D)	LOW HAZARD (A)	MODERATE HAZARD (B)	HIGH HAZARD (C)	NO DATA	
Beaver River	2	7	3	4	--	16
Crystal Creek	1	4	--	--	--	5
Cummings Creek	1	4	--	--	--	5
Deer River	3	12	1	--	--	16
Fish Creek	--	2	1	--	--	3
Independence River	3	1	--	--	--	4
Lower Black River	3	8	7	--	--	18
Lower Middle Black River	1	7	4	--	--	12
Middle Black River	--	3	--	--	--	3
Middle Branch Moose River	1	2	1	1	1	6
Mill Creek	--	3	--	--	--	3
Moose River	1	6	--	--	--	7
Otter Creek	2	1	--	--	--	3
South Branch Moose River	--	4	--	--	--	4
Stillwater Reservoir	--	2	--	1	--	3
Sugar River	1	1	--	--	--	2
Upper Middle Black River	2	21	3	1	--	27
Upper Black River	5	22	3	1	--	31
Woodhull Creek	2	8	--	--	--	10
Black River Watershed	**28**	**118**	**23**	**8**	**1**	**178**

Source: New York State Dam Inventory

For a more detailed discussion of dams in each of the 19 subwatersheds, see Section 8.3.

2.5.4 Water Quality

While most of the basin is characterized by waters of good to excellent quality, the watershed does suffer from water quality problems. Based on the New York State Priority Waterbodies List for 2006 (PWL), more than 2,500 miles (67.3 percent) of streams within the Black River watershed have been assessed for impairments. The PWL identifies seven assessment classifications:

- *Impaired* – waterbodies with well documented water quality problems that result in precluded or impaired uses
- *Minor Impacts* – waterbodies where less severe water quality impacts are apparent but uses are still considered fully supported

- *Needs Verification* – segments that are thought to have water quality problems or impact but for which there is not sufficient or definitive documentation
- *Threatened* – waterbodies for which uses are not restricted and no water quality problems currently exist, but where specific land use or other changes in the surrounding watershed are known or strongly suspected of threatening water quality
- *Threatened (possible)* – waterbodies for which uses are not restricted and no water quality problems currently exist, but where waterbody classification, distinct uses or other considerations make the water more susceptible to threats and additional protection efforts are warranted
- *No Known Impact* – segments where monitoring data and information indicate that there are no use restrictions or other water quality impacts/issues
- *Unassessed* – segments where there is no available water quality information to assess the support of designated uses

Of these more than 2,500 miles, approximately 1,758 miles (68.4 percent) are characterized by no use restrictions or other water quality impacts or issues (Table 2.21 and Map 15 provides a breakdown of impairment classifications by subwatershed).

At the subwatershed level, the following eight subwatersheds realize 100 percent of their assessed stream miles characterized by no use restrictions or other water quality impacts or issues:

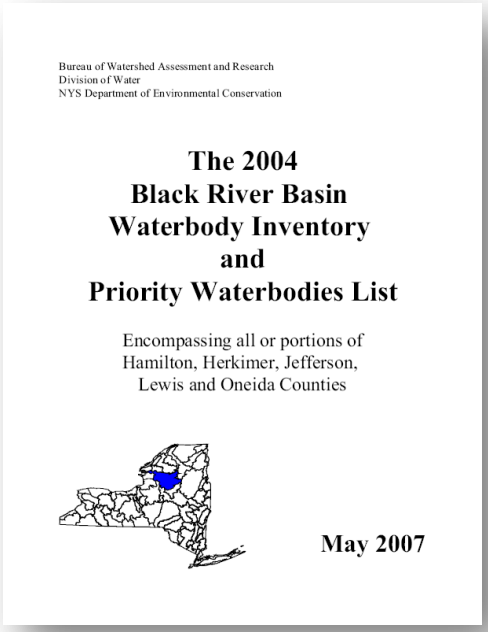
- Cummings Creek subwatershed – 29.3 miles
- Fish Creek subwatershed – 50.9 miles
- Crystal Creek subwatershed – 53.5 miles
- Moose River subwatershed – 83.9 miles
- Woodhull Creek subwatershed – 110.5 miles
- Otter Creek subwatershed – 149.8 miles
- Upper Black River subwatershed – 130.6 miles
- Upper Middle Black River subwatershed – 266.9 miles

The PWL also identifies waterbodies for which Total Maximum Daily Load (TMDL) requirements exist. A TMDL is defined as the maximum amount of a given pollutant that a waterbody can receive and still meet water quality standards. TMDLs also include the reductions necessary to meet these standards, as well as an allocation of reductions among the sources within a given watershed. The purpose of this process is to "identify impaired or threatened waterbodies and the pollutant(s) causing the impairment and establish a strategy for correcting the impairment or eliminating the threat and restoring the waterbody.

Only three subwatersheds within the Black River Watershed contain waterbodies for which TMDL requirements have been identified:

- Beaver River subwatershed (may be removed from the list in near future)
- Middle Branch Moose River subwatershed (due to atmospheric deposition)
- Mill Creek subwatershed

By far the most prevalent of the water quality problems stems from atmospheric deposition and acid precipitation, accounting for more than 90 percent of lake impairments and nearly 30 percent of stream impairments within the watershed. Atmospheric deposition occurs when pollutants are transferred from the air to the earth's surface as water moves through the hydrological cycle. More specifically, atmospheric deposition occurs when water vapor present in the atmosphere reacts with toxic compounds also present in the atmosphere, producing pollutant-laden precipitation that eventually makes its way into local waterbodies. Often, these pollutants are deposited long distances from their source, making it a difficult issue for local municipalities to properly address. Atmospheric deposition has been shown to be a significant source of pollutants to the Great Lakes.


Bureau of Watershed Assessment and Research
Division of Water
NYS Department of Environmental Conservation

The 2004
Black River Basin
Waterbody Inventory
and
Priority Waterbodies List

Encompassing all or portions of
Hamilton, Herkimer, Jefferson,
Lewis and Oneida Counties

May 2007

The most predominant form of atmospheric deposition is acid precipitation (i.e., acid rain). Low pH, frequently reported as less than 5, resulting from acid precipitation over the region has been documented in more than 150 lakes and ponds within the watershed. Episodic acidification of the smaller headwater streams also has been documented during periods of snowmelt and runoff. Episodic acidification has been found to cause harmful effects on biota that can be similar or worse than those from chronic acidification.[30] It is presumed that the problem also affects additional lakes and streams that have not been monitored. Such low pH levels are known to impair or even preclude aquatic life.

To address the lack of data regarding the acidification of Adirondack streams, the *Western Adirondack Stream Survey* (WASS) was conducted from 2003 through 2005 to assess the current chemical and biological conditions of streams in the region considered to have the highest number of acidified streams. Samples were collected from 200 randomly-selected streams located in the Black River watershed which lie within the Adirondack Park boundary. To ensure sampling accounted for episodic and seasonal variations in acidity levels, surveys were conducted twice during spring snowmelt, twice during summer base flows, and once during fall storms.

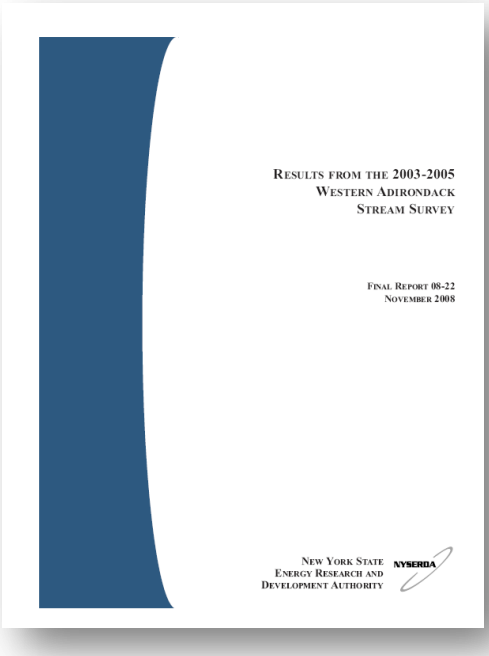
Table 2.21. NYSDEC Priority Waterbodies List Stream Assessments

SUBWATERSHED	PRIORITY WATERBODIES LIST ASSESSMENT CATEGORIES							TOTAL ASSESSED STREAM MILES	IMPACTED STREAM MILES[1]	IMPACTED PERCENT OF ASSESSED MILES
	IMPAIRED MILES	MINOR IMPACT MILES	NEED VERIFICATION MILES	THREATENED MILES	THREATENED (POSSIBLE) MILES	NO KNOWN IMPACT MILES	UNASSESSED MILES			
Beaver River	37.4	110.2	24.8	--	--	160.4	20.2	332.9	172.5	51.8%
Crystal Creek	--	--	--	--	--	53.5	1.6	53.5	0.0	0.0%
Cummings Creek	--	--	--	--	--	29.3	13.2	29.3	0.0	0.0%
Deer River	--	16.1	--	--	--	137.4	47.9	153.4	16.1	10.5%
Fish Creek	--	--	--	--	--	50.9	6.9	50.9	0.0	0.0%
Independence River	--	33.3	--	--	--	169.0	--	202.3	33.3	16.4%
Lower Black River	13.4	36.2	--	53.0	--	--	--	102.5	102.5	100.0%
Lower Middle Black River	--	29.3	--	--	--	38.4	41.1	67.7	29.3	43.2%
Middle Black River	17.3	15.9	0.3	--	--	51.6	247.6	85.1	33.5	39.4%
Middle Branch Moose River	73.4	65.1	--	--	--	43.6	37.6	182.1	138.5	76.0%
Mill Creek	34.2	36.8	--	--	--	--	--	71.0	71.0	100.0%
Moose River	--	--	--	--	--	83.9	108.6	83.9	0.0	0.0%
Otter Creek	--	--	--	--	--	149.8	0.1	149.8	0.0	0.0%
South Branch Moose River	--	98.9	--	--	--	184.3	137.0	283.2	98.9	34.9%
Stillwater Reservoir	31.1	--	--	--	--	--	217.2	31.1	31.1	100.0%
Sugar River	--	86.2	--	--	--	97.7	2.9	183.9	86.2	46.9%
Upper Middle Black River	--	--	--	--	--	266.9	150.8	266.9	0.0	0.0%
Upper Black River	--	--	--	--	--	130.6	171.0	130.6	0.0	0.0%
Woodhull Creek	--	--	--	--	--	110.5	47.0	110.5	0.0	0.0%
BLACK RIVER WATERSHED	**206.8**	**527.9**	**25.1**	**53.0**	**0.0**	**1,757.8**	**1,250.8**	**2,570.7**	**812.8**	**31.6%**

1. Impacted stream miles is the sum of the following categories: Impaired, Minor Impact, Need Verification, and Threatened.

Of the 565 streams assessed as part of this survey effort, 66 percent were identified as being prone to acidification levels that are harmful to biota. Of these 66 percent of streams, approximately one-half were likely to be episodically acidified and one-half were likely to be chronically acidified. The WASS also found that macroinvertebrate populations were negatively impacted by acidic deposition in approximately one-half of the sampled streams and that episodic acidification can reduce the size of fish populations and eliminate acid-sensitive species.

Additionally, comparisons between the results of this study and historical data demonstrate that pH values were statistically higher from 2003 to 2005 than during the early 1980s (note that none of the streams sampled in 2003 to 2005 had a lower pH than was identified in the early 1980s). These results suggest that Adirondack streams have not recovered from acidification to the same extent as Adirondack lakes have over the past two decades. In terms of geographic location, most of the streams identified in the WASS as being not at risk of acidification were located along the western edge of the study area adjacent to the Black River valley; streams tend to increase in acidification as one moves eastward into the Adirondacks.



Health advisories restricting the consumption of fish are in effect for a number of lakes within the watershed. The cause of the water quality impairments potentially results from atmospheric deposition. The most frequently cited sources of water quality impairments elsewhere in the basin include agriculture and failing septic systems. Nonpoint source pollution from agricultural operations primarily consists of sediments, nutrients, and pesticides. Such pollution may be reduced significantly through the implementation of farm conservation practices. Point source pollution from agricultural operations primarily comes from animal waste emanating from confined animal feeding operations (CAFOs). Such pollution may be controlled through proper animal waste collection and treatment.

Failing residential septic systems are also a significant source of water pollution in the watershed. Failing systems should be identified, repaired, replaced, or removed. If removed, the wastewater must be captured by another wastewater collection and treatment system.

Additional water quality problems include inadequate or nonexistent municipal wastewater treatment facilities, municipal stormwater sewer systems, combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), Concentrated animal feeding operations (CAFOs), and sylviculture (i.e., tree farms). Inadequate wastewater collection and treatment systems should be upgraded to reduce pollution. Such upgrades also should address existing CSOs and SSOs. Providing new wastewater treatment systems may eliminate the pollution from the failing septic systems. In the past, soil

erosion from various forestry operations has contributed to water quality impairment. Should the demand for lumber increase, the resulting problems from erosion may become significant again.

In terms of synthetic chemicals, a study was conducted in 2007 and 2008 to determine the loading of synthetic chemicals into Lake Ontario from several tributaries in New York, including 18-Mile Creek, the Genesee River, the Oswego River, the Salmon River, and the Black River.[31] Based on the results of this effort, the highest mercury loading rates (i.e., daily, per capita, and per unit area) were found in the Black River, suggesting that the Black River is an important source of mercury to Lake Ontario. Additionally, on March 2, 2010, the U.S. Environmental Protection Agency (USEPA) proposed to add sections of the Black River to the Superfund National Priorities List due to the presence of contaminated sediment in the areas along the Villages of Carthage and West Carthage. More specifically, several recent studies have indicated elevated levels of polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) in the vicinity and downstream of the inactive paper mills, a machine shop, the sewage treatment plant, and the hydroelectric power plant located in these two Villages. This designation would allow the USEPA to investigate the contamination and take those actions necessary to address it.

TROUT WATERS

NYSDEC is responsible for classifying surface waters for their best use, including water supply, swimming, boating, fishing, and shellfishing; as part of this program, NYSDEC also identifies streams as trout waters (T) or suitable for trout spawning (TS). Streams that typically support trout and trout spawning are cold, well oxygenated waters; as water temperatures rise, dissolved oxygen content decreases causing trout populations to decline. As such, NYSDEC has developed dissolved oxygen specifications for those streams classified as trout waters or suitable for trout spawning.

Brook Trout (Salvelinus fontinalis):
Source: Cornell University

Based on data provided by the NYSDEC, approximately 71.3 percent of all stream miles within the Black River watershed are trout waters (T) or suitable for trout spawning (TS) (see Table 2.22 and Map 16).

While 14 of the 19 subwatersheds have more than 55 percent of their total stream miles classified as trout waters, three subwatersheds have less than 20 percent:

- Mill Creek subwatershed – 2.2 miles (2.5 percent)
- Lower Black River subwatershed – 5.5 miles (5.4 percent)
- Middle Black River subwatershed – 33.2 miles (16.4 percent)

See Section 2.6 for a more detailed discussion of the natural history of trout within the Black River watershed.

Table 2.22. Trout Streams

SUBWATERSHED	TOTAL STREAM LENGTH (miles)	TROUT STREAM LENGTH (miles)	PERCENT AS STREAMS
Beaver River	294.9	224.7	76.2%
Crystal Creek	44.5	33.8	76.0%
Cummings Creek	52.6	46.2	87.8%
Deer River	250.3	98.8	39.5%
Fish Creek	52.2	46.2	88.5%
Independence River	198.8	161.9	81.4%
Lower Black River	102.3	5.5	5.4%
Lower Middle Black River	107.6	26.4	24.5%
Middle Black River	202.1	33.2	16.4%
Middle Branch Moose River	346.7	272.1	78.5%
Mill Creek	84.6	2.2	2.5%
Moose River	166.9	144.0	86.3%
Otter Creek	137.3	136.4	99.4%
South Branch Moose River	555.7	524.5	94.4%
Stillwater Reservoir	389.7	341.3	87.6%
Sugar River	163.4	102.0	62.4%
Upper Middle Black River	341.6	199.2	58.3%
Upper Black River	374.8	346.9	92.6%
Woodhull Creek	227.7	172.2	75.6%
Total Black River	**4,093.7**	**2,917.3**	**71.3%**

Source: Water Quality Classifications GIS Data Layer, NYSDEC

NONPOINT SOURCE LOADINGS

In addition to identifying impaired waterbodies using the NYSDEC Priority Waterbodies List, nonpoint source sediment and nutrient loadings were estimated for each of the nineteen subwatersheds using the ArcView Generalized Watershed Loading Function (AVGWLF). Based on generalized watershed loading functions, AVGWLF uses spatial analysis through an ArcView interface to simulate runoff, sediment, and nutrient (N and P) loadings from a given watershed. To account for regional variation in factors included in the model, AVGWLF has been calibrated and verified for watersheds in New York and New England.

More specifically, AVGWLF uses weather data to estimate runoff, which, in conjunction with land cover, soil features, and slope is used to calculate erosion. Based on the resulting erosion calculations, the amount of sediments and nutrients entering the watershed are estimated. Septic system inputs are also estimated. This model also has the ability to include point source and manure inputs to stream nutrients, but these were not implemented for the Black River watershed because of incomplete data. As a result, calculated nutrient loads will be underestimated for those subwatersheds where manure or point-source inputs are a major source of impairment. Additionally,

where one subwatershed is tributary to another (e.g., the Beaver River subwatershed drains into the Middle Black River subwatershed) the model does not include loads from the tributary watershed. Finally, in terms of streambank erosion, AVGWLF uses a fairly general sub-model to estimate this process, so that many site-specific conditions which affect erosion may not be accounted for. Thus, it is likely that the relative importance of streambank erosion to total loading is under-estimated for the watershed.

Thus, estimates represent nutrient loads resulting from processes within each individual subwatershed and not necessarily the total loads carried by each subwatershed. Since, however, the estimates are used to determine priorities for management within each subwatershed, the estimates provided below are appropriate for use in prioritization and for identifying watershed-specific recommendations.

Using the data inputs noted above, AVGWLF provides estimates for the following variables:

- Precipitation;
- Evapotranspiration;
- Runoff flow;
- Groundwater flow;
- Total stream flow (total of runoff and groundwater flows);
- Erosion (strictly soil erosion);
- Stream sediment (sediment originating from bank erosion);
- Sediment (sediment yield, including both soil and bank erosion, and accounting for channel deposition);
- Stream nitrogen;
- Dissolved nitrogen;
- Total nitrogen;
- Stream phosphorus;
- Dissolved phosphorus; and
- Total phosphorus.

For the purposes of this planning process, sediment (per acre), total nitrogen (per acre), and total phosphorus (per acre) were considered the primary metrics for prioritizing subwatersheds. To determine how these loads affect each subwatershed, the results of the total nitrogen and total phosphorous loads for each subwatershed were compared to threshold values developed to identify impaired watersheds in Pennsylvania.[32] The following threshold values were identified:

- Total nitrogen – 3.49 kilograms per acre per year
- Total phosphorous – 0.12 kilograms per acre per year

Subwatersheds with total nitrogen and total phosphorous loads exceeding these values may be at risk of impairment resulting from the problems associated with excess nutrient inputs. Table 2.23 provides the results for the loadings noted above for each subwatershed.

Sediment

Based on the results of the analysis, the highest estimated, scaled sediment loads were realized in the following three subwatersheds:

- Lower Black River subwatershed – 0.036 Megagrams per acre per year (1 Megagram is equal to 1,000 kilograms)
- Lower Middle Black River subwatershed – 0.036 Megagrams per acre per year
- Mill Creek subwatershed – 0.030 Megagrams per acre per year

These results suggest that the highest sediment loads occur in the alluvial, agricultural areas of the Black River subwatersheds, and in Mill Creek, which is highly agricultural. The model also indicates that moderate soil erosion occurs in some of the Adirondack subwatersheds, despite the high proportion of forested lands.

Table 2.23. AVGWLF Model Results – Annual Sediment, Total N, and Total P Loadings

SUBWATERSHED	SEDIMENT LOADINGS (Mg per acre)	TOTAL N LOADINGS (kg per acre)	TOTAL P LOADINGS (kg per acre)
Beaver River	0.012	1.12	0.089
Crystal Creek	0.011	1.40	0.102
Cummings Creek	0.026	0.62	0.088
Deer River	0.011	1.75	0.109
Fish Creek	0.005	0.37	0.058
Independence River	0.008	0.34	0.057
Lower Black River	0.036	3.30	0.218
Lower Middle Black River	0.036	2.68	0.166
Middle Black River	0.020	2.85	0.141
Middle Branch Moose River	0.015	0.37	0.056
Mill Creek	0.030	4.16	0.213
Moose River	0.011	0.40	0.070
Otter Creek	0.011	0.37	0.058
South Branch Moose River	0.020	0.32	0.052
Stillwater Reservoir	0.012	0.32	0.053
Sugar River	0.020	3.73	0.221
Upper Middle Black River	0.028	2.42	0.142
Upper Black River	0.012	0.82	0.087
Woodhull Creek	0.013	0.47	0.067

Total Nitrogen

Since most nitrogen originates as soil erosion, the ranking is similar to that for sediment. The highest estimated, scaled nitrogen loads were realized in the following three subwatersheds:

- Mill Creek subwatershed – 4.16 kilograms per acre per year
- Sugar River subwatershed – 3.73 kilograms per acre per year
- Lower Black River subwatershed – 3.30 kilograms per acre per year

Additionally, comparing the total nitrogen loads for the 19 subwatersheds indicates that the Mill Creek and Sugar River subwatersheds realize loadings in excess of the threshold identified above,

while the Lower Black River subwatershed realizes a total nitrogen load just under the threshold for impairment. While not above the threshold, two additional subwatersheds also realized high total nitrogen loads – the Middle Black River subwatershed (2.85 kilograms per acre) and the Lower Middle Black River subwatershed (2.68 kilograms per acre). The inclusion of point source inputs (e.g., from sewage treatment plants and industrial discharges) in this model would further increase estimated loads of nitrogen.

Total Phosphorous

Total phosphorus levels follows similar patterns as noted above for sediment and total nitrogen, with six subwatersheds realizing total phosphorous loads in excess of the threshold identified above:

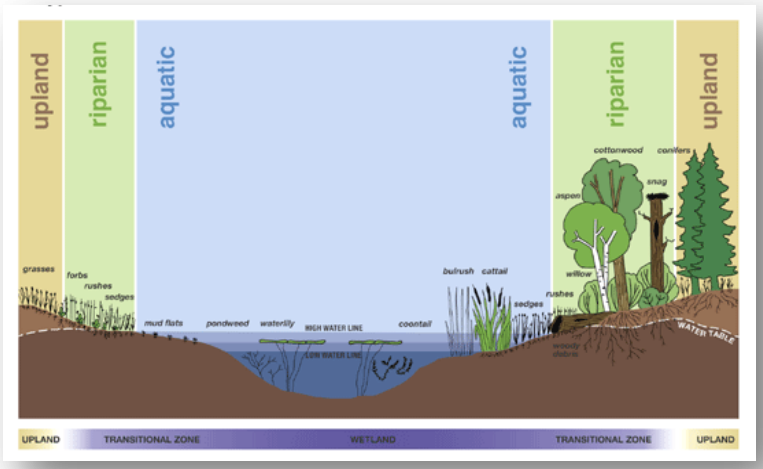
- Sugar River subwatershed – 0.221 kilograms per acre per year
- Lower Black River subwatershed – 0.218 kilograms per acre per year
- Mill Creek subwatershed – 0.213 kilograms per acre per year
- Lower Middle Black River subwatershed – 0.166 kilograms per acre per year
- Upper Middle Black River subwatershed – 0.142 kilograms per acre per year
- Middle Black River subwatershed – 0.141 kilograms per acre per year

2.5.5 Wetlands

Wetlands, defined in terms of their physical geography, are those areas located at the interface between terrestrial and aquatic ecosystems and comprise a wide range of hydrologic and vegetative conditions. Generally, wetland hydrology varies from periodically to permanently inundated, or saturated to the soil surface for a certain time period during the growing season. Wetland vegetation is predominantly comprised of species that are tolerant of anaerobic soil conditions resulting from inundation (i.e., hydrophytes) and includes both woody and non-woody plants.

Wetlands are nature's equivalent of the human kidney – they purify and slow the flow of water off the land, controlling flood water and pollutants.

In addition to providing food and habitat for a wide range of plant and animal species, wetlands also contribute to water quality. By impeding drainage flow from developed land, wetlands can filter out pollutant- and sediment-laden run-off prior to it entering streams, thus improving water quality. [33] Riparian wetlands located along streams and rivers also provide valuable flood protection, acting as storage basins and reducing the amount of downstream flow. This temporary storage of water results in decreased runoff velocities, reduced flood peaks, and delayed distribution of stormflows, all which cause tributaries and main channels to peak at different times.[34] In some instances it has been found that wetlands provide more cost-effective flood control than man-made measures such as reservoirs or dikes.[35]



Typical Wetland Profile
Source: Ducks Unlimited

The New York State Department of Environmental Conservation (NYSDEC) identifies and regulates all freshwater wetlands greater than 12.4 acres in size. The U.S. Fish and Wildlife Service also maps wetland areas through the National Wetlands Inventory (NWI). The National Wetlands Inventory identifies all wetlands, regardless of size and regulatory status, based on a combination of the interpretation of aerial photography and on-the-ground surveys. Additionally, NWI wetlands are classified according to cover type and hydrologic condition (e.g., semi-permanently flooded, palustrine forested wetland). Given the difference in identification methodologies, considerable overlap can occur between those wetlands identified by the NYSDEC and those identified by the NWI. Finally, the MLRC land cover data set also identifies wetlands based solely on the interpretation of aerial photography. This data set provides coverage information for two wetland classifications:

- *Woody Wetlands* – areas where forest or shrubland vegetation accounts for 25 to 100 percent of the cover and the soil or substrate is periodically saturated with or covered with water; and

- *Emergent Herbaceous Wetlands* – areas where perennial herbaceous vegetation (e.g., grasses, sedges) accounts for 75 to 100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

Unfortunately, neither NYSDEC nor NWI wetlands have been completely mapped for the Black River watershed. Thus, to ensure consistency throughout this analysis, MLRC land cover data (2001) was used to determine the amount of wetlands present in the Black River watershed, as well as the 19 subwatersheds (see Table 32 and Map 17).

As is indicated in Table 2.24, approximately 17 percent (212,319 acres) of the Black River watershed comprises wetland habitats, of which the majority are woody (95.5 percent, or 202,869 acres). Within the Black River watershed, three subwatersheds comprise less than 10 percent of their total land area in wetlands:

- Mill Creek subwatershed – 4.5 percent (1,012 acres)
- Sugar River subwatershed – 7.1 percent (3,156 acres)
- Crystal Creek subwatershed – 7.8 percent (1,333 acres)

Table 2.24. Wetland Habitats

SUBWATERSHED	TOTAL ACRES	WETLAND ACRES			WETLAND PERCENT COVER
		WOODY	EMERGENT	TOTAL	
Beaver River	98,761	14,309	365	14,674	14.9%
Crystal Creek	17,085	1,312	21	1,333	7.8%
Cummings Creek	14,212	2,481	10	2,491	17.5%
Deer River	62,270	16,544	546	17,090	27.4%
Fish Creek	14,966	2,119	10	2,129	14.2%
Independence River	61,074	14,012	505	14,517	23.8%
Lower Black River	39,532	4,346	391	4,737	12.0%
Lower Black Middle River	51,985	7,049	804	7,853	15.1%
Middle Black River	81,353	9,094	724	9,818	12.1%
Middle Branch Moose River	94,880	21,654	1,074	22,728	24.0%
Mill Creek	22,512	1,001	11	1,012	4.5%
Moose River	46,711	6,184	157	6,341	13.6%
Otter Creek	42,181	5,688	105	5,793	13.7%
South Branch Moose River	135,713	23,469	796	24,625	17.9%
Stillwater Reservoir	109,992	24,496	2,422	26,918	24.5%
Sugar River	44,732	3,101	55	3,156	7.1%
Upper Middle Black River	102,016	11,377	431	11,808	11.6%
Upper Black River	115,439	21,249	781	22,030	19.1%
Woodhull Creek	62,661	13,384	242	13,626	21.7%
BLACK RIVER WATERSHED	**1,218,075**	**202,869**	**9,450**	**212,319**	**17.4%**

Source: 2001 National Land Cover Data, Multi-Resolution Land Characteristics (MRLC) Consortium

At the opposite extreme, the Deer River subwatershed contains approximately 17,090 acres of wetlands, or 27.4 percent of its total land area. Many of these wetland areas are located in the upper reaches of the watershed, away from the agricultural and urban development associated with the Black River valley. Four additional subwatersheds also comprise more than 20 percent of their total land area in wetlands (these four subwatersheds are located predominately within the Adirondack Park):

- Stillwater Reservoir subwatershed – 24.5 percent (26,918 acres)
- Middle Branch Moose River subwatershed – 24.0 percent (22,728 acres)
- Independence River subwatershed – 23.8 percent (14,517 acres)
- Woodhull Creek subwatershed – 21.7 percent (13,626 acres)

2.5.6 Floodplains

Flooding, a natural and recurring event, results from heavy or continuous rainfall that exceeds the soil's absorptive capacity and the flow capacity of rivers and streams.[36] Once these capacities are exceeded (usually every 1 to 3 years), the waterway overflows its banks and spills into adjacent low-

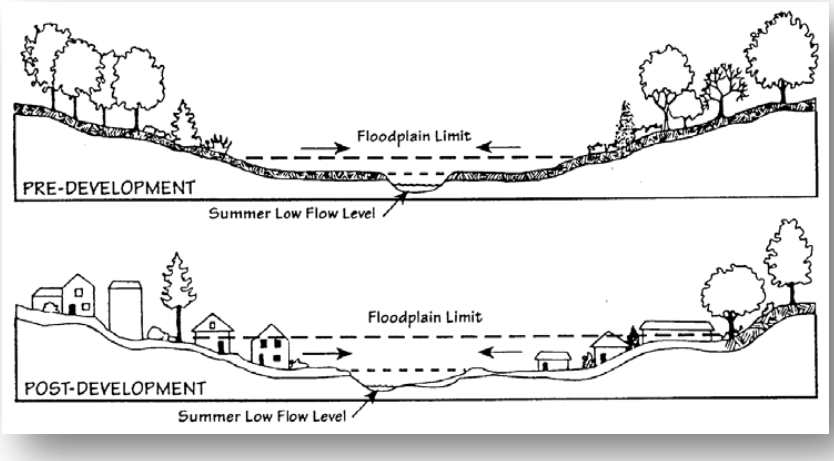
lying areas. Floodplains are these adjacent low-lying areas that are most subject to recurring inundation.

In terms of water quality and watershed management, floodplains provide a number of communal benefits and, as experience has shown, can be far more effective than many man-made structures (e.g., floodwalls, stream channelization) in reducing downstream flood peaks. First, floodplains provide flood and erosion control by storing and slowly releasing floodwaters, thus reducing the depth and velocity of flooding. Floodplain vegetation can also positively impact water quality, trapping sediments and capturing pollutants before they are carried off downstream. Floodplains also provide groundwater recharge by storing floodwaters and promoting aquifer infiltration.

Floods, and floodplains, are generally defined according to their statistical frequency of occurrence. For example, a "100-year floodplain" is an area that is subject to a one percent or greater chance of flooding in any given year. Depending on the degree of risk desired for a given analysis, any other statistical frequency of a flood event may be selected[37] For the purposes of this analysis, 100-year and 500-year floodplains were evaluated.

To determine the locations of floodplains within the Black River watershed, Flood Insurance Rate Maps (FIRMs) were acquired from the Federal Emergency Management Agency (FEMA) for the three of the five counties traversed by the watershed – Herkimer, Jefferson, and Lewis (see Map 18). At this time FEMA has not yet created FIRMs for the majority of Lewis or Hamilton Counties and the data that does exist is not in digital format; thus, floodplains were not mapped for these two counties.

Although this lack of floodplain data prohibits an analysis at the watershed and subwatershed levels, land cover within the 100-year floodplains for those portions of the Black River watershed located in Herkimer, Jefferson, and Oneida Counties are presented in Table 2.25 (see Table 2.4 for a description of each land cover type).



Floodplain development can increase the base-flood elevation
Source: New York State Stormwater Management Design Manual

Table 2.25. Land Cover in 100-Year Floodplains, Black River Watershed, 2001

LAND COVER TYPE	HERKIMER COUNTY		JEFFERSON COUNTY		ONEIDA COUNTY	
	TOTAL ACRES	PERCENT COVER	TOTAL ACRES	PERCENT COVER	TOTAL ACRES	PERCENT COVER
Agriculture	23	0.1%	300	11.7%	36	0.9%
Urban	114	0.3%	469	18.3%	15	0.4%
Barren Land	1,109	3.2%	0	0.0%	0	0.0%
Forest	17,922	52.0%	478	18.7%	1,741	45.4%
Grassland / Shrub	2,532	7.3%	234	9.2%	565	14.8%
Wetlands	12,778	37.1%	1,077	42.1%	1,474	38.5%
TOTAL	34,479	100.0%	2,558	100.0%	3,831	100.0%

2.5.7 Groundwater

Groundwater is often a much misunderstood resource. It provides a source for drinking water to one-quarter of New Yorkers and half of all Americans. Groundwater may be found nearly everywhere on the planet at depths ranging from near or at the surface to very deep below the surface. When rain falls to the ground, some of it runs off down slope into streams, lakes, and other bodies of water. Some of the water is taken up by plants and some of it becomes caught in puddles and evaporates. The remaining water, however, seeps into the ground through the underlying soil material. As water continues its downward journey through the unsaturated zone (ie. the upper part of the soil layer that does not completely fill with water), the water moves through the interconnected spaces between the soil particles or through the fissures in rock until it reaches the saturated zone, located below the water table, where it becomes groundwater.

An aquifer is a geologic formation or stratum containing groundwater in its void spaces and pores that may be removed economically and used as a source of water supply. Generally, two types of aquifers exist –confined and unconfined aquifers. Confined aquifers are those groundwater storage areas sandwiched between two layers of impermeable materials (e.g., clay) that impede the flow of water into and out of the aquifer. These aquifers are also known as artesian aquifers. Unconfined aquifers, however, do not possess an upper confining layer and are instead bounded by the water table. As such, these types of aquifers, especially those located near the surface, are particularly vulnerable to contamination.[38]

As shown in Map 19, aquifers are distributed across the watershed and occur to some degree in each subwatershed. Table 2.26 summarizes the extent of both confined and unconfined aquifers within each subwatershed. It is interesting to note that the single confined aquifer is roughly rectangular in shape. It is just over a mile wide and extends approximately 16 miles underneath the Black River channel and floodplain, predominantly in portions of the Middle Black River and Upper Middle Black River subwatersheds. Note that the *Black River Watershed Groundwater Assessment and Recommendations Report* provides additional details and analyses concerning groundwater within the Black River watershed.

Table 2.26. Aquifers

SUBWATERSHED	CONFINED AQUIFERS (in acres)	UNCONFINED AQUIFERS (in acres)
Beaver River	144	55,132
Crystal Creek	217	14,040
Cummings Creek	-	11,192
Deer River	-	4,949
Fish Creek	-	10,415
Independence River	17	39,326
Lower Black River	-	8,119
Lower Middle Black River	-	17,572
Middle Black River	6,943	22,204
Middle Branch Moose River	-	32,812
Mill Creek	63	3,856
Moose River	-	28,712
Otter Creek	-	25,719
South Branch Moose River	-	47,758
Stillwater Reservoir	-	31,203
Sugar River	-	10,936
Upper Middle Black River	-	43,903
Upper Black River	-	35,121
Woodhull Creek	-	32,539
Total Black River	**11,143**	**475,508**

Source: Unconsolidated Aquifers GIS Data Layer, NYSDEC

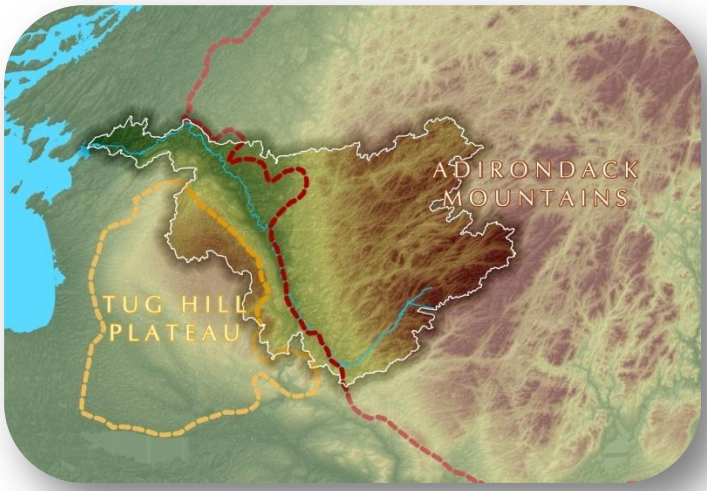
Bedrock formations may also provide a significant source of groundwater supply and are typically less susceptible to contamination. Bedrock aquifers generally are deeper than their confined/unconfined counterparts and, therefore, may require more energy to remove groundwater. Moreover, the more productive aquifers tend to be the more shallow alluvial deposits underlying streams, rivers, floodplains, and lake plains and terraces. These aquifers generally are capable of producing from 10 to 100 or more gallons of water per minute. As shown, the aquifers occupy approximately 486,651 acres or 40 percent of the total watershed area.

Generally, the more productive aquifers consist of unconsolidated deposits of sands and gravels that occupy the larger river valleys or lake plains and terraces. Groundwater in these aquifers occurs under water-table (unconfined) or under artesian (confined) conditions. Municipalities, industries, farms, and individuals historically have built over these aquifers as they typically form relatively flat areas that are suitable for development and often offer an ample supply of groundwater. Such development, coupled with the relatively high permeability of the alluvial deposits (i.e., soil or sediments deposited by a river or other running water) and the shallow depth to the water table, makes these aquifers highly susceptible to contamination from point sources of pollution such as landfills and petroleum storage tanks, as well as nonpoint sources of pollution from both urban and agricultural land uses.

2.6 Vegetation, Fish, and Wildlife

2.6.1 Ecozones and Vegetation

The Black River watershed is located in the rural and remote North Country region of New York State and is situated east of Lake Ontario between the Tug Hill Plateau and the Adirondack Mountains. Covering more than 10,000 square miles, this heavily forested region exhibits a variety of ecological conditions related to differences in climate, topography, dominant vegetation, land cover, soil, geology, and hydrology. These regional differences have been classified into distinct ecological zones (ecozones); the Black River watershed encompasses seven ecozones (there are 25 recognized zones in northern New York) – the Black River Valley, Central Adirondacks, Central Tug Hill, Eastern Ontario Plain, Tug Hill Transition, Western Adirondack Foothills, and the Western Adirondack Transition (see Map 20).[39]



The Black River watershed in relation to the Adirondack Mountains and Tug Hill Plateau

BLACK RIVER VALLEY

This zone consists of low-elevation lands along the floodplain of the Black River and the lower portions of its tributaries. Much of the valley is underlain by limestone. Limestone terraces are well-developed along the western side of the valley.[40] A number of rare plant species occur in limestone fens in this vicinity. The igneous rocks which form the Adirondacks occur along the river channel and much of the eastern side of the valley. Parts of the valley have thick sand deposits formed as glacial outwash. The valley is characterized by its intensive agricultural use, in contrast to abandoned and second-growth agricultural areas of the Tug Hill Transition zone to the west and the Adirondack Transition zone to the east. [41] Much of the Lower Black River, Lower Middle Black River, Upper Middle Black River, and Sugar and Mill Creek subwatersheds are in this zone, as well as lower portions of the Deer River, Crystal Creek, Beaver River, and Moose River subwatersheds.

CENTRAL ADIRONDACKS

This zone consists of portions of the Adirondack Mountains and the associated valley areas. The area consists of various coniferous communities at higher elevations and mixed forests at lower elevations. The area is also characterized by numerous lakes, ponds, and wetlands. The igneous bedrock of the zone leads to low soil fertility and contributes to the formation of acidic bog communities. The high proportion of public ownership in this area is one of its defining characteristics. [42] In the Black River basin, most of the Stillwater, Middle Branch Moose River, South Branch Moose River and Upper Black River subwatersheds are in this zone, as well as upper portions of the Independence, Otter,

and Woodhull Creek drainages. Several biotic communities are characteristic of higher-elevation areas in the Adirondacks (i.e., above approximately 3,000 feet). The Black River basin has little area of these higher elevations, with small areas on Little Moose Mountain within the South Branch Moose River subwatershed and Wakeley Mountain (elevation 3,760 feet) at the boundary between the Black River (South Branch Moose River) and Raquette River drainages.

CENTRAL TUG HILL

The Tug Hill Plateau, formed of sandstones over shale, ranges from approximately 1,500 to 1,900 feet in elevation. The plateau is characterized by high snowfall. The flat terrain and relatively impermeable soils lead to extensive wetland areas. The basic forest vegetation of the plateau is mixed hardwoods and conifers. The plateau also supports agriculture. Much of the plateau drains to the west and south of the Black River basin, but the upper Deer River also lies within the plateau. The headwaters of several creeks in the Middle Black River subwatershed (e.g., Whetstone Creek and Roaring Creek) and of Sugar Creek also reach the central plateau.

EASTERN ONTARIO PLAIN (SUBTYPE OF THE GREAT LAKES PLAIN)

In the Black River basin, virtually all areas in this zone are in the Lower Black River subwatershed. This zone consists of low elevations over limestone bedrock along the Lake Ontario shore. While hardwood forests historically covered much of this area, it now contains large amounts of agricultural land, largely as pastures for the dairy industry. Grasslands and shrublands support several rare species, such as Henslow's sparrow and loggerhead shrike. The Lower Black River subwatershed also includes the primary urban area in the basin – Watertown and its surrounding communities. The underlying limestone bedrock supports unusual communities, such as limestone pavement communities (alvars), a globally-rare group of communities formed on flat areas of exposed, cracked limestone bedrock. Alvar communities occur around Lake Ontario, with one site known within the basin containing calcareous limestone barrens and limestone woodlands. The limestone bedrock also contains caves that support several rare bat species. The mouth of the Black River, along with Black River Bay, is considered a significant waterfowl conservation area because of its importance as a wintering area.

TUG HILL TRANSITION

This zone consists of areas along the edges of the Tug Hill Plateau. Many of its climatic and ecological characteristics are intermediate between those of the Central Tug Hill Plateau and adjacent zones (Lake Ontario Plains and Black River Valley). However, erosion of ravines (e.g., Whetsone Gulf, Deer River gorge) by creeks are characteristic of the transition zone. These gulfs support a variety of unusual communities, such as those associated with wet cliff-faces, talus slopes, and ravine bottoms.

Deer River Gorge

WESTERN ADIRONDACK FOOTHILLS

This zone consists of lower, more rolling hills along the western edge of the Adirondacks. Although it does not contain the high elevation communities of the central

Adirondacks, it supports many similar communities, as well as extensive areas of northern hardwood forests. In the Black River basin, most of the Woodhull, Otter, Independence, Moose, Fish, Cummings, and Beaver subwatersheds are in this zone, as well as substantial parts of the Upper Black River, South Branch Moose River, and Middle Branch Moose River subwatersheds.

WESTERN ADIRONDACK TRANSITION

This zone forms a narrow band between the Western Adirondack Foothills and Black River Valley and is transitional between these zones. This zone is characterized by sandy, low-nutrient soils, ultimately derived from glacial outwash deposits. In the Black River valley, much of this area consists of abandoned agricultural areas (i.e., "sand farms"). Many of these areas were actively reforested with a mix of pine species after acquisition by the state. Extensive parts of the Upper Black River and Crystal Creek subwatersheds are in this zone, as well as parts of all the lower east bank tributaries of the Black River (i.e., Beaver, Fish, Independence, Cummings, Moose, Otter and Woodhull subwatersheds).

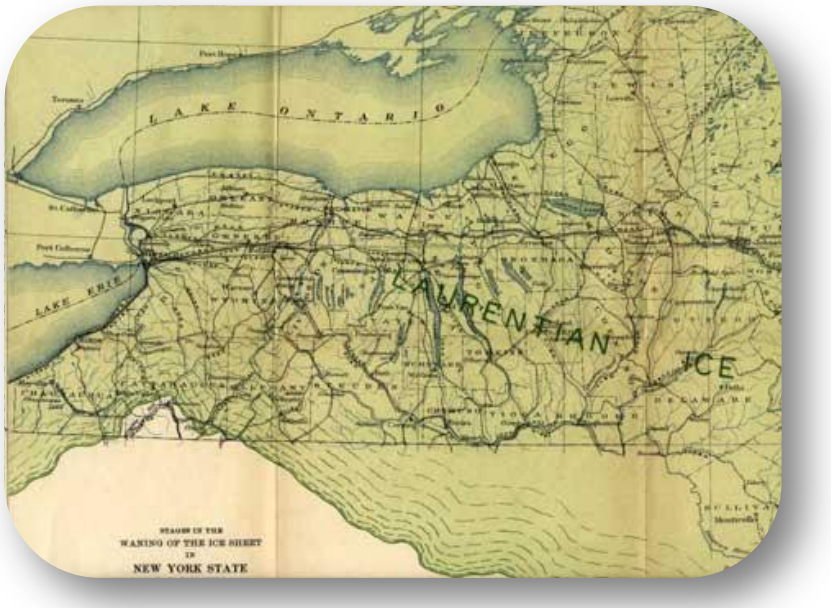
NYSDEC has also developed a classification system for biotic communities based on plant and animal occurrences, which are correlated with local environmental conditions. Communities are defined for terrestrial habitats, palustrine habitats (largely wetland and riparian areas), and lacustrine (lake) and riverine habitats. Some of these communities cover large areas, while others typically occur in small areas of appropriate conditions. For example, much of the basin was originally covered in northern hardwood forests (beech [*Fagus grandifolia*] and sugar maple [*Acer saccharum*] are typical dominants) and coniferous forests (spruce [*Picea* spp.] and balsam fir [*Abies balsamea*] are typical dominants), with a number of other communities in wetlands, floodplains, outwash plains, cliffs and other local habitats. Communities include a variety of natural successional stages, as well as human-maintained communities such as agricultural, suburban, and industrial areas. Some communities, such as the northern hardwood forest, occur in appropriate habitats throughout the basin, while others are typically small, uncommon, and limited to different parts of the basin. The New York Heritage Program maps certain of these ecological communities, many of which support unusual flora and fauna.

2.6.2 Fish and Wildlife

FISH OCCURRENCES

Much of the information regarding historical fish occurrence in the Black River drainage basin is the result of extensive sampling by J.R. Greeley conducted in 1932.[43] Subsequent sampling has been done by the NYSDEC, Cornell University, the American Museum of Natural History, and the Adirondack Lake Survey Corporation (ALSC). In particular, in 2007, NYSDEC completed a review of fishes of the drainage based on new sampling, mostly of the river and streams, and a review of historic data by D. Carlson.[44] Unless otherwise referenced, the following information is from that Greeley's and Carlson's survey reports. Extensive sampling was done in lakes and ponds in the drainage in the 1980's by the ALSC.[45] Subsequent lake and pond sampling was conducted by the USEPA as part of the EMAP program.[46, 47, 48] NYSDEC has also performed repeat sampling of some lakes and ponds as part of the Adirondack Effects Assessment Program.[49]

As the Black River drainage was glaciated as recently as 8,000 to 10,000 years ago[50], fish occurrence is related to both opportunities for colonization and to local habitat and water quality characteristics. The early colonization of basin waterbodies resulted from two general routes. The first route was of mainly northern fishes that were able to move from glacial refugia to formerly glaciated areas by way of post-glacial lakes and drainage patterns that no longer exist. This group includes coldwater species like lake trout (*Salvelinus fontinalus*), which has been restricted to cold lakes, as well as species like brook trout , which eventually occurred in appropriate habitats throughout the drainage. The second route of colonization is characterized by upriver movements from Lake Ontario. This route opened later and many species were blocked by upstream barriers. As a result, a number of species historically occurred mainly below Watertown or a little farther upstream. Several species that are found in Lake Ontario (including Black River Bay) have not been recorded in the river.



Map by Herman L. Fairchild (1909) depicting the maximum extent of the glacier during the latest (Wisconsin) glacial epoch

Forty-two native species have been tabulated in the drainage upstream of the mouth, plus seven species found only at the mouth.[51] All of these were collected in recent sampling, although two species (American eel [*Anguilla rostrata*] and finescale dace [*Phoxinus neogaeus*]) were captured in such small numbers that they were considered essentially extirpated. In addition to species found only near the mouth of the river, a number of other native species were captured at or otherwise known from only a few sites:

- Grass pickerel (*Esox americanus vermicultatus*);
- Brassy minnow (*Hybognathus hankinsoni*);
- Eastern silvery minnow (*H. regius*);
- Blacknose shiner (*Notropis heterolepis*);
- Mimic shiner (*Notropis volucellus*);
- Stonecat (*Noturus flavus*);
- Johnny darter (*Etheostoma nigrum*);
- Logperch (*Percina caprodes*);
- Round whitefish (*Prosopium cylindraceum*); and
- Summer sucker (*Catostomus utuwana*).

Two additional native species were discovered in the recent sampling.

The opening of the Black River Canal provided an additional path for immigration of fish from the Mohawk drainage into the Black River upstream of Watertown. At least one species, the satinfin shiner (*Cyprinella analostana*), probably entered the drainage via the canal. In addition, a number of species have been introduced into the drainage, many of which are native to New York. Some of these are found downstream in the Lake Ontario drainage, (e.g., lake whitefish [*Coregonus clupeiformis*], hornyhead chub [*Nocomis biguttatus*], green sunfish [*Lepomis cyanellus]*), while others are found in the Mohawk Drainage, as well as many mid-Atlantic drainages (e.g., margined madtom [*Noturus insignis])*. Others are exotic to the region, such as brown trout (*Salmo trutta*) and common carp (*Cyprinus carpio*), which are native to Europe, and the rainbow trout (*Oncorhynchus mykiss*), sockeye salmon (*O. nerka*) and chinook salmon (*O. tshawytscha)*, which are native to western North America. Additionally, many species have been introduced upstream of barriers into parts of the drainage where they were not native (e.g., the Atlantic salmon [*Salmo salar*], central mudminnow [*Umbra limi*], fallfish [*Semotilus corporalis*], northern hog sucker [*Hypentelium nigricans*], channel catfish [*ctalurus punctatus]*, banded killifish [*Fundulus diaphanous*], bluegill [*Lepomis macrochirus*], black crappie [*Pomoxis nigromaculatus*], and walleye [*Sander vitreum*]). The native range of some sport species in the drainage, such as chain pickerel *(Esox niger*), smallmouth bass (*Micropterus dolomieu*), and largemouth bass (*M. salmoides*), is poorly known. Many of these species were introduced as sport species, while others may have been introduced as bait bucket releases. Some species, such as fallfish (*Semotilus corporalis*) and walleye (*Sander vitreum*) are now relatively common in the main stem of the Black River.

Introductions of fish species have had major effects on lakes. Many lakes originally contained a fish fauna that included brook trout, suckers (*Catostomus* spp.), slimy sculpin (*Cottus cognatus*), and various species of minnow such as northern redbelly dace (*Chrosomus eos*) . Species such as yellow perch (*Perca flavescens*), golden shiner (*Notemigonus crysoleucas*) and smallmouth bass (*Micropterus dolomieu*) are now common in many lakes, with decreases in the abundance of the formerly-common species. Walleye, largemouth bass, rainbow smelt (*Osmerus mordax*), and northern pike have also been widely introduced into lakes in the drainage basin.

Appendix 2, Table 24 provides a breakdown of fish records by subwatershed.[52] The breakdown is based on historical and recent collections by NYSDEC and others, and tabulates introductions and upstream extensions of range of fish species. Table 24 provides a breakdown of fish records by subwatershed. Many of these are coincident with the subwatersheds used in this plan, although subwatersheds within the Moose River (Middle Branch, South Branch, and Moose) subwatersheds were not broken out and different divisions of the main Black River drainage were used. These records depict 32 and 45 species in the two lower reaches of the Black River, 25 to 35 species in the larger, more-heavily sampled subwatersheds (Beaver, Moose, Mill, and Deer), and 11 to 18 species in smaller, less-heavily sampled subwatersheds. Few or no samples were taken in the Stillwater Reservoir, Fish Creek, and Cummings Creek subwatersheds.

In order to provide specific data on the subwatersheds recognized in the plan, recent fish data were obtained from NYSDEC and sample sites were identified within the subwatersheds. In addition, new samples were taken by ANS in some of the poorly-sampled watersheds or portions of subwatersheds. Totals of fish species by subwatershed (Appendix 2, Table 25) show combined numbers of fish

reported in the recent data and the ANS collections. Because of limited access, most of the Adirondack subwatersheds are under-sampled.

The Lower Black River subwatershed is notable for occurrence of species not found upstream of Dexter or Watertown, such as sea lamprey (*Petromyzon marinus*), lake sturgeon (*Acipenser fulvescens*), longnose gar (*Lepisosteus osseus*), bowfin (*Amia calva*), gizzard shad (*Dorosoma cepedianum*), quillback (*Carpiodes carpio*), white perch (*Morone americana*), sockeye salmon, and chinook salmon. As noted above, many species once restricted to the lower part of the drainage are now more widely distributed. Philomel Creek, a tributary of the Black River located in the Lower Black River subwatershed, has characteristics similar to other Lake Ontario streams and contains, or did contain species several rare species such as brassy minnow and finescale dace.

Chinook salmon caught in the nearby Salmon River; this same fish is also found in the Black River
Source: NYSDEC

The Black River from Lyons Falls to Carthage, located in the Lower Middle, Middle, and Upper Middle Black River subwatersheds, provides low gradient riverine habitat for a number of species. In addition, swamps, wetlands, and ditches within the floodplain of the river provide spawning and nursery areas for chain pickerel, northern pike, and probably burbot (*Lota lota*). Within the overall Black River basin, the common carp and spottail shiner *Notropis hudsonius*) are found primarily in the main stem. The burbot occurs in the Black River and associated tributary mouths; burbot have also been reported near the mouth of the Black River. Walleye and smallmouth bass are important recreational species. Chain pickerel and northern pike have fluctuated in relative abundance, with chain pickerel more common in recent surveys.[53] The eastern silvery minnow has also been recorded only in the Black River (above Carthage and below Dexter), and the satinfin shiner occurs mainly in the Black River and lower parts of tributaries.

A few species were found only or mainly in streams draining the Tug Hill Plateau (e.g., in Deer River, Mill Creek, and Sugar Creek). These include blacknose shiner (found at one site in Deer Creek and known from other Tug Hill tributaries outside the Black River drainage), pearl dace (*Margariscus margarita*), and redside dace (*Clinostomus elongatus*).

Several species, such as fathead minnow (*Pimephales promelas*), bluntnose minnow (*P. notatus*), tesselated darter (*Etheostoma olmstedi*), brown bullhead (*Amieurus nebulosus*), and longnose dace *(Rhinichthys cataractae*) are found mainly in small streams at lower elvevations, which would include tributaries of the various Black River subwatersheds, as well as the lower parts of most of the other subwatersheds. The tesselated darter and longnose dace may occur at moderate elevations (e.g., greater than 1,500 feet).

A variety of species are widespread in areas of the Adirondacks not impacted by acidification or flow regulation. These include brook trout (*Salvelinus fontinalis*), brown trout (which has replaced brook trout in many areas), cutlip minnow (*Exoglossum maxillingua*), common shiner (*Luxilus cornutus*), and creek chub (*Semotilus atromaculatus*). The brook trout was not recorded in several of the Adirondacks watersheds. The absence probably reflects poor sampling coverage, particularly of remote areas. However, it could also reflect effects of acidification.

The longnose sucker (*Catostomus catostomus*) is a coldwater species that was widespread in the Adirondacks and other streams in the drainage. It is less common now, although it occurs in the Adirondacks and a few other streams. The lake chub (*Couesius plumbeus*) was also widespread in the Adirondacks, although recent records are mainly from the Upper Black River and Woodhull Creek subwatersheds. The lake chub is less sensitive to acidification than many other species.

Many shallow ponds and lake shallows contain species similar to their associated river and stream systems. These areas, however, have been heavily affected by the introduction of sport and other species and by acidification. The lake trout (*Salvelinus nemaycush*) typically occurs in deep, cold lakes in the region. It is still found in many lakes, though populations in some areas are sustained by hatchery supplementation. The round whitefish was known in more lakes in the Black River watershed than any other New York watershed. Currently, Little Moose Lake has a native population and round whitefish have been introduced into four other lakes. A heritage (i.e., native) strain of brook trout was identified in Horn Lake and Windfall Pond. Genetic analyses of brook trout in other areas may reveal other sites with heritage strains. The NYSDEC has developed an initiative to identify, protect, and manage brook trout stains in the state. Other local races of brook trout may have been extirpated or swamped by hybridization with stocked trout.

REPTILE AND AMPHIBIANS

New York State conducted a herpetological atlas project that mapped reptile and amphibian presence on topographic maps coincident with USGS 7.5' topographic sheets.[54] Occurrence of species within the Black River drainage can be determined from these maps, although the precise occurrence of species in or near the boundaries of the drainage cannot be distinguished.

A few species occur throughout the drainage – redback salamander (*Plethodon cinereus*), green frog (*Rana clamitans*), bullfrog (*Rana catesbiana*), spring peeper (*Hyla crucifer*), American toad (*Bufo americanus*), and common garter snake (*Thamnophis sirtalis*). Among the remaining species there exists a general elevational gradient of occurrence in the Black River drainage basin. A number of species, such as the western chorus frog (*Pseudacris triseriata*), northern water snake (*Nerodia sipedon*), brown snake (*Storeria dekayi*), smooth green snake (Opheodrys *vernalis*), and eastern milk snake (*Lampropeltus triangulum triangulum)* occur primarily in lower areas along the Black River. The northern dusky salamander (*Desmognathus fuscus*), mountain dusky salamander (*D. ochrophaeus*), and mink frog (*Rana septentrionalis)* occur mainly at higher elevations in the Adirondacks and/or on the Tug Hill Plateau. The mink frog is a northern species that is found in Canada, northern New England, the Adirondacks, and the Tug Hill Plateau. It occurs on the edge of the Black River drainage on the Tug Hill Plateau and there are records of the mink frog in several blocks in the eastern part of the drainage.

Several species of frog and salamander breed in shallow ponds. Survival is highest in ponds without fish and in vernal ponds, which are dry for much of the year and provide important habitats for these

species. Recruitment from ponds with fish is much lower. Due to the greater area of ponds with fish, however, ponds with fish can contribute significantly to the maintenance of these species. Tadpoles of green frog and bull frog are apparently distasteful to fish and these species occur commonly in streams and lakes with fish.

MAMMALS

Local faunal information on mammals was obtained from *The Mammals of the Tug Hill Plateau, New York* and *Adirondack Mammals*.[55, 56] State harvest records also provide information on sport and fur species.[57] As with most of the faunal groups, mammal distributions reflect ecological conditions shaped by climate, geology and topography, and modified by existing land use and vegetational succession from former land uses. Many species of mammals were locally extirpated and current distribution reflects the dynamics of recolonization. The abundance and distribution of some species, such as moose (*Alces alces*) and fisher, continues to change.

As a result of intensive fur trapping efforts, beaver (*Castor canadensis*) was extirpated through most of the northeastern United States. By 1640, beavers were extirpated from virtually all of New York State.[58] In 1900, a few beaver occurred in the Adirondacks outside of the Black River drainage. Beavers were re-introduced to several locations from 1902 to 1910, including areas around the Fulton lakes, Big Moose Lake and the South Branch of the Moose River. Beavers have expanded into the entire drainage basin in response to reintroduction efforts. Beaver trapping was reinstated in 1924 and the harvest has generally increased since, with large fluctuations in catch. Beaver have major effects on vegetation and aquatic habitats; beaver dams increase shallow pond habitats and may affect sedimentation and channel erosion. As a result, the extirpation and re-introduction of beavers is likely to have had major effects on other organisms. Moose, for example, were extirpated from the state by the middle of the 19th Century. From 1935 to 1980, there were occasional records of moose in the Adirondacks, presumably of individuals wandering from populations in Canada and New England. With the increase in the beaver population, more moose habitat has been created within the basin, which has potentially resulted in an ever increasing moose population (moose have been recorded at a number of sites in Hamilton, Herkimer, and Lewis Counties).

White-tailed deer (*Odocoileus virginianus*) are found throughout the drainage and deer hunting is been economically important to the region. Deer populations increased along with early successional vegetation in the Adirondacks following logging of mature forests. This increase, combined with rarity or extirpation of deer outside the Adirondacks, made the area famous as a deer hunting destination. Up to about 1970, deer harvest rates (i.e., the number of deer taken per square mile) were higher inside the Adirondacks than out. Since then, maturation of forests has decreased deer populations within the Adirondacks, while populations outside have increased due to deer management, land use, and possibly climate change. Recent deer harvests (1986 to 2000), however, have been greater outside the park than within. Despite the increase in deer harvest in Jefferson and Lewis Counties, harvest rates are still lower than those in the southern part of the state.[59]

Historically within the basin, carnivorous mammals were killed for fur and to reduce losses of livestock and game species. Mountain lion (*Felis concolor)* and gray wolf (*Canis lupus)* were last recorded in New York in 1894 and 1899, respectively. Fisher (*Martes pennanti*) and marten (*M.* Americana) were reduced to small areas in the central Adirondacks, and the species were provided State protection in the 1930's. Since then, both species have increased in numbers. While the fisher prefers extensive areas of forest, it can use a variety of forest types and has expanded widely in

White-tail deer are found throughout the Black River watershed

southern Canada, New York, and New England. Coyotes (*Canis latrans*) have also expanded into the northeast, becoming established in northern New York by about 1950 and now widely established in the region.

As with most of the faunal groups, there are differences in distribution of mammals between the lower elevations (Black River valley) and higher elevations (Tug Hill Plateau and Adirondacks). For example, the opossum (*Didelphis marsupialis*), gray fox (*Vulpes cineroargenteus*), southern flying squirrel (Glaucomys volans*)*, gray squirrel (*Sciurus carolinensis*), and Eastern cottontail (*Sylvilagus floridanus*) occur primarily at lower elevations. The first two of these are relatively recent immigrants to the region. In addition to some of the mammals discussed above, bobcat (*Felis rufa_*, water shrew (*Sorex palustris*), northern flying squirrel (*G. sabrinus*), and rock vole (*Microtus chrotorrhinus*) occur primarily at higher elevations.

BIRDS

Breeding bird surveys were conducted from 1980 to 1985 and from 2000 to 2005, providing recent status and trend information.[60] The breeding bird surveys are conducted by volunteers in relatively small blocks. Occurrence in blocks is classified as confirmed, probable, or possible. Each block survey is not exhaustive, with more rare species potentially not being detected. The surveys supplement extensive general and regional studies of species present in the drainage. Additional information on wintering birds is available from Christmas Bird Counts. As with many groups, the distribution of breeding birds follows the general zonation of the region, ranging from the river mouth and Black River valley through to the Central Adirondacks and Tug Hill Plateau. These distributional patterns reflect both climatic and topographic variation, as well as current land uses. Agricultural areas, primarily located in the Black River valley, now support a variety of open country birds.

Several general distributional patterns of breeding bird populations can be identified within the Black River drainage basin. Approximately 20 species are found throughout the drainage, including common, resident woodland birds (e.g., Downy woodpecker, Black-capped chickadee, White-breasted nuthatch, and Blue jay), summer residents of deciduous forests (e.g., Red-eyed vireo, Scarlet tanager, Rose-breasted grosbeak, least flycatcher, and several species of warblers), and common

eastern birds such as the Eastern robin, Common yellowthroat, and Song sparrow. An additional 20 species may breed only or mainly near the mouth of the Black River; these species are marsh-breeders (pied-billed grebe, several herons, Canada goose, ducks, coots, rail, and marsh wren). Blue-winged, golden-winged and prairie warblers prefer low, open woods and shrublands. Several predominately southern species, such as red-bellied woodpecker, Eastern mockingbird, and orchard oriole, occur along the edge of Lake Ontario; the range of these species has expanded northward and these species may have colonized the drainage relatively recently. Some of these species may breed just outside the drainage (e.g., in marshes around Black River Bay).

Approximately 25 species of birds breed primarily along the Black River valley from its mouth upstream. Most of these species are typical of agricultural areas, grasslands, savannahs, and early successional habitats. This group includes hawks (e.g., Northern harrier, Red-tailed hawk), several swallows, several sparrows, killdeer, Eastern bluebird, horned lark, bobolink, Eastern meadowlark, and brown-headed cowbird. An additional 20 to 25 species occur frequently throughout much of the western part of the drainage (including much of the Black River valley and Tug Hill Plateau), but are uncommon to rare in the eastern part of the drainage. Some of these species may be absent from much of the Adirondacks, while others may be absent only from the eastern-most part of the drainage.

In contrast to these groups found mainly in the western or lower elevation portions of the drainage, many species are widespread in the Adirondacks and Tug Hill Plateau and much less frequent or absent in the Black River mouth and valley. Most of these species (e.g., winter wren, Swainsons thrush, brown creeper, red-breasted nuthatch, and several species of warblers) are typical of northern, coniferous woods. A few (e.g., parula warbler and broad-winged hawk) occur in wooded areas throughout the eastern US. Another group of northern species occur almost entirely in the Adirondacks, including some waterbirds (e.g., Ring-necked duck). This group also includes boreal species, which occur in the East only in the higher mountains of New England and in the Adirondacks. Because of their limited range in the region, apparent declines in several species, and likely sensitivity to climate change, these species are of considerable conservation interest. Several of these are classified as Species of Special Concern in New York State (see below for a more detailed discussion of endangered, threatened, and rare species). This group includes the spruce grouse, gray jay, boreal chickadee, black-backed woodpecker, three-toed woodpecker, Bicknell's thrush, blackpoll warbler, and rusty blackbird. New York State has designated an Adirondack Sub-alpine Forest Bird Conservation Area (BCA), comprising Adirondack peaks over 2,800 feet in elevation with dense (stunted or early successional) balsam fir and/or red spruce vegetation, to sustain Adirondack populations of the Bicknell's thrush, as well as Swainson's thrush and Blackpoll warbler. Wakely Mountain, on the edge of the Black River drainage, is specifically

Spruce grouse occupy boreal habitats in the drainage

included in this area. The status of other potentially qualifying sites in the drainage (e.g., Big Moose Mountain) that are not specifically listed is unclear. The main goal of the BCA is to sustain the wilderness quality of these areas, provide suitable habitat for the bird species of concern, and facilitate recreation where it is compatible with the aforementioned objectives. Some known areas for the boreal birds in the Black River basin are included in New York State forests, such as the Moose River Plains.

A few species share different distributional patterns than those previously discussed. Several species (e.g., white-throated sparrow, pine wabler, northern waterthrush, and mourning warbler) occur primarily on the Tug Hill Plateau and within the central Black River valley and parts of the Adirondacks Transition zone (the white-throated sparrow breeds in the Adirondacks, as well).This pattern may reflect preferences of these species for early successional thickets, woods, and pine forests. These habitats may be most common in abandoned agricultural areas and pine reforestation areas in the central part of the drainage basin.

Breeding records of Yellow-throated vireo and Goshawk occur mainly on the Tug Hill Plateau. Three species of ducks (Common merganser, American black duck, and wood duck) were recorded mainly near the mouth of the river and in the Adirondacks, presumably reflecting occurrence of suitable riverine and pond habitats. A number of other species were recorded only a few times (often unconfirmed breeding records), so definitive statements about distribution cannot be made.

2.6.3 Endangered, Threatened, and Rare Species

To ensure the continued viability of certain species of fish, wildlife, and plants, federal and state laws have been enacted that identify and manage species threatened with extinction. In New York State, these species are classified as either endangered, threatened, or species of special concern:

- Endangered species include "any species of fish, shellfish, crustacea, wildlife or plant designated by NYSDEC that are native species in imminent danger of extirpation or extinction in New York; or are listed as endangered by the USFWS in 50 C.F.R. §§ 17.11-17.12".[61]
- Threatened species include "any fish, shellfish, crustacea, wildlife or plant species that are native species likely to become an endangered species within the foreseeable future in NY; or are listed as threatened by the USFWS in 50 C.F.R. Part 17.11-17.12".[62]
- Species of Special Concern are those species that "warrant attention and consideration but current information, collected by the department, does not justify listing these species as either endangered or threatened".[63]

Notes on some of the endangered, threatened, and species of special concern are included below.

ENDANGERED SPECIES

Round Whitefish (*Prosopium cylindraceum*). The round whitefish has endangered status in New York State. The round whitefish has been extirpated from many lakes in the watershed. A native population occurs in Little Moose Lake, and the species has been introduced into four other lakes.

Short-eared owl (*Asio flammeusi)*. The short-eared owl is endangered in New York. The breeding bird atlas shows one site for short-eared owl, probably just outside the Black River drainage. The Heritage database shows one site in the Lower Black River subwatershed.

The endangered short-eared owl

Golden eagle. The golden eagle has endangered status in New York State, although it is considered extirpated as a breeding bird in the State. The last known nesting area was in the Black River drainage.

Black tern.The black tern is endangered in New York State. Black terns breed in marshes around eastern Lake Ontario. Black River Bay is listed as a site for the species, but the Black River drainage is not considered habitat for the species.

Indiana Bat *(Myotis sodalis)***.** The Indiana bat is endangered in New York State and is Federally endangered as well. Although knowledge of its distribution is limited, data provided by the NYS Natural Heritage Program identifies four sites of occurrence in the Lower Black River subwatershed. While several of these sites are cave hibernation sites, summer maternity sites are also known. Undocumented foraging and roost sites are likely, since these sites are best located by radiotelemetry.

Loggerhead shrike (*Lanius ludovicianus)*. The loggerhead shrike is endangered in New York State. There are records of the loggerhead shrike in the Lower Black River and Upper Middle Black River subwatersheds of the drainage. The loggerhead shrike occurs in grasslands or fields with some shrubs or in open shrublands. The decrease of the shrike in the Northeastern United States has been attributed to the loss of grasslands and early successional habitats and more intensive farming practices which decrease shrubby cover near agricultural areas. No loggerhead shrikes were reported within the drainage in the latest breeding bird survey.

THREATENED SPECIES

Lake sturgeon (*Acipenser fulvescens*). The lake sturgeon is threatened in New York State. The lake sturgeon occurs in the mouth of the Black River up to the Dexter Dam. The Black River was a spawning site for lake sturgeon, and recent observations of sturgeon in rapids in the Black River indicate that the sturgeon probably still spawns in the river.

Blandings turtle (*Emys blandingi)*. This turtle has threatened status in New York State. The New York Natural Heritage Program lists a potential site of occurrence in the Lower Black River and/or the Lower Middle Black River subwatersheds. The herpetology atlas shows two records in or near the Lower Black River subwatershed; one of these is probably the same area as the Heritage program site.

SPECIES OF SPECIAL CONCERN

Brook trout (*Salvelinus fontinalis*). A heritage brook trout strain has been identified in Horn Lake and Windfall Pond. Other heritage strains may exist in the drainage.

Summer sucker (*Catostomus utuwana*). The summer sucker was described as a distinct species from a tributary of Big Moose Lake. It was subsequently considered to be a form of white sucker. Recent studies indicate that it is a distinct species.[64] The species is endemic to the Adirondacks. The species is known from Squaw Lake and tributary streams. As such, it is a major conservation priority for the Black River drainage. However, until its redescription is published, it cannot receive formal state or Federal designation as an endangered or threatened species.

Burbot (*Lota lota*). The burbot is present in the Black River between Carthage and Lyons Falls. The burbot also occurs in Lake Ontario. The burbot is not listed as a species of concern in New York State. However, the burbot's life history and requirement of relatively large, low gradient, cool water makes it vulnerable to climate warming. Riverine populations are at particular risk, and inland populations have special status in Pennsylvania and Connecticut.

Bluespotted salamander (*Ambystoma jeffersonianum).* The bluespotted salamander is a species of special concern in New York State. There are a few records in the herpetology atlas near the mouth of the Black River.

Wood turtle (*Clemys insculpta).* The wood turtle is a species of special concern in New York State. The herpetology atlas shows about six records scattered throughout the Black River drainage.

Common loon (*Gavia immer*). Common loons occur on a number of lakes in the Adirondacks. Major concerns for the common loon are acidification (eliminating fish prey in lakes), bioaccumulation of mercury, lake level fluctuations, and ingestion of lead (on breeding and wintering grounds).

Bicknell's thrush (*Catharus bicknelli*). Bicknell's thrush breeds in shrubby spruce-fir forests mostly above 2,900 feet in elevation. It occurs in Quebec, Maine, the White Mountains of New Hampshire, the Green Mountains of Vermont, and in the Adirondacks. There is one record of Bicknell's thrush on or just across the boundary of the South Branch Moose River subwatershed.

Golden-winged warbler (*Vermivora chrysoptera*). The golden-winged warbler inhabits shrubby habitats in the northeastern US. Its abundance has decreased with the decrease of early successional habitats. The blue-winged warbler has expanded its range into that of the golden-winged warbler during the last century. Genetic swamping of golden-winged warbler due to hybridization with the blue-winged warbler is considered a major cause of its decrease in areas which still contain suitable habitat.

2.6.4 Invasive Plants and Animals

Invasive plants and animals pose a threat to native species and ecosystems by predation, competition, disease transmission, and hybridization. Invasive species may be resistant to diseases that are highly virulent to native species and may actually be carriers of these diseases. For example, several important diseases of native trees have been introduced by cultivation of closely related non-

native species. Hybridization between native and non-native taxa (i.e., varieties, other closely related species.) may have demographic and genetic effects on species.

TERMINOLOGY

A variety of terms, such as invasive, exotic, and alien, are in common use for non-native species, often with overlapping or contradictory meanings. The following meanings are used in this report:

Non-native. A general term for a taxon that does not occur naturally in a region. A large number of non-native species have been established for a relatively long time. For example, many European plants arrived with early modern settlement of the area and are now common, familiar elements of many ecological communities. Nonindigenous is considered synonymous with non-native.

Exotic. A taxon introduced from outside North America.

Adventive. A taxon that is non-native, but which has immigrated into the region without direct introduction. However, introduction may have been facilitated by human activities (e.g., dispersal along roads and railroad tracks) and establishment may be favored by human-caused changes in habitat.

Invasive. The New York State Invasive Species Task Force defines an invasive species as one that is "1) 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."[65] While many species are clearly invasive in terms of distribution, there is subjectivity in classification of less dominant non-native species.

NON-NATIVE SPECIES

Most discussions of invasives focus on species, but forms at lower levels (e.g., subspecies, varieties, races) may have impacts on native conspecifics, and non-native forms may have different ecological effects. For example, the common reed (*Phragmites australis)* is a native species, naturally occurring along marsh edges. A European genotype of common reed, however, is considered invasive, forming dense, mono-specific stands in a variety of damp habitats.[66] The Canada goose (*Branta canadensis*) is native to New York, but didn't breed in the state until introduction of non-migratory forms in the 1930's and 1940's.[67] Resident Canada geese may become nuisances, with significant effects on riparian vegetation and aquatic ecosystems.

Eradication of well-established, non-native species is often difficult or essentially impossible. Local control of these species may be done where they have the greatest ecological or economic effects. Prevention of introduction or early eradication of potentially-occurring species may be feasible. A number of aquatic plants and animals colonize new waterbodies by being held in residual water (e.g., bilge water, etc.) or attached to boats, trailers, or other equipment. Thorough cleaning and drying of equipment can prevent such transport and is critical in reducing spread of several species. A number of species, including fish, crayfish and earthworms, have been introduced via bait bucket release, and disease may be transmitted by bait fish.

Newly introduced exotic species are typically not included in standard regional floras and faunas, and the taxonomic status of newly-encountered forms is often uncertain. Ranges of many non-native

species can change rapidly. As a result, websites of several agencies are important in providing information on identification, impacts and control techniques. These include:

- The National Invasive Species Council (USDA): *http://www.invasivespeciesinfo.gov/*
- New York Sea Grant, Aquatic Invasive Species: *http://www.nysgextension.org/ans/anspages/NYSGAIS.htm*
- USGS nonindigenous aquatic species: *http://nas.er.usgs.gov/*
- St. Lawrence Eastern Lake Ontario PRISM *http://www.sleloinvasives.org/*
- Adirondack Park Invasive Plant Program: *http://www.adkinvasives.com/*
- New York State Invasive Species Task Force: final report at *http://www.dec.ny.gov/docs/wildlife_pdf/istfreport1105.pdf*
- National Biological Information Infrastructure invasive species node: *http://invasivespecies.nbii.gov/index.html*

EXOTIC SPECIES

A large number of exotic species occur in the Black River drainage basin. The range of taxa, from diseases to vertebrates, indicates the wide range of potential impacts from invasive species. The following are a few that are particularly significant to this watershed management plan:

Giant hogweed (*Heracleum mantegazzianum*). Giant hogweed was introduced as an ornamental plant and has become established in New York State, including the Black River drainage area. It is capable of forming dense cover in riparian areas where it may shade native species and increase bank erosion. Sap of giant hogweed causes photodermatitis in people. Cutting is usually effective at controlling small infestations of giant hogweed but does increase risk of skin contact with sap. Giant hogweed is on the US Federal noxious plant list. The NYS Department of Environmental Conservation maintains a Giant Hogweed Hotline 1-518-256-3111, maintains a small staff to coordinate herbicidal and mechanical control, and posts information on giant hogweed at http://www.agmkt.state.ny.us/nys_ghw_broch.pdf.

Giant hogweed is an invasive plant that can be harmful to humans
Source: NYSDEC

Purple loosestrife (*Lythrum salicare*). Purple loosestrife has escaped from cultivation and become invasive over much of the northeastern United States. Purple loosestrife can be a dominant plant in many wetland communities. The ecological importance of wetlands and occurrence of many rare, native species in wetlands increases the potential damage of the species and also impedes the use of herbicide control. Biological control of purple loosestrife has been developed and successfully used in the northeast (e.g., Connecticut and Illinois). There have been a number of studies concerning the ecological impacts of purple loosestrife, demonstrating mixed effects.[68,69,70]

There is evidence that native generalist herbivorous insects feed on purple loosestrife, which may reduce its invasiveness.

Garlic mustard (*Allalaria petiolaris*). Garlic mustard is a biennial herb which can achieve high densities, particularly in disturbed situations. It has chemical (allelopathic) effects on other plant species. Garlic mustard is known along roads in several areas of the Black River drainage in the Adirondack Park.[71]

Japanese knotweed (*Polygonum cuspidatum*). Japanese knotweed is a perennial herb that has spread from cultivation throughout the northeastern US and Canada. It forms dense patches, which spread vegetatively, and the species can also spread by seeds.[72] Japanese knotweed forms a large rhizome. These rhizomes can form numerous new shoots, and the rhizome can regrow from fragments. As a result, cutting or hand removal is usually ineffective, and herbicide control has been the most effective control technique. Japanese knotweed can dominate riparian zones and occurs in more upland habitats, as well as along road and railroad banks. Japanese knotweed was one of the more commonly found exotics along roads in the Black River drainage area.[73]

Common reed (*Phragmites australis*). The exotic genotype of the common reed can form dense, monospecific stands in marsh areas and other damp areas. It is often considered to form poor cover for waterfowl and other organisms and to reduce density of native aquatic plants. Most studies of impacts of common reed have been done in freshwater and brackish tidal marshes (Fell, et al. 2003, Lathrop, et al. 2003, Weis and Weis 2003).[74, 75, 76] These studies have found that marshes dominated by common reed still support aquatic biodiversity and ecological functions. However, the common reed may reduce the complexity of topography of the marsh surface, which could have significant effects on marsh ecology. Common reed is difficult to control, and herbicide may be the most effective technique. Common reed has been documented in settled areas in the Adirondacks. [77]

Common buckthorn (*Rhamnus cathartica*). Common buckthorn is a tree or shrub native to Eurasia. It is widely established in the northeast and is common in parts of the Black River drainage. It often occurs on alkaline soils of a variety of moisture conditions.[78] The Canadian Shield may be a barrier to its occurrence in the north.[79] Therefore, it may be an important invasive in the Black River valley, but is unlikely to become invasive in the Adirondacks. Recent surveys found buckthorns *(Rhamnus cathartica* and/or *R. frangula*) only in the northwest corner of the Park.[80]

Eurasian water milfoil (*Myriophyllum spicatum*). This milfoil is an aquatic plant which has become widely established throughout the northeastern US, including New York State. It forms very dense patches which interfere with boat traffic and may affect native plants, such as the state-threatened Farwell's watermilfoil (*M. farwelli*), and aquatic animals. It is tracked by the Adirondack Park Invasive Plant Program. It has been found in several lakes in the Fulton Chain, and the Fulton Chain of Lakes Organization has been co-ordinating survey and removal efforts. These efforts use divers and pumps to reduce fragmentation of plants, which is a primary means of colonization of the plant.

Honeysuckles (*Lonicera spp)*. The fly honeysuckle (*Lonicera morrowii*) and Tartarian honeysuckle (*L. tatarica*) have escaped cultivation and become widely established. Recent efforts identified one or both species to be among the most widely distributed exotic species in the western Adirondacks.[81] Native species of honeysuckles occur in the drainage as well.

Sport fishes. As discussed in the section on fishes of the Black River drainage, a number of species have been introduced for sport species. Species such as brown and rainbow trout have been introduced from outside the drainage, while many species occurred in parts of the drainage and have been spread within the drainage. Introductions of species such as smallmouth bass and yellow perch have had huge impacts on the fish faunas of lakes.[82] Introduction of brook trout may have obliterated native races of the species.

EXOTICS FOUND IN LAKE ONTARIO

A number of invasive species occur in the Great Lakes. Several of these occur in Lake Ontario and may occur in the lower part of the river. These species could potentially be transported into upper parts of the drainage.

Zebra mussel (*Dreissena polymorpha*). The zebra mussel was introduced to the Great Lakes via ballast water and has spread into a number of river and lake systems. Zebra mussels can clog water intakes and can overgrow native mussels. Zebra mussels are filter feeders and they have had huge effects on aquatic systems by removing phytoplankton and increasing benthic detrital material. The filtering has increased water clarity in places but has also affected aquatic food webs. Zebra mussels can be spread by boats, either as adults or juveniles attached to boats and trailers, or as larvae contained in bilge water or live well water.

Invasive plants and animals pose a threat to native species and ecosystems by predation, competition, disease transmission, and hybridization.

Quagga mussel (*Dresseina bugensis* or *D. rostriformis bugensis*). The quagga mussel was also apparently introduced via ballast water into the Great Lakes. The quagga mussel was probably introduced after the zebra mussel and has not spread as extensively. However, it is expected to replace zebra mussels in many areas[83]. Quagga mussels have similar impacts as zebra mussels. Quagga mussels occur in Lake Ontario.

Round goby (*Neogobius melanostomus* or *Apolonnia melanostomus*). Round goby was introduced into the Great Lakes by 1990. Impacts include predation on native fishes and other organisms, competition with native species for food, cover and nesting areas (especially sculpins *Cottus*) and predation on fish eggs, including those of smallmouth bass. It is preyed on by smallmouth bass, so interactions between bass and goby are complex. Round gobies are susceptible to viral hemorragic septicemia virus (VHSV) and could spread the disease to predatory smallmouth bass.[84] Round gobies have been found in Black River Bay near the mouth of the Black River.[85]

Fishhook waterflea (*Cercopagus pengoi*) ***and spiny waterflea*** (*Bythotrephes longimanus*). Both of these species occur in Lake Ontario. These species are predatory zooplanktors that compete with fish for zooplankton and disrupt aquatic food webs. They can also be nuisance species, clogging fishing lines.

The European frog bit (*Hydrocharis morsus-ranae*) is an aquatic plant which is established along the shores of Lake Ontario.

The tubenose goby (*Proterorhinus marmoratus*) and ruffe *(Gymnocephalus cernuus)* are Eurasian fishes which are established in the Great Lakes and could potentially spread into Lake Ontario.

OTHER INVASIVES

A number of other invasive species have the potential to colonize the Black River drainage basin. The ranges of many of these species have been expanding and the Black River drainage would likely provide adequate conditions for their establishment.

Hemlock woolly adelgid (*Adelges tsugae*) is an insect that infects hemlocks, which is an important tree in the Black River drainage. The woolly adelgid has caused massive mortality of hemlocks in areas where it has occurred. Currently, control can only be done locally on a stand or few trees, so that protection of hemlock throughout the region is infeasible. An adelgid predator has been released in New York, but biological control is currently ineffective. The hemlock woolly adelgid is common in parts of southern New York and has been detected in Rochester.[86]

The Rusty crayfish (*Orconectes rusticus*) has been introduced into the Upper Susquehanna and the Hudson River drainages. In many areas, native crayfish have disappeared after invasion of rusty crayfish. Rusty crayfish grows to a size where it is invulnerable to most fish predators, so it can reach large densities and have significant effects on macrophytes and other organisms.

Didymo (*Didymosphenia geminata*) Didymo is a diatom that forms thick mats on river substrates. It has had major impacts on rivers (e.g., in New Zealand) and has been found in the Delaware River system in New York, including the East Branch, Batten Kill, West Branch and main stem. Impacts of didymo in these systems is not well-established. It is thought that didymo has been spread primarily by movement of boats and anglers' gear such as waders and boots. Didymo cannot stand complete drying, but can remain alive for long periods in moist gear. Thorough drying and/or cleaning of gear is considered the best way to prevent spread of Didymo. The Pennsylvania Fish and Boat Commission provides information on Didymo at *www.fish.state.pa.us/water/habitat/ans/didymo/faq_didymo.htm*.

Viral hemorragic septicemia virus (VHSV). VHSV is a viral disease now known to be endemic in marine and anadromous fish in both the Atlantic and Pacific Oceans. It caused large fish kills in Lake Ontario, other Great Lakes, the St. Lawrence River, and some inland lakes (e.g., Lake Oneida) from 2005 to 2007. It has been found in a variety of freshwater species in the Great Lakes. Muskellunge, freshwater drum, yellow perch, gizzard shad, emerald shiner, and round goby were most affected, with smaller numbers of deaths of Chinook salmon, walleye, white bass, redhorse, lake whitefish, smallmouth bass, bluegill, black crappie, burbot, and northern pike.[87, 88, 89]A total of 25 fish species have been identified with VHSV, with differences in symptoms, progression of the disease and mortality.[90] VHSV is not known to affect humans and handling or consumption of infected fish is not considered a health or wildlife risk. Management of movement of fish, including transport and sale of baitfish, has been instituted to control the spread of the disease. Population-level effects of the fish mortalities are currently unknown. For example, large mortalities of freshwater drum in Lake Ontario were not matched with decreases in abundance of drum in subsequent years. Conversely, it is estimated that half of the mature muskellunge in the Thousand Islands section of the St. Lawrence Seaway died from the disease.[91]

Emerald ash borer (Agrilus planipennis)

The emerald ash borer (*Agrilus planipennis*) was first discovered in Ohio, Michigan and Ontario (Canada) in 2002 and could have huge effects on regional forests.[92] This species has recently been identified in New York State.

Sudden oak death (*Phytophthora ramorum*) is a disease that affects oaks and a variety of other broad-leaved trees and shrubs, such as *Rhododendron* and *Viburnum*. It may be spread through the horticultural trade.

Pale swallow-wort (*Vincetoxicum rossicum*). Pale swallow-wort is a perennial vine that can form large, dense infestations. It prefers limestone soils and therefore potentially occurs in the lower Black River valley. No occurrences in the Black River drainage have been located, but the pale swallow-wort occurs in Jefferson County, with known sites only a few miles from the drainage (e.g., at the Chaumont Barrens). The Cornell Cooperative Extension of Jefferson County is tracking this species and records may be reported at 315-788-8450.

OTHER NON-NATIVE SPECIES

A number of other non-native species have been recorded within the drainage. These species have impacted in other areas and could become invasive. These include the mute swan (*Cygnus olor*), which has bred near the mouth of the river. The Adirondack volunteer invasive survey recorded several non-native plants in relatively low frequency, such as Russian/Olive autumn (*Eleagnus* species) and black locust (*Robinia pseudoacacia*).[93] The Large gray willow *(Salix cinerea ssp. oleifolia, synonym: Salix atrocinerea)* is naturalized from Europe, and it occurs widely in the Black River drainage, including portions of the Adirondacks (e.g., Moose River Plains{REF45a}). There is little information on effects of this species on other plants or on the invasive potential of the species. Earthworms have recolonized slowly following glaciation, and native earthworms are rare or absent throughout many glaciated areas. Non-native earthworms have been widely introduced by anglers and possibly by horticulture. Some non-native earthworms consume humus and have had huge effects on soil conditions following introduction. Earthworms occur locally in the Black River drainage (e.g., especially around fishing camps and popular fishing areas). Controls on selling non-native earthworms may diminish movement, although many anglers may dig their own earthworms and bring them from outside the drainage.

There has been considerable investigation of factors affecting the establishment and invasiveness of non-native species to predict potential invasiveness of horticultural species, prioritize control of exotic species, and develop regional control strategies. Many species have spread widely following introduction and restriction of introduction (e.g., controls on flushing of ballast water) and dispersal (e.g., controls on use of live bait, and promotion of cleaning and drying of boating and fishing equipment) may be the most effective techniques for widely invasive species. Land disturbance may promote establishment of many weedy plant species. However, the local fauna and flora may be adapted to the local disturbance regime, so that fire, drought, flooding, etc., may have more significant effects on non-native than native species and serve to control the establishment of non-native species. Development of biological controls has been effective on some species, but the effort

involved in producing safe, effective biological control restricts it to the most widespread and damaging non-native species. For many non-native species, control (e.g., through mechanical removal or pesticides) rather than eradication is the only practical approach. Finally, climate change is anticipated to have large effects on the spread of non-native species. For example, a large number of invasive species are important in areas south of the Black River drainage, and these species may continue to expand northward with climate change.

2.6.5 Key Habitats and Resources

The previous sections describe ecological characteristics of the Black River drainage. This section summarizes these sections with respect to important ecological resources, which will form the focus for management and restoration.

ADIRONDACK MOUNTAINS AND FOOTHILLS

The Adirondacks represent one of the largest undeveloped areas in the northeastern United States. A significant portion of the Adirondacks is located within the Black River drainage, which allows for the maintenance of a mosaic of ecological communities, reflecting both inherent environmental variability (e.g., moisture, elevation, etc.) and different successional stages. A number of species of plants and animals depend on early successional stages of vegetation, while others prefer mature vegetation. The Adirondacks support a variety of ecological communities that are uncommon elsewhere in the United States, particularly several northern (boreal) upland and wetland communities. These communities support uncommon species of animals such as the suite of boreal birds. One species, the summer sucker, is endemic to the Adirondacks and the Black River drainage comprises a significant portion of its total range. The large extent of forest is important to a number of species, such as fisher and broad-winged hawk. The Adirondacks support an array of recreational activities, ranging from wilderness hiking and boating through summer and permanent residence on area lakes. The region provides opportunities for a variety of lake, stream, and river fishing, as well as hunting and trapping for a number of game and fur species. The Adirondacks are headwaters for a number of streams and are hydrologically important for regional water storage, supply, and hydropower. Rivers and lakes of the Adirondacks provide a variety of recreational boating experiences. The lower Moose River is a nationally-known whitewater river.

Boreal forest habitat in the Adirondack Mountains

TUG HILL PLATEAU

The Tug Hill Plateau represents a second large area of largely undeveloped land. The Plateau provides many of the ecological and economic benefits of the Adirondacks. While this area supports some of the same northern fauna as the Adirondacks, differences in climate, geology, and hydrology lead to differences in the occurrence of species and communities. For example, the Plateau is less susceptible to acidification than the Adirondacks. Additionally, the gulfs formed by tributary creeks support a number of uncommon plant communities and provide unique recreational opportunities.

MAINSTEM BLACK RIVER AND VALLEY

The central portion of the Black River provides a large, undammed section of river. The continuous stretch of river is important to migratory fish species such as burbot, and the river supports a variety of other game and nongame fish species. Floodplain swamps within the valley are an important habitat, providing food and cover for a variety of fish and other organisms. The Black River valley contains uncommon plant communities, such as calcareous wetlands, which support rare species of plants and other organisms. Many areas in the valley also provide hunting and trapping opportunities.

UNFORESTED UPLAND HABITATS

The Black River valley, including the lower valley, also contain grasslands and shrubland habitats. Many of these are culturally produced, (e.g., by dairy farming), while others, such as limestone pavement barrens, are controlled by soil, bedrock and moisture conditions. Many shrublands represent successional stages resulting from abandoned farms. Several rare plant species occur in these habitats. The importance of these habitats to a number of species of birds is well-established, and these habitats are important to a number of other taxa, as well. Many of these species have declined in the northeastern United States as a result of changing agricultural and land cover trends.

LOWER BLACK RIVER

The lower Black River is home to regionally important fisheries (e.g., walleye, steelhead and salmon runs). The mouth of the river serves as an important area for nongame fish, as well, including lake sturgeon spawning areas. The Black River gorge is a well-known whitewater run because of its level of difficulty, unique characteristics, and summer flows.

WETLAND HABITATS

The Black River drainage contains a variety of wetlands, including calcareous fens, peatlands, and floodplain swamps. These habitats support a variety of rare plants and animals. Along with marshes along the Black River Bay, wetlands in the drainage provide important breeding, migratory and wintering habitat for a variety of species of waterbirds. Areas near the mouth of the river are important as both breeding and wintering areas, while ponds and wetlands in the rest of the drainage, including the Tug Hill Plateau, the Black River floodplain, and the Adirondacks, are important nesting areas for various species.

CAVES

The limestone bedrock of the Black River valley contains caves, which provide habitat for several species, including the Federally-endangered Indiana Bat.

This page intentionally left blank

3 Issues Facing the Watershed

3.1 Known Threats and Impairments

The Black River drainage area has been affected by a number of ecological impacts associated with settlement, agriculture, logging, and industrial development. Effects include erosion and stream sedimentation, nutrient inputs and eutrophication, hydrological change and stream channel modification, fires, river damming and dewatering, and contamination by pesticides and industrial wastes. While many of the historic impacts are still evident through the recycling of environmental contaminants between the atmosphere and watersheds, these environmental challenges were addressed by dedication of the Adirondack Park and land preservation, and a series of Federal and State regulations including the Clean Air Act and the Clean Water Act.

Traditional Logging in the Adirondacks
Source: Adirondack Museum

Under authority of the Clean Air Act and the U.S. Environmental Protection Agency, the NYSDEC monitors waterbodies of the state, reviews and grants discharge permits, determines impairments with respect to defined uses, identifies priority waterbodies for remediation, and develops plans for attainment of designated uses.

Priority waterbodies have been identified by the NYSDEC in 1996, 2006, and 2008, including water quality impacts and sites identified for development of total daily maximum load (TMDL) regulations under section 303d.[94, 95] The NYSDEC also samples water chemistry and macroinvertebrates as part of the Rotating Integrated Basin Studies, which alternate annually among regions, providing regular assessments of impairments within each basin – the Black River was most recently assessed during 2008.[96] These assessments are used to determine impairments from defined uses.

New York State sets more restrictions on permitted discharges, and discharges are regulated by State Pollutant Discharge Elimination System (SPDES) permits. SPDES permittees include wastewater treatment plants and industries.

NYSDEC has identified stresses and impaired waters throughout the Black River watershed. A large number of impaired sites are lakes and ponds in the Adirondacks which are impacted by acidification. Since impairment of these sites is addressed on a regional level, many small ponds, formerly listed separately on the Priority Waterbody List, are currently grouped on the basis of the identical cause of impairment.

Other waterbodies are listed as impaired due to fish consumption advisories. These are mainly larger lakes and reservoirs in the Adirondacks, as well as parts of the lower Black River. Advisories are due to contamination by mercury (Adirondack lakes), DDT, PCBs, and other organic contaminants.

A number of stream segments are listed as impaired because of nutrients and associated effects. These reaches are mainly in the lower reaches of tributaries of the Black River, with impairment reflecting agricultural, residential and urban pollution. Currently (2008 Priority Waterbody List), two areas are identified as requiring TMDLs, South Branch Mill Creek and tributaries for nutrients and pathogens, and Beaver River for dissolved oxygen demand and pathogens. However, it was announced that with the installation of the wastewater treatment system, the Beaver River will no longer be required to develop a TMDL.

The following sections highlight some of the significant current threats to the Black River drainage basin. These sections draw on the NYSDEC assessment documents, as well as extensive literature on the various issues.

3.1.1 Acidification

The geology of the Adirondacks and their location with respect to acid deposition, acid rain, and dry deposition of sulfate and nitrate makes them highly susceptible to acidification. The bedrock and relatively thin soils, mainly derived from glacial tills, provides little buffering, leading to soft water with low acid neutralizing capacity (ANC). In the late 1980's, the Adirondack Lake Survey Corporation monitored water chemistry and ecological conditions of a number of lakes and ponds in the Adirondacks. Many of these were acid-impacted, and a number of small ponds, many in the Black River drainage, had high acidity (low pH).

Fish species vary in their sensitivity to acidification. Species that commonly occur in areas of natural, organic acidity, such as chain pickerel, are relatively tolerant, as are some species typical of small, soft water lakes and streams (e.g, brook trout). Aluminum becomes more bioavailable in conditions of inorganic acidity, and aluminum toxicity is an important impact in acidified waters. For example, brook trout reproduction may fail due to aluminum toxicity of early life stages even where adults are able to survive. Fish community composition was strongly affected by acidification and a number of ponds had no fish.

A number of lakes on the 2006 303(d) list in the Black River drainage are classified as impaired because of acid effects. Since most are small, however, the relative acreage affected by acidification is less than that of the fewer, but larger lakes impaired by fish consumption advisories. Individual acid-impaired lakes are no longer listed separately in the 2006 Priority Waterbody List (PWL), since impairment will be addressed on a regional, rather than a lake-by-lake basis. Several lakes, including Brook Trout Lake and Big Moose Lake, both in the Black River drainage, have been extensively studied with respect to acidification. In general, deposition of sulfates has decreased following control under the Clean Air Act, although deposition of nitrates has increased.[97, 98]The severity of acidification has decreased in many Adirondack lakes, with decreases in sulfate, nitrate, and monomeric aluminum, as well as increases in pH and ANC.[99] For example, conditions in Brook Trout Lake have changed, and brook trout have been restocked (Farrell, et al. 2008). Studies in Brook Trout and other lakes have indicated a complex pattern of recovery, with some biological groups lagging behind apparent changes in water chemistry. While fish population recovery in Adirondack lakes has been monitored, the extent of recovery was difficult to assess due a greatly affected fish composition resulting from subsequent introductions of fishes.[100]

While acidification of lakes and ponds has received a great deal of attention, streams have also been affected by acidification.[101] From 2003 to 2005, the USGS, NYSDEC, ALSC and the NYS Energy Research and Development Authority studied water chemistry and macroinvertebrate communities in a number of streams in the Black and Oswegatchie drainages in the Western Adirondacks.[102] Approximately 200 streams with little upstream pond and lake inputs were studied. In addition to measuring ANC, base-cation surplus (BCS) was measured, since this was more clearly related to concentrations of inorganic aluminum. They found an average of 38 percent of streams had a BCS less than zero, corresponding to 31 percent of streams with aluminum concentrations of levels toxic to brook trout. A much higher percentage (56 percent) of streams had low BCS during high stream-flow events. They estimated that 446 miles of streams in the region would be vulnerable to acidification, excluding assessment of 1,916 miles of inaccessible streams which were not included in the study design. Currently, seven rivers and streams are listed as acid-impaired in the 2006 303(d) list (North Branch Moose River, Bald Mountain Brook, Seventh Lake Inlet, Buck Creek, Wheeler Creek, Bradley Brook, and Cellar Brook), with suspected impacts on other streams (e.g., Independence River).

Acidification also affects terrestrial communities. High elevation coniferous forests, for example, are affected by acidification.[103] Additionally, studies specific to the region found low recent regeneration of sugar maple in western Adirondack forests and suggested depletion of soil calcium due to acidification as the most likely cause.[104] Calcium depletion may also affect abundance of birds by reducing the abundance of terrestrial invertebrates that provide calcium necessary for egg-laying.[105] Low pH soil also affects ionic balance in salamanders, which can affect species abundance and distribution.[106]

Ultimately, recovery from acidification effects depends on decreasing acidic inputs and is expected to take a long time. Due to the nature of acidification, reduction of acidic inputs is a regulatory and technological issue best dealt with at the national level rather than a site-by-site level. As a result, NYSDEC's strategy for remediation involves participation in efforts to reduce acidic inputs, along with monitoring and assessment to determine continued effects and recovery.

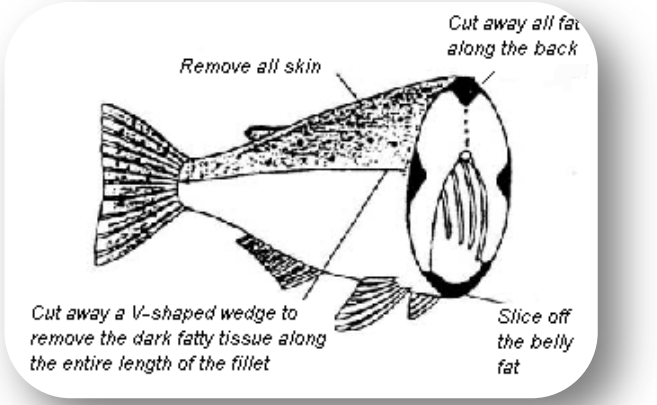
3.1.2 Contaminants

Fish consumption advisories affect a number of lakes in the Black River drainage area. Sixteen lakes in the drainage are on the state 2006 303(d) list as a result of mercury consumption advisories. New York State has general fish advisories for all state waters due to the occurrence of contaminants throughout the state, including the Stillwater Reservoir and Big Moose Lake. Because of the larger average size of these contaminant-affected waterbodies, the proportion of acreage affected by contaminants is disproportionate to the number of sites. Additionally, the Western Adirondacks have been identified as a hotspot of mercury bioaccumulation in the Northeastern U.S., based on measured concentrations in yellow perch and common loon.[107]

Mercury, a toxic element that can threaten the health of both people and wildlife, enters ecosystems by a variety of point and nonpoint sources. In undeveloped areas, atmospheric deposition is the primary source of mercury. Deposition of mercury has increased from historical levels as a result of power plant emissions and other industrial sources (e.g., cement plants and landfills). Most deposition consists of inorganic mercury, which does not bioaccumulate readily. Bacterial methylation forms

methylmercury, which is readily accumulated in food chains. Levels of mercury in fish reflect levels of mercury inputs, geochemical factors affecting methylation, and the trophic structure of waterbodies.

Mercury methylation appears to be particularly active in deep lakes with fluctuating oxic-anoxic zones and in systems with extensive wetlands and dissolved organic carbon (DOC), conditions that are present in many Adirondack lakes. Because of the long-range transport of atmospheric mercury and the environmental factors affecting methylation, mercury bioaccumulation may be especially severe in otherwise relatively undisturbed ecosystems. In addition to affecting mercury levels in fish within the basin, transport of mercury by the river is a significant source of mercury entering Lake Ontario. Mercury bioaccumulation is not closely related to lipid (i.e., fat) content, but is higher in older, fish-eating fish. Neurological impairment during development is a primary human health issue for mercury, and different risk levels have been developed for both high risk groups (e.g., children, women of child-rearing age) and lower risk groups. Assessments of high risk groups indicate effects at relatively low amounts of mercury intake, which can be exceeded by frequent consumption of most species of freshwater fish. As a result, general advisories have been developed for all state fish.



You can reduce the amount of contaminants in a fish meal by properly trimming, skinning and cooking your catch
Source: NYSDOH

As with acidic deposition, recovery ultimately depends on reduction of atmospheric inputs, which is a national regulatory and technological issue. As a result, the primary response to mercury contamination is monitoring concentrations in fish and promulgation of consumption advisories.

One lake, Fourth Lake, has fish consumption advisories based on DDT concentrations. The source of the DDT is unknown, but remediation efforts are underway (NYSDEC 2006a). Although DDT is no longer used in the US, DDT or its breakdown products DDE and DDD (the three together are referred to as DDX) persist in area ecosystems. DDX contamination in fish can result from sediment contamination from historical pesticide applications.

Approximately 43 miles of the Lower Black River are classified as impaired due to priority organic contaminants (with other impairments as well). Kelsey Creek is listed as impaired due to PCB concentrations. Like DDT, PCBs are no longer used, but are present from historical uses. PCBs were used in transformers and PCB contamination may come from railroads, electrical facilities, or other industrial uses. In addition to point sources, PCBs can cycle through ecosystems by volatilization and subsequent wet or dry deposition. As noted in Section 2.5.4, recent studies have indicated the Black River is an important source of mercury to Lake Ontario. More specifically, several recent studies have indicated elevated levels of PCBs, PCDDs, and PCDFs in the vicinity and downstream of the

inactive paper mills, a machine shop, the sewage treatment plant, and the hydroelectric power plant located in these two Villages.

Contaminant effects on groundwater resources have been identified as a significant issue in the Black River drainage (NYSDEC 2006a), resulting from historic industrial discharges, hazardous waste sites, and pesticide application.

3.1.3 Sewage Inputs

The input of sewage into local waterbodies can pose both human and ecosystem health risks. Nutrient inputs from sewage can lead to eutrophication and oxygen depletion, with effects on algae, macrophytes, and aquatic fauna. Treatment of sewage from larger communities has reduced eutrophication issues associated with these sources, although failing septic systems still represent significant issues. Replacement of septic systems by municipal sewer systems is financially prohibitive in many areas.[108] Identification of failing septic systems (e.g., by dye studies) has been conducted by organizations such as the Fulton Chain of Lakes Association. Agricultural land uses represent another large source of nutrient inputs (see below). Combined sewer overflows (e.g., Watertown) are also listed as a source of impairment for the lower Black River.

Many natural and synthetic chemicals may be concentrated and introduced into waterbodies via sewage. Many chemicals are not removed by sewage treatment and may present problems even in areas with no regulatory sewage issues. Endocrine disruption of fish, for example, has been linked to the release of hormone mimics into local waterways from birth control or from plant compounds released below pulp and paper plants. Release of anti-microbial chemicals may affect microbial processing in receiving waters. These issues are generally poorly known and no information has been located on their occurrence in the Black River drainage.

3.1.4 Agriculture

The Black River basin water quality report lists the following agricultural impacts as significant in the Black River drainage, many resulting from poor agricultural practices:

- Nutrient and silt/sediment inputs from agricultural runoff;
- Livestock access to streams, resulting in damage to riparian vegetation, bank erosion, and nutrient inputs;
- Improper manure application;
- Lack of silage leachate control;
- Inputs from manure or milkhouse wastewater treatment facilities;
- Intensive cropping near streams with inadequate riparian buffers;
- Fertilizer and pesticide application without approved pesticide/nutrient management plans.[109]

Agricultural impacts are listed for over one-quarter of the Priority Waterbody List rivers in the drainage area, including tributaries of Mill Creek.[110, 111, 112, 113] Unlike effects of acidic and mercury deposition, many of these effects can be controlled at the local level. For example, in 2005, the New York State Agricultural Nonpoint Source Abatement & Control Program awarded grants through the Agricultural Environmental Management planning process for several projects in the Black River

watershed in Jefferson County to implement best management practices on concentrated animal feed operations (CAFO's). Several grants have subsequently been awarded in Lewis, Oneida and Herkimer Counties as well.

Potential impacts from agricultural practices were highlighted by the major fish kill in the Black River near Lowville, resulting from a spill of liquid manure. On August 10, 2005, several million gallons of manure entered the river through a drainage ditch following rupture of a wall of the manure holding lagoon, resulting in depletion of dissolved oxygen and increases in ammonia. Mortality resulted from oxygen depletion, with progressive mortality as the manure traveled downstream, resulting in an estimated loss of 375,000 fish over 20 to 24 miles of river. Many species of fish were killed, including walleye, northern pike, smallmouth bass, rock bass, minnows and darters. Carp and bullhead appeared to be unaffected, as were fish in tributaries and floodplain waterways.

3.1.5 Invasive Species

Invasive species can affect human health (e.g., West Nile virus) and wildlife health (e.g., West Nile virus, VHSV), displace native species through competition, predation, interbreeding, disease transmission or habitat destruction, modify food chains (e.g., zebra mussels), change nutrient biogeochemistry and contaminant pathways, and increase streambank erosion. Significant and potentially significant invasive species in the Black River drainage are discussed above.

The section on invasives discussed VHSV as a pathogen with potential effects on the fish fauna of the Black River drainage. A number of other diseases have recently become important locally or nationally. These include West Nile virus (affecting birds, humans, and other mammals), chronic wasting disease (which affects deer), largemouth bass virus, and Chytridiomycosis (a fungal disease that affects amphibians). Transmission of diseases and susceptibility of hosts depends on a variety of factors, including health and immune function of the host (which may be affected by contaminants, crowding, etc.), contact between hosts and native or exotic organisms carrying diseases, and increases in potential for long- and short- range dispersal of diseases.

3.1.6 Climate Change

Climate change is expected to change temperature and the pattern and timing of precipitation. Climate change will have extensive ecological effects, including decrease and possible extirpation of northern species and immigration and increase of southern species, including exotic, potentially-invasive species. The effects on any taxon will depend both on its temperature and moisture requirements and the sensitivity of its habitat to climate change. Sugar maple, for example, is projected to be much more heavily affected by climate change than eastern hemlock, which often occurs in shaded ravines. Changes in the extent and duration of ice cover on lakes and streams will have large effects on these systems by changing the amount of production and lake turnover patterns.

3.1.7 Flow Regulation

Flow regulation may be carried out for water storage, for flood control, and to deliver hydroelectric power at times of demand. Flow regulation may create lake conditions upstream of dams that support aquatic organisms, but changes in base flows, peak flows, and the timing of flow variation can have extreme impacts on the downstream biota. Hydroelectric power is generated by the Black,

Moose and Beaver Rivers. In 1996, a settlement was made concerning operations of Beaver River Dams (excepting Stillwater). The settlement provided minimum flows for fish in river bypasses downstream of dams, as well as other provisions for increasing recreational use of the river.

3.1.8 Natural Disturbances

Several notable short-term disturbances in the Black River drainage have affected ecological conditions over large areas in the basin.[114] In November, 1950, a large cyclonic storm blew down large numbers of trees in the Adirondacks. Some of the largest areas of impact were in the Beaver and Moose River drainages. It affected a variety of tree species and was most damaging on north and east-facing hills.[115] Following the storm, salvage logging was done, with new roads built into wilderness areas to provide logging access. On July 15, 1995, an intense storm created bursts of strong winds, blowing down trees.[116] Much of the damage was north and east of the Black River drainage, but parts of the drainage were affected.

3.1.9 External Factors

The effects of acidification, mercury, and invasive species, whose sources are primarily located outside the drainage, are discussed above. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control. Migratory organisms are also strongly affected by conditions in other parts of their range. The American eel, for example, has been functionally extirpated in the Black River drainage, which was likely caused by dam blockage and various sources of mortality throughout its life stages. Many breeding birds of the drainage winter in the Southern US, the Caribbean, Central America, and/or South America. Decreases in winter habitat has been considered a major threat to many species wintering in the tropics and conditions on US wintering or migration areas could also threaten some species.

3.1.10 Floodplains

According to FEMA's Community Status Book, fifty-five of the communities located partially or entirely within the watershed are enrolled in the National Flood Insurance Program (NFIP). Only the Town of Montague is not. Eleven of the 55 communities, according to their effective Flood Insurance Studies, are entirely located within Zone C, meaning that there are no Special Flood Hazard Areas (SFHAs). Most all of the original Flood Insurance Rate Maps in these communities, prepared in the mid-1980s, are over 20 years old.

All communities enrolled in the NFIP have adopted zoning codes in the form of floodplain overlay districts, where NFIP regulations apply that are intended to assure compliance with NFIP requirements. Typically, a Floodplain Development Permit is issued by the local community to assure that projects constructed within SFHAs meet these requirements. Projects that are proposed to be located within SFHAs are subject to the NFIP regulations and the associated zoning provisions in the Zoning Code. All new construction and substantial improvements should:

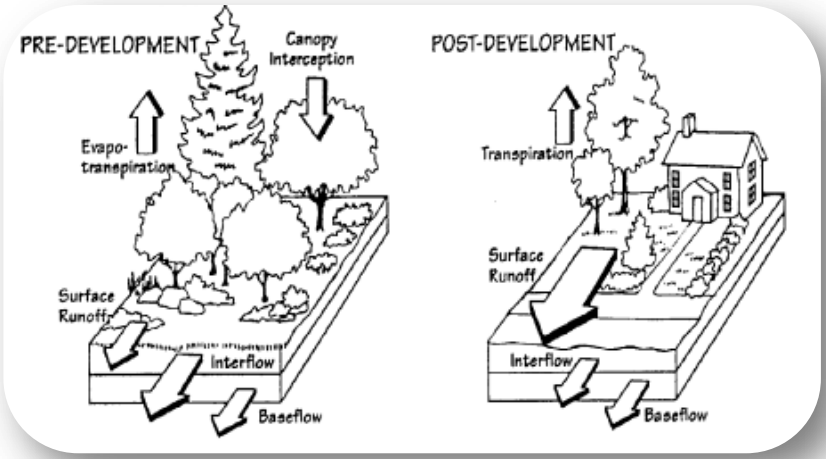
- Be designed (or modified) and adequately anchored to prevent floatation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy; [44 CFR Part 60.3(a) (3) (i)]

- Be constructed with materials resistant to flood damage. This would include assuring that surfacing materials can resist the expected velocities; [44 CFR Part 60.3(a) (3) (ii)]
- Be constructed by methods and practices that minimize flood damages; [44 CFR Part 60.3(a) (3) (iii)];
- Be constructed with electrical, and other services facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding. [44 CFR Part 60.3(a) (3) (iv)]
- Prohibit any significant encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway. [44 CFR Part 60.3(d) (3)]; and
- Not increase the base (100-year) flood elevation by more than 1.0 feet. [44CFR Part 60.3 (c) (13)].

Projected urban land use development pressures will occur primarily along the valleys of the Lower Black River, Middle Black River, Fish Creek, Stillwater, Otter Creek, Independence River, Cummings Creek and the South Branch Moose River watersheds. Since development pressures will be most prevalent in floodplain areas, where development costs are lower, and since many of the FISs are over 20 years old, inclusion of Black River watershed counties (Hamilton, Herkimer, Lewis, Jefferson and Oneida) in FEMA's Map Modernization Program would be an important step towards assuring that floodplains are developed in a manner that minimizes future flood damages.

3.1.11 Stormwater Management

Development projects generally change an area from natural vegetation to impervious areas, such as roofs, roads, and parking areas. This change can produce a change in runoff patterns downstream of the development. The increased runoff can also contain pollutants from roadway and parking area surfaces. Such an increase in runoff could cause accelerated erosion downstream of a development. The increase in pollutants could flow into wetland areas, streams, lakes and rivers downstream and decrease the quality of these water bodies.



Rooftops, roads, parking lots, driveways and other impervious surfaces no longer allow rainfall to soak into the ground, thus increasing runoff

Source: New York State Stormwater Management Design Manual

The regulatory tool used in New York State for assuring that development projects neither significantly change stormwater runoff patterns nor

significantly increase pollutant loadings is the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No GP-0-08-001). Actions that disturb more than one acre of land require coverage under this permit (or an individual permit from the US EPA). Requirements for this coverage include the development of an Erosion and Sediment Control Plan (E&SCP) and a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP requires that additional runoff be controlled, and that the Water Quality Volume (WQ_V) be treated in accordance with New York State standards. The Stormwater Management Practices (SMP's) specified by New York typically used to treat the WQ_V are generally effective at removing 80 to 85 percent of pollutants.

In addition to construction activities, discharges from Municipal Separate Storm Sewer Systems (MS4s) in Urbanized or Additionally Designated Areas are also regulated, and must be authorized in accordance with a permit for stormwater discharges from MS4s. According to NYSDEC, there are no MS4s located within the Black River Watershed. Thus, there is presently no means to regulate separate storm sewer systems in the Black Creek Watershed.

3.2 Subwatershed Analysis and Prioritization

3.2.1 Introduction

The subwatershed analysis and prioritization is intended to categorize the subwatersheds of the Black River watershed in order to better understand and identify those areas requiring additional measures to improve water quality, or in the case where water quality is already good, maintain a high water quality. "Priority," in this document is not meant to limit the potential for projects to receive funding in any given area of the watershed.

Based on the results of the subwatershed analysis and prioritization, each of the 19 subwatersheds within the Black River watershed has been categorized as a high, medium, or low priority subwatershed. General defining characteristics for each of the categories are detailed below:

High Priority Subwatersheds
High priority watersheds generally exhibit the most significant water quality issues when compared to other subwatersheds. These areas are often characterized by large amount of agricultural lands and little forest cover, are likely experiencing significant increases in urbanized areas, and can suffer from high rates of erosion and sedimentation.

Medium Priority Subwatersheds
Medium priority subwatersheds are those subwatersheds that should be monitored as they change and transition. These subwatersheds do not have the same level of water quality issues as high priority subwatersheds but do show some degree of water quality problems. Medium priority subwatersheds should be monitored to ensure that changes to water quality factors do not result in a change from medium priority to high priority. Measures to ensure the improvement of medium priority subwatersheds should be identified and implemented.

Low Priority Subwatersheds
Low priority subwatersheds include those subwatersheds with no clearly identifiable water quality problems. Designation as a low priority subwatershed does not suggest that there are

no water quality problems within the subwatershed. Designation signifies that water quality issues are notably lower than in other subwatersheds and/or that reliable data regarding water quality issues specific to the subwatershed were not available and, as a result, were not factored into the overall analysis. Efforts should focus on maintaining those conditions that facilitate high water quality.

The sections below discuss the methodology for determining which subwatersheds have the most significant water quality issues and identifies the potential factors that contribute to the subwatersheds' overall water quality.

3.2.2 Prioritization Approach and Methodology

To identify existing and potential water quality issues within the Black River watershed, a methodology for scoring and prioritizing the subwatersheds was developed to assist in identifying problem areas and, ultimately, recommendations for mitigating and improving water quality.

The prioritization model developed to analyze the subwatersheds of the Black River watershed includes 15 factors that have a direct influence on water quality. These factors have been grouped into four categories:

- Water Quality;
- Land Cover;
- Land Use and Ownership; and
- Natural Resources.

A five point scale was developed for each of the 15 factors, with higher scores representing higher priorities (e.g., subwatersheds with little forest cover will receive a score of 5). Additionally, as certain factors have a greater influence on water quality than others, weights were assigned to each factor based on the category to which they were assigned. A higher weight indicates factors with a greater influence on water quality. *Water Quality* factors received a weight of 2; *Land Cover* factors received a weight of 2; *Land Use and Ownership* factors received a weight of 1.5; and *Natural Resources* factors received a weight of 1.

To determine the overall priority rankings, the scores for each of the 15 factors were summed for each subwatershed. Based on the prioritization model, subwatershed scores can range from 26.0 to 130.0, with actual scores ranging from 35.5 to 105.5. Once the final scores were calculated, each of the 19 subwatersheds was placed into one of the following three priorities based on its score:

- High Priority – scores from 80.0 to 135.0
- Medium Priority – scores from 47.5 to 79.5
- Low Priority – scores from 26.0 to 47.0

A more detailed discussion of the categories, their weights, and the factors included therein can be found in Section 8.4.

3.2.3 Summary of Prioritization Ranking Results

OVERALL RESULTS

Based on the scoring systems developed for the prioritization model, weighted scores were calculated for each of the 15 factors for each subwatershed. To determine the overall priority score, the scores for each of the 15 factors were then summed. Table 3.17 provides the individual weighted category scores, as well as the overall results of the prioritization model for each subwatershed. Note that higher scores represent higher priorities.

Table 3.17. Prioritization Ranking Results

SUBWATERSHED	WEIGHTED CATEGORY SCORE				TOTAL SCORE
	WATER QUALITY	LAND COVER	LAND USE & OWNERSHIP	NATURAL RESOURCES	
Beaver River	28	18	16.5	6	68.5
Crystal Creek	18	22	15	6	61
Cummings Creek	14	20	9	4	47
Deer River	20	14	13.5	6	53.5
Fish Creek	8	24	10.5	3	45.5
Independence River	8	24	6	3	41
Lower Black River	32	36	28.5	9	105.5
Lower Middle Black River	26	32	25.5	6	89.5
Middle Black River	24	26	19.5	5	74.5
Middle Branch Moose River	22	14	9	6	51
Mill Creek	40	28	21	7	96
Moose River	12	16	12	4	44
Otter Creek	8	24	6	5	43
South Branch Moose River	10	14	6	6	36
Stillwater Reservoir	16	22	6	6	50
Sugar River	28	24	19.5	6	77.5
Upper Black River	16	12	10.5	4	42.5
Upper Middle Black River	22	22	19.5	6	69.5
Woodhull Creek	12	14	7.5	2	35.5

As noted in Section 3.2.2, the minimum total possible score is 26.0 and the maximum possible score is 130.0. Based on the results of the prioritization model, total scores ranged from a low of 35.5 (Woodhull Creek subwatershed) to a high of 105.5 (Lower Black River subwatershed); no subwatershed received either the highest or lowest possible score. A more detailed discussion of the category-specific scores can be found below, while the final priority rankings are discussed in further detail in Section 3.3.

WATER QUALITY

As noted in Section 8.4, total possible scores for the *Water Quality* category range between 8 and 40; based on the results of the prioritization model, actual scores range from the highest to the lowest possible score. Table 3.18 provides a breakdown of the *Water Quality* category score by its individual factors.

Table 3.18. Water Quality Category Results

SUBWATERSHED	WEIGHTED FACTOR SCORE				TOTAL CATEGORY SCORE
	TOTAL NITTROGEN LOAD	TOTAL PHOSPHORUS LOAD	NYSDEC STREAM IMPAIRMENT	NYSDEC TMDL REQUIREMENT	
Beaver River	6	6	6	10	28
Crystal Creek	6	8	2	2	18
Cummings Creek	4	6	2	2	14
Deer River	8	8	2	2	20
Fish Creek	2	2	2	2	8
Independence River	2	2	2	2	8
Lower Black River	10	10	10	2	32
Lower Middle Black River	8	10	6	2	26
Middle Black River	8	10	4	2	24
Middle Branch Moose River	2	2	8	10	22
Mill Creek	10	10	10	10	40
Moose River	4	4	2	2	12
Otter Creek	2	2	2	2	8
South Branch Moose River	2	2	4	2	10
Stillwater Reservoir	2	2	10	2	16
Sugar River	10	10	6	2	28
Upper Black River	6	6	2	2	16
Upper Middle Black River	8	10	2	2	22
Woodhull Creek	4	4	2	2	12

As is depicted in Table 3.18 and Map 21, the Mill Creek subwatershed and the Lower Black River subwatershed received the highest scores for this category. Both received the highest scores for the *Total Phosphorus Load* factor, *Total Phosphorus Load* factor, and the amount of *NYSDEC Stream Impairment* factor, while the Mill Creek subwatershed also received the highest score for the *NYSDEC TMDL Requirement* factor. Two additional subwatersheds – Beaver River and Middle Branch Moose River – also received the highest possible score for the *NYSDEC TMDL Requirement* factor as both encompass waterbodies that are included in Parts 1 or 2b of the NYSDEC 2008 303(d) List.

LAND COVER

Total possible scores for the *Land Cover* category range between 10 and 50. Based on the results of the prioritization model, actual scores range from a low of 12 to a high of 36. While no subwatershed realized the highest possible score, the three highest priority subwatersheds with regards to land cover include:

- Lower Black River subwatershed
- Lower Middle Black River subwatershed
- Mill Creek subwatershed

Table 3.19 provides a breakdown of the *Land Cover* category score by its individual factors.

Table 3.19. Land Cover Category Results

SUBWATERSHED	WEIGHTED FACTOR SCORE					TOTAL CATEGORY SCORE
	PERCENT FOREST & WETLAND COVER	PERCENT AGRICULTURE COVER	PERCENT NATURAL RIPARIAN COVER	PERCENT GROUND-WATER RECHARGE AREA	PROJECTED INCREASE IN URBAN LANDS	
Beaver River	4	2	4	6	2	18
Crystal Creek	4	4	2	10	2	22
Cummings Creek	2	2	2	8	6	20
Deer River	4	4	2	2	2	14
Fish Creek	2	2	2	8	10	24
Independence River	2	2	2	8	10	24
Lower Black River	8	10	6	4	8	36
Lower Middle Black River	6	8	6	4	8	32
Middle Black River	6	8	6	4	2	26
Middle Branch Moose River	2	2	4	4	2	14
Mill Creek	8	10	6	2	2	28
Moose River	2	2	2	8	2	16
Otter Creek	2	2	2	8	10	24
South Branch Moose River	2	2	2	4	4	14
Stillwater Reservoir	2	2	4	4	10	22
Sugar River	6	8	4	4	2	24
Upper Black River	2	2	2	4	2	12
Upper Middle Black River	4	6	4	6	2	22
Woodhull Creek	2	2	2	6	2	14

As is depicted in Table 3.19 and Map 22, the Lower Black River subwatershed received the highest score for this category. Upon further analysis of the scores, certain geographic patterns begin to emerge:

- Subwatersheds located partially or wholly within the Adirondack Park realized the lowest scores for the *Land Cover* category; and

- Subwatersheds within the Black River valley received the highest scores for the *Percent Agricultural Cover* factor.

LAND USE AND OWNERSHIP

Total possible scores for the *Land Use and Ownership* category range between 6.0 and 30.0 (see Section 8.4). Based on the results of the prioritization model, actual scores range from a low of 6.0 to a high of 28.5. While no subwatersheds realized the highest possible score, four received the lowest possible scores, indicating low priority in terms of land use:

- Independence River subwatershed
- Otter Creek subwatershed
- South Branch Moose River subwatershed
- Stillwater Reservoir

Table 3.20 provides a breakdown of the *Land Use and Ownership* category score by its individual factors.

Table 3.20. Land Use & Ownership Category Results

SUBWATERSHED	WEIGHTED FACTOR SCORE				TOTAL CATEGORY SCORE
	PUBLIC OWNERSHIP	LIVESTOCK PER ACRE	INDUSTRIAL LANDS	KNOWN HOTSPOT AREAS	
Beaver River	4.5	4.5	1.5	6	16.5
Crystal Creek	6	4.5	3	1.5	15
Cummings Creek	4.5	1.5	1.5	1.5	9
Deer River	4.5	4.5	1.5	3	13.5
Fish Creek	4.5	3	1.5	1.5	10.5
Independence River	1.5	1.5	1.5	1.5	6
Lower Black River	7.5	6	7.5	7.5	28.5
Lower Middle Black River	7.5	6	6	6	25.5
Middle Black River	7.5	6	1.5	4.5	19.5
Middle Branch Moose River	3	1.5	1.5	3	9
Mill Creek	7.5	7.5	1.5	4.5	21
Moose River	4.5	1.5	1.5	4.5	12
Otter Creek	1.5	1.5	1.5	1.5	6
South Branch Moose River	1.5	1.5	1.5	1.5	6
Stillwater Reservoir	1.5	1.5	1.5	1.5	6
Sugar River	7.5	7.5	1.5	3	19.5
Upper Black River	3	3	1.5	3	10.5
Upper Middle Black River	6	6	1.5	6	19.5
Woodhull Creek	3	1.5	1.5	1.5	7.5

As is depicted in Table 3.20 and Map 23, the Lower Black River subwatershed and the Lower Middle Black River subwatershed received the highest scores for this category. Both subwatersheds realized the highest possible score for the *Public Ownership* factor, while the Lower Black River subwatershed also received the highest possible scores for the *Industrial Lands* and *Known Hotspot Areas* factors. As can be expected, a definitive spatial pattern exists for the *Public Ownership* factor:

- Subwatersheds located partially or wholly within the Adirondack Park realized lower scores due to the increased concentration of publically-owned lands; and
- Subwatersheds located within the more heavily developed Black River valley received higher scores for both the *Industrial Lands* factor and the *Known Hotspot Areas* factor.

The following general trends were also identified for the *Land Use and Ownership* category:

- Subwatersheds located in the more developed areas at the lower reaches of the Black River received the highest scores;
- Subwatershed located in the more rural areas associated with the Black River valley received moderate scores; and
- Subwatersheds located within the Adirondack Park received the lowest total scores.

NATURAL RESOURCES

As noted in Section 8.4, total possible scores for the *Natural Resources* category range between 2 and 10. Based on the results of the prioritization model, actual scores range from a low of 2 to a high of 9, with no subwatershed realizing the highest or lowest possible score. Table 3.21 provides a breakdown of the *Natural Resources* category score by its individual factors.

As is depicted in Table 3.21 and Map 24, the Lower Black River subwatershed and the Mill Creek subwatershed received the highest scores for this category. Interestingly, the highest possible score the *Natural Resources* category was realized by the Lower Black River subwatershed due to high *Habitat and Biota* factor score. Given the predominance of agricultural and urban lands within this subwatershed, it is surprising to see it score so highly for *Habitat and Biota* (note that higher scores for this factor indicate the presence of sensitive resources that require protection). This high score for the Lower Black River subwatershed is driven predominantly by the documented and potential occurrence of protected species – 1 documented federally endangered species, 4 documented state endangered species, 4 documented state threatened species, 1 documented species of special concern, 1 potential state endangered species, and 3 potential state threatened species. While two other subwatersheds also realized the highest possible scores for this factor, they are located within the Adirondack Park where the presence of sensitive resources is expected due to regulatory controls and the large amount of contiguous habitat.

Table 3.21. Natural Resources Category Results

SUBWATERSHED	WEIGHTED FACTOR SCORE		TOTAL CATEGORY SCORE
	HABITAT AND BIOTA	HIGH EROSION AREAS	
Beaver River	3	3	6
Crystal Creek	3	3	6
Cummings Creek	3	1	4
Deer River	3	3	6
Fish Creek	1	2	3
Independence River	2	1	3
Lower Black River	5	4	9
Lower Middle Black River	2	4	6
Middle Black River	2	3	5
Middle Branch Moose River	4	2	6
Mill Creek	2	5	7
Moose River	3	1	4
Otter Creek	4	1	5
South Branch Moose River	5	1	6
Stillwater Reservoir	5	1	6
Sugar River	1	5	6
Upper Black River	2	2	4
Upper Middle Black River	2	4	6
Woodhull Creek	1	1	2

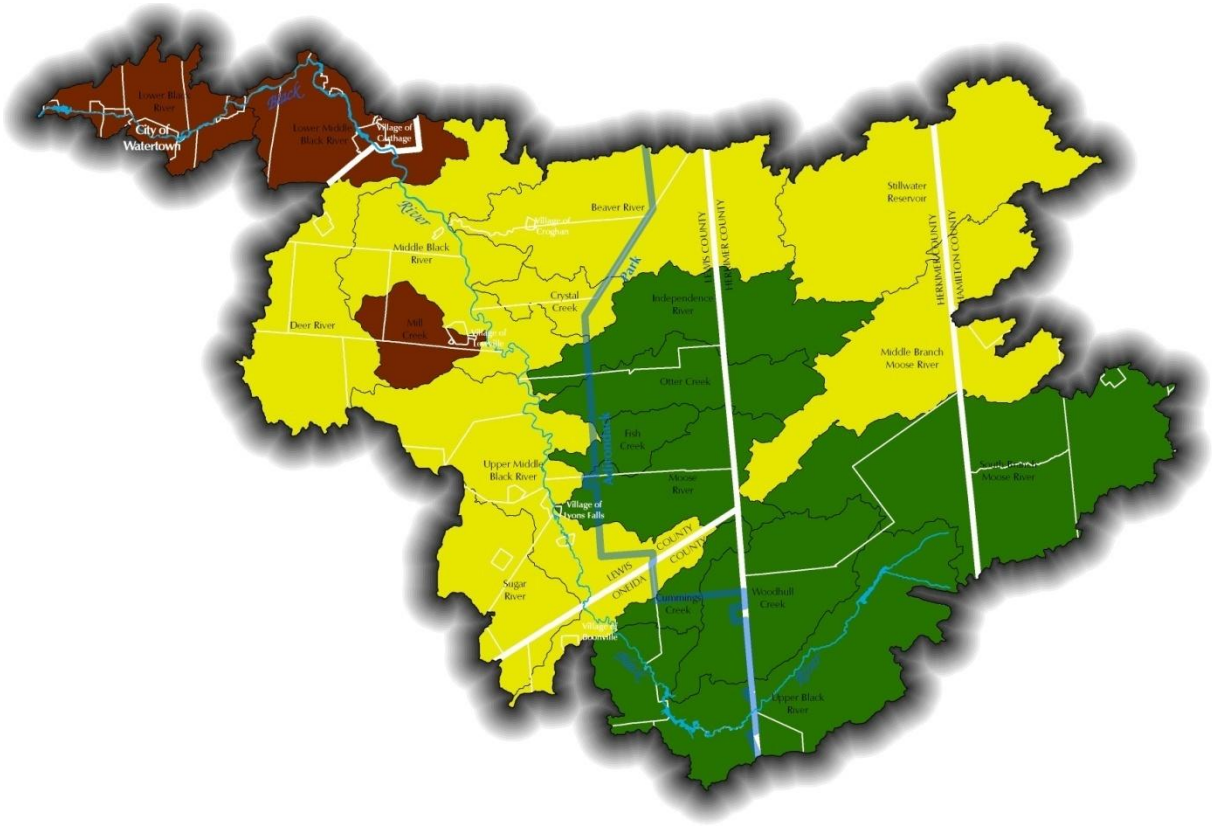
3.3 Discussion of Key Findings

INTRODUCTION

As previously noted, the purpose of the subwatershed analysis and prioritization is to develop a methodology for scoring and ranking the 19 subwatersheds within the Black River watershed. The resulting model includes 15 factors that have a direct influence on water quality. The scores, when summed for each subwatershed, provide the basis for prioritization. Based on the results of this analysis, each of the 19 subwatersheds within the Black River watershed was categorized as high, medium, or low priority according to the following scoring system:

- High Priority – scores from 80.0 to 135.0
- Medium Priority – scores from 47.5 to 79.5
- Low Priority – scores from 27.0 to 47.0

General defining characteristics for each of the categories are detailed below.



High priority (red), medium Priority (yellow), and Low Priority (green) Subwatersheds of the Black River Watershed

High Priority Subwatersheds

Three subwatersheds were classified as High Priority based on the results of the analysis:

- Lower Black River subwatershed (total score = 105.5)
- Mill Creek subwatershed (total score = 96)
- Lower Middle Black River subwatershed (total score = 89.5)

These three subwatersheds are located in the lower reaches of the Black River watershed and comprise some of its most urbanized and cultivated lands. As such, these subwatersheds are characterized by little forest and wetland cover and existing water quality problems. All three high priority subwatersheds realized some of the highest scores for both total nitrogen and total phosphorus loads. The Mill Creek subwatershed encompasses waterbodies that are included on Parts 1 or 2b of the NYSDEC 2008 303(d) List and thus require either a TMDL to be developed or that BMPs be implemented to address the impairment.

Medium Priority Subwatersheds

Eight subwatersheds were identified as being of Medium Priority:

- Sugar River subwatershed (total score = 77.5)
- Middle Black River subwatershed (total score = 74.5)
- Upper Middle Black River subwatershed (total score = 69.5)
- Beaver River subwatershed (total score = 68.5)
- Crystal Creek subwatershed (total score = 61)
- Deer River subwatershed (total score = 53.5)
- Middle Branch Moose River subwatershed (total score = 51)
- Stillwater Reservoir subwatershed (total score = 50)

This priority category includes subwatersheds located both along the Black River valley in Lewis County, as well as within the Adirondack Park. While these subwatersheds are not large population centers, those located along the Black River valley are home to much of the agricultural activity that takes place within the watershed. As such, they are characterized by larger amounts of agricultural lands and smaller amounts of forest lands and wetlands than are the subwatersheds identified as Low Priority. For those subwatersheds located outside the Black River valley, the primary issues revolve around water quality and land cover. Generally, subwatersheds within this category were found to have more water quality issues than those subwatersheds within the Low Priority categories and less than those in the High Priority category.

Low Priority Subwatersheds

Eight subwatersheds were identified as being of Low Priority:

- Cummings Creek subwatershed (total score = 47)
- Fish Creek subwatershed (total score = 45.5)
- Moose River subwatershed (total score = 44)
- Otter Creek subwatershed (total score = 43)
- Upper Black River subwatershed (total score = 42.5)
- Independence River subwatershed (total score = 41)
- South Branch Moose River subwatershed (total score = 36)
- Woodhull Creek subwatershed (total score = 35.5)

All of the subwatersheds in this category are partially or wholly located within the Adirondack Park. As a result of the land use restrictions placed on property located within the park, these subwatersheds are characterized by large amounts of forests and wetlands, little agriculture or urban development, and less significant water quality problems.

4 General Recommendations for Watershed Health

4.1 Introduction

This section provides the first of three levels of recommendations for improving and protecting water quality in the Black River watershed (see Sections 5 and 6 for the remaining two levels of recommendations – subwatershed-specific recommendations and recommendations for municipalities). The continued health and effective management of the Black River watershed can be achieved through the careful implementation of the general strategies, recommendations, and best management practices identified in the following sections. Each community and subwatershed within the overall Black River watershed is unique and has its own set of factors that influence water quality and opportunities for effectively addressing those factors.

The strategies and best management practices identified herein are not appropriate in each and every location within the watershed, but provide an overarching framework of actions that should be undertaken, as appropriate, to improve and maintain good water quality. Sections 4.2 to 4.11 are dedicated to these recommendations and include an introduction to the category, a list of identified goals, and a series of specific strategies and recommendations designed to achieve those goals.

Subwatershed-specific strategies and recommendations have been developed based on an understanding of the specific factors and issues that have the greatest influence on water quality within a given subwatershed and build on the general strategies and recommendations noted above. These strategies can be found in Section 5.

Finally, given that the primary authority for guiding community planning and development is vested in local municipalities, municipality-specific strategies and recommendations address local planning and regulatory controls that should be employed to protect and improve water quality within the Black River watershed. These strategies were developed from an analysis of existing land use regulations within each of the 56 municipalities located wholly or partially within the basin and are provided in Section 1.4.

Building on the threats and impairments identified in Section 3, the general strategies and recommendations were grouped into one of ten categories:

- Partnerships, Collaborations, & Education;
- Development, Infrastructure, & Stormwater Management;
- Wastewater Management;
- Agricultural Practices and Management;
- Floodplain Management;
- Forestry Practices;
- Invasive Species;
- Planning and Land Use;
- Recreation; and
- Watershed Residents.

4.2 Partnerships, Collaboration, and Education

INTRODUCTION

Within the 1.2 million-acre Black River watershed are 37 towns, 18 villages, 5 counties, and 1 city. In addition to these units of government, the watershed is home to approximately 67,000 people, most of whom reside in the Black River valley and in and around the City of Watertown (located near the mouth of the Black River). Unfortunately, due to the very nature of watersheds, downstream communities often bear the largest burden in terms of negative water quality impacts and the costs associated with remediating these impacts (e.g., increasing treatment capacity at wastewater treatment plants). Conversely, upstream communities often bear the largest burden when it comes to watershed restoration and protection, with forest lands being protected and removed from the tax rolls or by limiting the amount and type of new development. Given this, combined with New York State vesting the authority for guiding community planning and development in local municipalities (i.e., home rule), any efforts designed to improve water quality in the basin will require the cooperation between its many stakeholders. Improving basin water quality will not be possible without such collaboration.

As it relates to water quality, collaboration between various stakeholder groups, municipal governments, other non-municipal organizations, and New York State can result in improved and more effective management of water resources by:

- Improving communication between various groups;
- Promoting shared ownership of the collective water quality issues;
- Building relationships and understanding between disparate groups, fostering trust where it was previously lacking; and
- Providing for a richer understanding of the water quality issues and their various components.

An important component to building partnerships throughout the Black River watershed is that of watershed education. By educating stakeholders on the general function of watersheds, as well as to the specific issues facing the Black River watershed, you can build support for the various initiatives designed to improve water quality in the basin. Watershed education can also provide decision-makers with the tools necessary to modify existing regulations, policies, and procedures that are detrimental to water quality, and to develop new regulations, policies, and procedures that will be beneficial to the long-term health of the watershed.

Michele Watkins Beaver River High School students participating in electrofishing on the Black River in Naumburg

The Black River watershed falls within the purview of the following four regional planning bodies whose purpose is to facilitate coordination among the various units of government in the region:

- The Adirondack Park Agency;
- The Black River – St. Lawrence Resource Conservation & Development Council;
- The Herkimer-Oneida Counties Comprehensive Planning Program (also known as the Regional Planning Board); and
- The Tug Hill Commission;

These organizations have undertaken a wide range of local municipal projects and larger regional-based initiatives in the watershed, including Main Street plans, Black River Scenic Byway, Blueway Trail Plan, infrastructure improvements, invasive species monitoring and eradication, recreation planning, and education and outreach.

GOALS

The following goals have been identified for the *Partnerships, Collaborations, & Education* category:

- All watershed stakeholders should coordinate their activities through improved communications, the continuation of existing partnerships and collaborations, and the development of new partnerships and collaborations.
- Enhance knowledge of water resources and how they are linked to ecology, geology, heritage, and human service needs within the Black River watershed.

STRATEGIES & RECOMMENDATIONS

To maintain or improve (where necessary) water quality in the Black River watershed, a collective effort by all stakeholders is required. Many of the issues facing the basin cross jurisdictional boundaries and often require a multi-disciplinary approach to implement effective solutions. Thus, education, collaboration, and partnerships are crucial to effective watershed management.

To improve communication and coordination between watershed stakeholders, build relationships, and heighten water quality awareness in the basin, the following actions should be implemented where appropriate:

Partnerships and Collaboration Recommendations

1. Promote the networking of stakeholders by providing an avenue for participants to input, share and compare information gathered on the watershed (and their individual subwatersheds) to increase environmental knowledge, stewardship, and community service in the basin. This could include, but is not limited to the following:
    a. Develop and hold an annual Black River Watershed Conference, where stakeholders will have the opportunity to learn about and discuss issues that face the Black River, as well as how to become better stewards of the Black River.
    b. Internet-based forum (e.g., Facebook) where stakeholders can meet to discuss issues and ideas, including internet meetings and conference calls.
2. Develop an Intermunicipal Coordinating Organization (ICO) through a Memorandum of Understanding that would consist of representatives (preferably elected officials) from each of the municipalities located within the Black River watershed, as well as members from the County Soil & Water Conservation Districts. The purpose of the ICO would be to maintain and enhance the

high water quality of the watershed through education, research, restoration and, if necessary, regulation. The ICO would be responsible for directing limited resources to the most high priority projects throughout the Black River watershed. The ICO would also work to identify funding sources and opportunities, including in-kind services, for sharing the cost of watershed management implementation between municipalities. The ICO could also act as an informational clearinghouse/repository for watershed information and be the gatekeeper for watershed based knowledge. At the time of this Plan's development, the establishment of the ICO through a Memorandum of Understanding was underway.

3. Investigate the need for a Watershed Coordinator position that would work with/for theICO. The Watershed Coordinator would be responsible for organizing future watershed planning efforts, education, and implementation for the protection and restoration of local water resources. While the members of the ICO would work on a part-time, voluntary basis, the Watershed Coordinator would be a paid position.
4. Identify opportunities for sharing the cost burden of watershed management implementation between municipalities.
5. Encourage community service within the watershed with such organizations as the Boy Scouts, Girl Scouts or other service-based organizations on such items as watershed cleanup, developing environmental problem solving skills and becoming environmentally conscious citizens.
6. Develop an information and data clearinghouse that provides access to watershed-specific resources, information on BMPs, funding sources, etc.

Improving and protecting water quality will not be possible without collaboration.

7. Work with local media outlets to provide regular coverage of watershed issues, events, and education. Also, develop a series of regular newsletters for watershed residents to inform them about how their daily activities can impact water quality.
8. Work with NYSDEC to complete TMDL work throughout the watershed. A TMDL is defined as the maximum amount of a given pollutant that a waterbody can receive and still meet water quality standards. TMDLs also include the reductions necessary to meet these standards, as well as an allocation of reductions among the sources within a given watershed. The following waterbodies require TMDL development, or the implementation of BMPs appropriate to address the impairment:
    a. Mill Creek/South Branch and tributaries (Water Index No. Ont. 19-51). The segment consists of Mill Creek and its tributaries from its confluence with the Black River to Lowville. The segment is impaired by both nutrients and pathogens from agricultural sources.
    b. Lower Beaver River and tributaries (Water Index No. Ont. 19-40 (portion 1). The segment consists of the Lower Beaver River and all of its tributaries from it mouth upstream to Beaver Falls. Confirmation that the impairment has been addressed should allow the waterbody to be removed from the State's 303d list of Impaired Waters in the near future.

9. Work with NYSDEC to verify the impairment and cause of pollution in Kelsey Creek (Water Index No. Ont. 19-6 (-1)). Sediments in the main stem are thought to be impaired by PCBs from industrial sources.
10. Work with NYSDEC to complete assessments of "Unassessed" streams. "Unassessed" streams are segments where there is insufficient water quality information available to assess the support of designated uses. Approximately one-third of all streams within the Black River watershed comprise "unassessed" segments.
11. Municipalities should work together to ensure upstream communities are not negatively impacting downstream communities. Actions taken in upstream communities can result in considerable impacts on downstream water quality and can undermine the efforts of downstream municipalities to control pollution.
12. Complete remediation of unremediated hazardous waste/contaminated materials sites and also investigate suspected contaminated sites. Complete remediation and/or investigation of known hotspots, including sediments, through Hazardous Waste Remediation Program, Brownfield Opportunity Grant Program, Voluntary Clean-up Assistance Program and Spill Remediation Program. There are numerous unremeditated sites in the Black River Watershed.
13. Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control.
14. Work with the USDA/Natural Resources Conservation Service and Lewis County Soil & Water Conservation District to complete the Lewis County Soil Survey. This will increase the ability to determine susceptibility of areas to runoff and erosion by providing more detailed information such as runoff coefficients, soil erodibility, and other related factors. This will be important for a number of the subwatersheds in the drainage.
15. Continue to investigate PCB contamination problems in local waterbodies and implement recommendations from the recent EPA study on PCB loadings.
16. Work with the NYSDEC Division of Fish, Wildlife and Marine Resources to continue monitoring mercury concentrations in biota. Locate and list all fish consumption advisories in the Watershed.
17. Work with regional organizations and educational institutions to research and manage rare species, particularly those dependent on water resources. This should also include monitoring the impacts of flow modification on local ecosystems.
18. Investigate the impacts of flow modification based on dam removal and relicensing.

Education Recommendations

1. Develop a watershed education program that provides specific areas of focus for the various watershed stakeholders. This could include, but is not limited to the following:
    a. Brochures provided to residents informing them of the issues facing the watershed and how their actions can affect these issues. This could include proper lawn care techniques for environmentally sensitive areas, proper on-site septic system use and maintenance, and information on the importance of cleaning watercraft to prevent the spread of invasive species, just to name a few.

b. Develop issue-specific brochures that detail successful strategies for improving water quality. An agricultural brochure, for example, could include successful strategies for nutrient management, manure handling, and erosion control.

2. Develop and/or offer workshops for municipal employees (highway departments, code enforcement, etc.) and contractors that provide training and information about how their job duties can impact water quality and that provide education on topic-specific Best Management Practices (BMPs) (e.g., stormwater management, erosion control).
3. Develop and/or offer workshops for elected and appointed officials on erosion control, stormwater management, agricultural BMPs, proper streambank and shoreline management, floodplain management, and any other watershed-specific issues of interest.
4. Continue to work with local academic institutions, including Jefferson Community College, the Boards of Cooperative Educational Services (BOCES), and school districts and private schools to conduct small-scale demonstration projects and promote watershed education. Additionally, educational efforts such as the Envirothon, Future Farmers of America, and Ag-stravaganza should be continued and should incorporate watershed-specific topics into the programming to promote stewardship.

4.3 Development and Stormwater Management

INTRODUCTION

As precipitation falls over naturally vegetated areas, most of the water infiltrates slowly into the ground, with only a small percentage flowing overland as runoff. The infiltrating water is cleansed as it percolates down through the soil, while runoff is slowed by natural vegetation resulting in the settling of particles and sediment. In both situations, natural biologic processes remove pollutants and sediments from the water before it makes its way to nearby waterbodies. Development often results in a significant change to these natural conditions, resulting in increased rates and volumes of runoff, and accelerated downstream erosion. This increased runoff takes up pollutants from roads, parking areas, roofs, lawns, and other developed surfaces and deposits them into downstream wetland areas, streams, lakes, and rivers, significantly decreasing the quality of these waterbodies.

An example of ineffective erosion control practice – silt fencing should be buried to a depth of about 8 inches. Also, silt fencing is not intended for use in drainage ways.

The regulatory tool used in New York State for assuring that development projects neither significantly change stormwater runoff patterns nor significantly increase pollutant loadings is the NYSDEC SPDES *General Permit for Stormwater Discharges from Construction Activity* (Permit No GP-0-08-001). Requirements for this general permit include the development of an Erosion and Sediment Control Plan (E&SCP) and a Stormwater Pollution Prevention Plan (SWPPP). It should be

noted that no community within the watershed has been designated a Municipal Separate Storm Sewer System (MS4s) and therefore is not subject to MS4 regulations.

At the local level, some municipalities incorporate stormwater regulations into the existing zoning ordinance, while others create separate ordinances to address stormwater management. Effective stormwater operation and maintenance ordinances include the designation of a specific entity responsible for long-term maintenance, the timing and number of required inspections, design guidelines that can help ease the maintenance burden (e.g., the inclusion of maintenance easements), and the use and maintenance of stormwater BMPs. Some local stormwater ordinances also include provisions for innovative stormwater management techniques, such as rain gardens, green roofs, pervious pavement, and other types of green infrastructure.

GOALS

The following goals have been identified for the *Development, Infrastructure, & Stormwater Management* category:

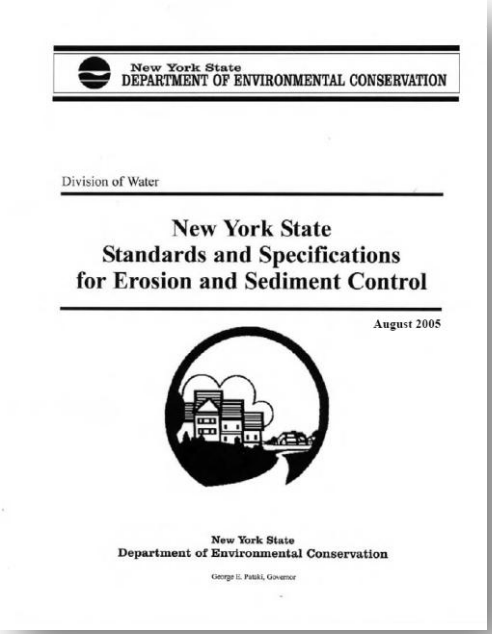
- Reduce the adverse impacts from new development by limiting the rate and volume of runoff to predevelopment values.
- Reduce loadings of nutrients, bacteria, and sediments into the rivers and lakes from stormwater runoff.
- Reduce loadings of other pollutants into the rivers and lakes from stormwater.

STRATEGIES & RECOMMENDATIONS

1. Develop a model stormwater ordinance that municipalities in the Black River watershed can modify and adopt. This should be consistent with the *New York State Stormwater Management Design Manual* and the *New York Standards and Specifications for Erosion and Sediment Control*. Additionally, this ordinance should include provisions that require developments disturbing less than one acre to abide by the New York State *General Permit for Stormwater Discharges from Construction Activity*.
2. Provide training to local developers, engineers, construction inspectors, and planning board members on existing stormwater regulatory programs and accepted stormwater Best Management Practices. Encourage DEC to monitor stormwater and sediment control during construction activities.
3. Research the technical literature for specific actions and programs that would assist in meeting upcoming TMDL load allocations for nonpoint sources.
4. Develop protocols and recommendations for green infrastructure such as green roofs, porous pavement, bio-retention, rain barrels or cisterns, downspout diversions, rain gardens, soil reconditioning, native landscaping, and urban tree canopy expansion. This should also include developing and submitting grant applications and proposals for retrofit and redevelopment projects.

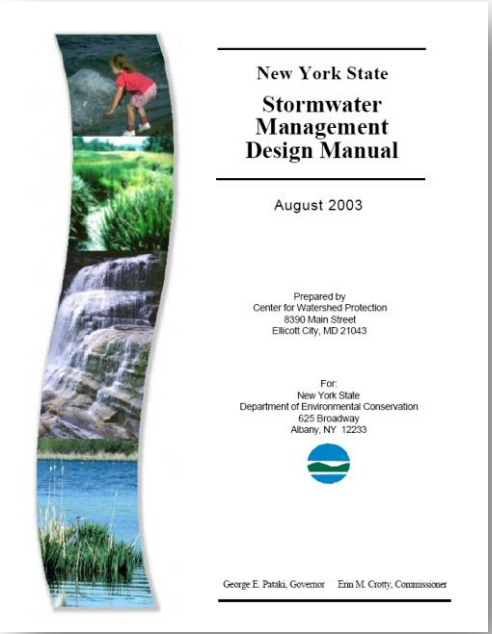
*The purpose of the **New York State Standards and Specifications for Erosion and Sediment Control** manual is to provide minimum standards and specifications for minimizing erosion and sediment impacts from construction activity, including the use of soil, water, plants, and products to protect the quality of our environment. Some of the information provided in the manual includes:*

- *Erosion control planning and site management process;*
- *Vegetative, bio-technical, and structural measures for erosion and sediment control;*
- *Performance evaluations for temporary erosion and sediment control practices; and*
- *Sample checklist for reviewing erosion and sediment control plans.*



*The purpose of the **New York State Stormwater Management Design Manual** is to provide standards for the design of the Stormwater Management Practices (SMPs) to protect the waters of the State of New York from the adverse impacts of urban stormwater runoff. Some of the information provided in the manual includes:*

- *The permitting process for stormwater management facilities;*
- *Sizing criteria and design calculations;*
- *Performance criteria and design guidelines for acceptable SMPs;*
- *Guidance for selecting the most appropriate SMP; and*
- *SMP design examples.*



5. Work with NYSDOT, county and local highway departments to establish protocols for minimizing erosion from existing roadways and construction of new roadways. This could include requiring that roadside ditches remain vegetated, steep roadside ditches are rock-lined, check-dams are installed in roadside ditches, and pervious pavements are used (where appropriate).
6. Work with county and local highway departments to establish protocols for minimizing water pollution from deicing and other routine maintenance activities. This could include covering stored road salts, varying the amount of salt applied based on site-specific conditions (road width, traffic concentration, proximity to surface waters), and the use of alternate materials such as sand or gravel.
7. Work with county and local highway departments to establish protocols for minimizing pollution through such measures as street sweeping, storm drain stenciling, catchment cleaning and culvert maintenance.
8. Encourage county and local highway departments to use *Cornell Local Roads Program* for guidance on erosion and sediment control during road maintenance activities.

4.4 Wastewater Management

INTRODUCTION

To remove nutrients (e.g., nitrogen, phosphorus), pathogens, and other possible pollutants from household wastewater, it must undergo treatment (physical, chemical, or biological) prior to being released back into the environment so as to avoid negatively impacting water quality. The two predominant methods for wastewater treatment are municipal treatment facilities and on-site treatment facilities (i.e., septic systems). While on-site treatment can be a cost-effective and convenient solution, it requires regular inspection and maintenance (by the homeowner) to ensure it functions properly and does not fail. According to the 1990 U.S. Census, approximately 20 percent of homes in New York State use on-site treatment facilities; the U.S. Census 2005 American Housing Survey reported similar figures at the national level. [117]

Of the 56 local municipalities in the Black River watershed, only 16 treat their municipal wastewater in 15 treatment facilities. Nine of these 15 facilities discharge directly into the Black River, two discharge into the Beaver River, one discharges to the Deer River, and one discharges to the Middle Branch Moose River (Section 8.7 provides a table listing all wastewater treatment facilities in the Black River watershed). On average, these facilities discharge a total of approximately 24.2 million gallons of treated wastewater into the watershed each day. The residents in the remaining 41 municipalities rely on on-site treatment methods to manage their wastewater. On-site treatment systems are regulated by the rules set forth in Appendix 75A of New York State Public Health Law 201(1)(1). The purpose of regulations for onsite wastewater treatment systems is to ensure that household wastewater is treated and dispersed in a manner protective of public health and the environment. A more detailed discussion of Appendix 75A can be found in Section 8.5.2.

GOALS

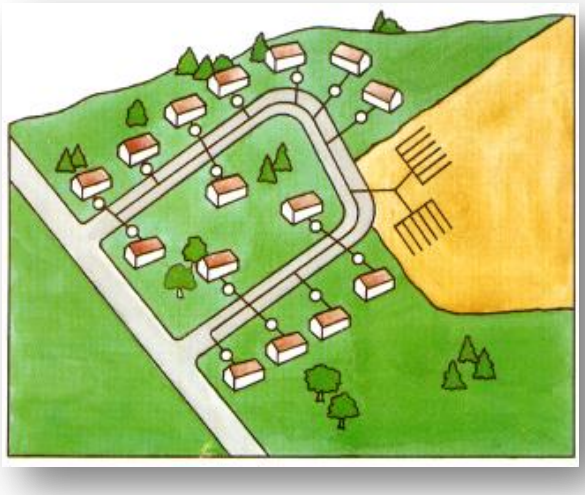
The following goals have been identified for the *Wastewater Management* category:

- Reduce nutrient loads into rivers and lakes.

- Reduce other pollutant loads from bacteria, pharmaceuticals, and other contaminants of emerging concern into rivers and lakes.

STRATEGIES & RECOMMENDATIONS

1. Municipalities should update, or enact, sewer ordinances to protect water quality by reducing nitrogen, phosphorus, and other pollutant loads (e.g., bacteria, pharmaceuticals, and other contaminants of emerging concern) from private treatment systems. This should include minimum distance to waterbody requirements, regularly scheduled maintenance, and provisions to allow alternative wastewater disposal methods. Encourage municipalities to ensure adequate funding for infrastructure maintenance and asset management.
2. Encourage the use of alternative/innovative treatment systems, such as cluster/community-based septic systems, constructed wetlands, or composting toilets, particularly where lot sizes do not meet minimum on-site septic system requirements.
3. Work with landowners to reduce pollution from on-site septic systems. Work with county and local municipalities to develop an active program for identifying failing septic systems.
4. Implement a program to repair or replace failing septic systems.
5. Make necessary improvements to existing municipal wastewater treatment systems.



Cluster septic systems are a cost-effective way for treating wastewater at the neighborhood level

Source: USEPA

6. Where density allows, increase the number of residences served by the existing municipal systems. Generally, conventional sewer systems should only be used where 100 or more houses will be connected for every mile of sewer line.

4.5 Agricultural Practices and Management

INTRODUCTION

In addition to playing an important role in the region's economy, agricultural lands within the Black River watershed also provide highly valued open space and scenic vistas and contribute to the support of a number of species of wildlife. With more than 172,000 acres of land under agricultural production, most of which occurs in the Black River valley, agricultural land use practices are also a significant contributor to nutrient and sediment loadings in streams. Additionally, almost one-half of agricultural uses in the watershed are directly related to livestock and its associated products.

In terms of water quality impacts, the *2004 Black River Basin Waterbody Inventory and Priority Waterbodies List* indicates that the following agricultural practices have negatively impacted watershed water quality:

- Nutrient and silt/sediment inputs from agricultural runoff;
- Livestock access to streams, resulting in damage to riparian vegetation, bank erosion, and nutrient inputs;
- Improper manure application;
- Lack of silage leachate control;
- Inputs from manure or milkhouse wastewater treatment facilities;
- Intensive cropping near streams with inadequate riparian buffers;
- Fertilizer and pesticide application without approved pesticide/nutrient management plans.[118]

Additionally, more than 25 percent of waterbodies in the watershed were included on the Priority Waterbody List as a result of agricultural impacts.

GOALS

The following goals have been identified for the *Agricultural Practices & Management* category:

- Maintain viability of agricultural land uses in the Black River watershed, particularly along and within the fertile Black River valley.
- Minimize the negative impacts that some agricultural practices can have on water quality, particularly the movement of sediments and nutrients from agricultural lands to surface waters.

STRATEGIES & RECOMMENDATIONS

Over the past several decades, both the number of farms and the number of acres farmed in the Black River watershed have been decreasing (although the intensity of farming activities has generally increased), with approximately 20 percent fewer farms in 2007 than in 1982. Based on this downward trend, it is apparent that recommendations targeted towards agricultural land uses should focus on improving the environmental management of agricultural practices without placing additional regulatory burdens on farmers.

Thus, the recommendations provided below focus on the voluntary actions of local landowners, such as implementation of Best Management Practices (BMPs) designed to reduce the degradation of water resources through cost-effective means, or through participating in any of the voluntary agricultural management programs provided by New York State. BMPs on agricultural lands include pest, nutrient and waste management, vegetative and tillage practices (e.g., no-till farming), and structural practices (e.g., riparian buffers).

To facilitate their use and application and reduce the negative impact that some agricultural practices can have on water quality, the *Agricultural Practices & Management* recommendations are grouped into three categories:

- Agricultural Environmental Management
- Nutrient Management Planning

- Best Management Practices

More specific information related to the effectiveness of these recommendations can be found in Section 8.4.

Agricultural Environmental Management Program

1. Continue to use and promote the Agricultural Environmental Management (AEM) program as an initial review tool from which additional needs can be determined. The NYS Department of Agriculture and Markets, NYS Soil and Water Conservation Committee, NYS DEC and local SWCD's have been promoting the AEM program as an essential watershed management tool as it has been effective at reducing nitrate inputs. For more information about the AEM Program go to www.nys-soilandwater.org/.

2. Develop a regional funding program to provide financial incentives that can supplement State and federal level funding for improving water quality on agricultural lands in the Black River watershed (for State and federal level funding opportunities, see Section 8.6). This program could be administered by the ICO (see Partnerships & Collaboration Recommendation 2).

Nutrient Management Planning

1. Work with landowners and the AEM program to develop Comprehensive Nutrient Management Plans (CNMPs) where appropriate. The purpose of the CNMP is to manage the production, handling, storage and/or treatment of animal manure and organic byproducts generated in the area(s) of animal concentration and fertilizers; manage the amount, source, form, placement, and timing of the application of these materials to the land; and manage soil erosion. Cost-share assistance for CNMP development is available through State and Federal grant programs. Nutrient management plans can result in nitrogen reductions of up to 70 percent and phosphorus reductions up to 28 percent. Although a CNMP is required for dairy farms with greater than 200 milking cows or 300 heifers, farms below those thresholds have CNMPs on a voluntary basis.
2. Build on existing GIS work to improve watershed data and models so as to incorporate the range of agricultural practices that occur within the Black River watershed, including the development of an updated land cover map based on field verification of agricultural cover types and an updated soil survey.

Best Management Practices

County Soil & Water Conservation Districts work with local farmers to implement best management practices (BMPs) that can improve water quality in the watershed. These BMP's are categorized into operational, vegetative and structural practices defined below:

- *Operational practices*: are practices that involve changes in farm management, usually resulting in a change in day-to-day decision-making. For example, fertilizer management and land applications of manure are examples of operational management practices.

- *Vegetative practices*: increase the amount of herbaceous and/or woody vegetation on a field or critically eroding area. For example, conservation tillage and filter strips increasing the amount of vegetation on or around a field to hold sediment and reduce erosion.
- *Structural practices*: are usually practices that require engineering design, and often control surface runoff which is the primary transporter of most agricultural pollutants. Examples of structural practices include waste storage facilities and waste transfer.

For a more extensive list of BMPs, see Section 8.4.

4.6 Floodplain Management

INTRODUCTION

Floodplain management is the adoption and implementation of a program that provides corrective and preventative measures for reducing flood damage.[119] While these programs may take a variety of forms, typical measures include requirements for zoning, subdivision or building permits, and special-purpose floodplain or stream buffer ordinances. By adopting and enforcing these measures, communities make federally-subsidized flood insurance available to local property owners.

According to FEMA's Community Status Book, of the 56 communities located partially or entirely within the watershed, only one (Town of Montague in Lewis County) is not enrolled in the National Flood Insurance Program (NFIP). All 55 watershed communities enrolled in the NFIP have adopted zoning codes in the form of floodplain overlay districts to assure compliance with NFIP requirements. Most all of the original Flood Insurance Rate Maps in these communities, however, were prepared in the mid-1980s or before and thus may not accurately reflect the flood risks present in the watershed. Moreover, FEMA reports that eleven of the watershed communities have no current flood mapping. The eleven communities include four in Hamilton County (Towns of Arietta, Inlet, Lake Pleasant, and Morehouse), three in Jefferson County (Town of Worth and Villages of Deferiet and Glen Park), and four in Lewis County (Towns of Harrisburg, Pinckney, and West Turin and Village of Castorland).

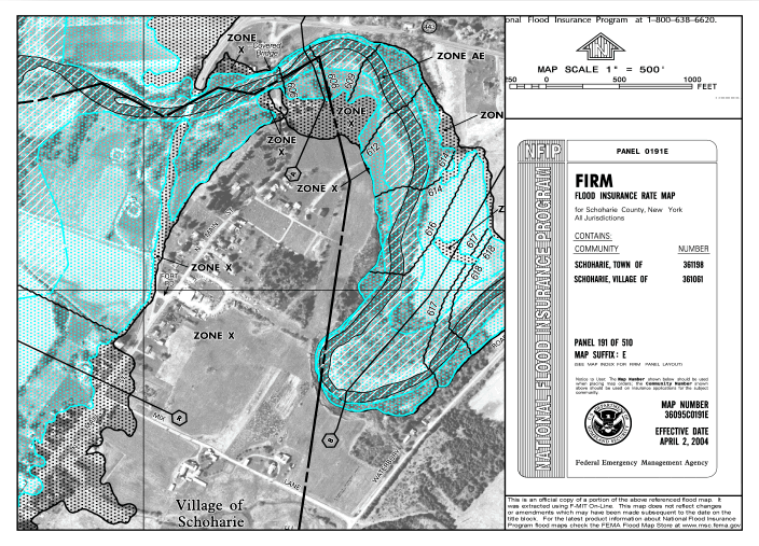
GOALS

The following goals have been identified for the *Floodplain Management* category:

- Improve the preservation of riverine and lacustrine floodplains and shorelines, while reducing damage to private property and public infrastructure from flooding.
- Increase coverage and improve accuracy of floodplain delineation and mapping throughout the Black River watershed.

STRATEGIES & RECOMMENDATIONS

1. Work with the FEMA/NYSDEC Map Modernization Program to provide updated Digital Flood Insurance Rate Maps (DFIRMs). This includes requesting detailed studies of the floodplains within the urbanized portions of the municipalities and approximate studies of the undeveloped portions of the municipalities.
2. Use newly delineated floodplains to better regulate development in some floodplains, in accordance with National Flood Insurance Program (NFIP) regulations. This could include the



New DFIRM Example from the Village of Schoharie

prohibition of clearing, excavating, and developing environmentally sensitive floodplain areas, which can result in less severe flooding events downstream.

3. Maintain, enhance, and increase the connectivity of seasonally-flooded habitats along the Black River by using the newly delineated floodplains to preserve the most sensitive riparian and lacustrine corridors through the prohibition of development, acquisition of development rights, or purchase of easements and rights-of-way. Additionally, clearing, grading, filling, and developing environmentally sensitive floodplain areas should be prohibited.
4. Municipalities should adopt or update their floodplain ordinance by adopting the most current NYSDEC Model Law for Flood Damage Reduction.
5. Provide training to local floodplain administrators and code enforcement officers to increase the capability of local municipalities to effectively manage floodplains and reduce the impacts associated with floodplain development and so that they can adequately enforce their floodplain laws and educate planners and local officials about them. If communities do not adequately enforce their floodplain management regulations by allowing improper development within the floodplain, they can be placed on probation and potentially suspended from the flood insurance program.
6. Ensure that all new construction and substantial improvements meet the NFIP floodplain requirements.

4.7 Forest Management

INTRODUCTION

The Black River watershed comprises a substantial forestry base that spans from the Tug Hill Plateau in the west to the Adirondack Mountains in the east. Lands devoted to the forestry industry are generally owned and managed by logging firms, sawmills, paper mills, finished/secondary wood products processors, and the wood energy industry, although private individuals may also participate

in the industry. Of the more than 700,000 acres of Wild, Conservation, Forest, & Park lands in the Black River watershed, more than 400,000 acres are classified as Forever Wild and ""shall be forever kept as wild forest lands". For those forest lands not classified as Forever Wild, the goal should be to maintain them as working forests. Responsibly managed working forests encompass treed lands that provide many benefits to communities, including a sustainable supply of wood products, jobs for rural communities, wildlife habitat, as well as clean air and water.

As it relates to sustainable forestry practices, the subdivision of large forest areas into smaller tracts can preclude such techniques at the parcel level due to the loss of economies of scale. As a result, some forest landholders are turning to conservation easements and special taxing programs to continue to make the growing of forests for timber affordable by reducing their tax burden and maintaining the ability to actively harvest limited amounts of timber.

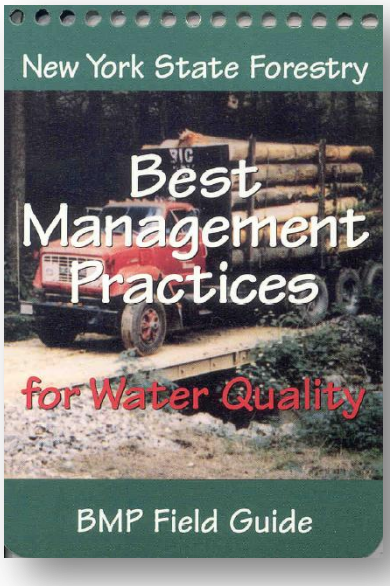
GOALS

The following goals have been identified for the *Forestry Practices* category:

- Ensure the continued viability of forestry in the Black River watershed.
- Minimize the negative impacts that some forestry practices can have on water quality.
- Minimize forest fragmentation

STRATEGIES & RECOMMENDATIONS

1. Work with forest landowners to protect water quality during timber harvesting by promoting existing programs and organizations – New York Forest Owners Association (NYFOA), Cornell Cooperative Extension, NYS DEC's cooperating forester and logger program, NYS DEC's Forestry Best Management Practices for Water Quality, WNY Chapter of the Society of American Foresters, Association of Consulting Foresters, American Forest Foundation (Tree Farm), and the Empire State Forest Products Association.
2. Promote sustainable forestry practices that support water quality and sustainable economic principles, as well as reducing forest fragmentation, for managed forests. Water quality principles include the development of forest management plans, low impact riparian buffers, stream crossings that minimize erosion, properly located haul roads, skid trails and log landings, and steep slope practices. Additionally, to reduce forest fragmentation during timber harvest, minimize the removal of trees adjacent to a stream, minimize new road construction or road widening when harvesting, sufficiently space canopy openings to prevent fragmentation, and do not "open up" more than 10 percent of the total forest area during any one harvest.



The NYS Forestry BMP Field Guide is a practical tool for timber harvesters, forest managers and landowners in helping to protect water quality (available from Cornell Cooperative Extension)

3. Encourage the use of conservation easements on working forest lands. Landowners who place a Conservation Easement on their forest land may be eligible for the NYS Conservation Easement Tax Credit, which provides landowners a 25 percent property tax refund annually up to $5,000 with no impact to local property tax revenues. Municipalities should collaborate with local land trusts to accomplish this recommendation.
4. Address disincentives associated with the NYS Forest Tax Law – 480a program to allow for increased enrollment. Disincentives include the minimum acreage requirement (50 acres), ten-year rolling enrollment commitment penalties, tax assessment classification, and the 6 percent stumpage payment.

4.8 Invasive Species

INTRODUCTION

According to the EPA, invasive species negatively affect agriculture, rangeland, forests, people's homes and yards, human and animal health, food supplies, fishing and boating, outdoor recreation, and many other areas, with total damages in the United States estimated to be as high as $138 billion per year.[120] In terms of water quality, invasive species can affect bank stability, the volume of runoff and its associated pollutant loads, as well as nutrient biogeochemistry and contaminant pathways. Japanese knotweed and giant hogweed, for example, can affect bank stability and erosion rates, while zebra mussels can alter the nutrient cycle and increase the amount of soluble phosphorus and ammonia nitrogen in a given waterbody.

Invasive species cause more than $138 billion in total damages per year in the United States.

Given these impacts, it is becoming increasingly important that watershed managers and stakeholders are knowledgeable of both the terrestrial and aquatic invasive species affecting their watershed so that the appropriate management strategies can be developed. In most cases, elimination of invasive species is essentially impossible once widely established, so that partial or local control and mitigation of effects are the primary options. Where a particular invasive species has not become established in the watershed, aggressive actions should be taken to prevent establishment from occurring.

There are numerous ongoing efforts at the Federal, State, regional, and local level to deal with invasive species issues. At the Federal and State levels, these efforts include reducing the importation of alien species (e.g., via ballast water), compiling information on distribution, life history and control methods of invasive species, distributing information on invasive species, and developing regulations and advisories to reduce transport of invasive species. Federal groups involved in these efforts include the US Department of Agriculture (including the Forest Service), US Department of the Interior (including the US Geological Survey), and NOAA. NYSDEC provides online information on invasive species, compiles literature on invasive species (i.e., New York Invasive Species Clearinghouse), promotes activities such as boat washing, and has recently restricted the use of live bait by anglers to reduce transmission of disease and "bait-bucket" releases of non-native organisms. New York State has also set up regional Partnerships for Regional Invasive Species Management (PRISM) to integrate invasive species management. The western part of the Black River drainage is covered by the St. Lawrence-Eastern Lake Ontario (SLELO) PRISM (www.sleloinvasives.org). The pre-existing The

Adirondack Park Invasive Plant Program (APIPP) was incorporated into this framework, and APIPP covers the Adirondack portion of the Black River drainage (www.adkinvasives.com).

There have been significant local efforts to control invasive species. These ongoing monitoring and removal of Eurasian watermilfoil by the Fulton Chain of Lakes Association is a notable example, as is the recent effort to remove giant hogweed in Lewis County. Additionally, the Nature Conservancy has removed invasive species on local preserves under its management.

There are ongoing programs in other parts of the state to monitor invasive species which are not currently found in the Black River drainage. For example, there has been intensive monitoring of the emerald ash borer since its discovery in western New York in early 2009. These efforts would expand into the drainage following range expansion of the invasive species.

GOALS

The following goals have been identified for the *Invasive Species* category:

- Prevent the establishment of new invasive species in the drainage basin.
- Prevent the introduction of invasive species currently in Lake Ontario into the upper portions of the watershed.
- Provide local control or eradication of invasive species, particularly in ecologically or recreationally important areas.

STRATEGIES & RECOMMENDATIONS

1. Continue to coordinate with SLELO and APIPP to prevent and manage the spread of invasive plants. This should also include providing support to the *iMapInvasives* Consortium (http://imapinvasives.org/) in their efforts to develop an on-line, GIS-based, all-taxa invasive species mapping tool.
2. Develop a local rapid response program to be housed in County SWCD offices that will ensure that appropriate protocols, trained personnel, equipment, permits, and other resources are ready to go to contain or eradicate newly detected invasive plant or animal species as they are reported to or discovered.
3. Develop a methodology to prioritize invasive species control and eradication activities. This should include identifying those species that can be eradicated from the Black River watershed, as well as identifying important sites where local control is important and feasible.
4. Continue to educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials.
5. Provide training to landowners and county and local highway departments in the identification and proper management of invasive plant species. This should include techniques for preventing the spread of these species, as well as the proper methods for safe removal.

6. Educate anglers and other groups about the threats to native fauna posed by the unauthorized introduction of sport fishes into lakes.
7. Provide washing stations at public marinas and boat launches to facilitate the removal of invasive species from boats before and after entering the water. This helps to prevent the transport of invasive species from Lake Ontario into the upper drainage, the transport of species between locations within the drainage, and the export of species from the drainage.
8. Educate local highway departments on how to identify and remove invasive species. Identification and removal of invasive species should occur during routine maintenance operations, as well as during construction.
9. Provide local resources and build capacity in the County Soil and Water Conservation Districts for the eradication of invasive species. Local municipalities and County Soil and Water Conservation Districts should identify local resources to dedicate towards the removal on invasive species in the watershed.
10. Continue surveys to determine occurrence and abundance of invasive species, particularly for Eurasian watermilfoil in Fulton Chain of Lakes.
11. Develop volunteer programs for monitoring and control of invasive plants. These programs should be based on the following:
    a. Control feasible for species that can be controlled by hand cutting (e.g., vines, buckthorn)
    b. Control not feasible for species best controlled by herbicide or dangerous to handle (e.g., Japanese knotweed, giant hogweed)
    c. Control programs can be done by groups with relatively little training over short periods, e.g., service days for groups
    d. Monitoring can be done by trained volunteers doing road surveys (like the Adirondack survey program), trail surveys or boat surveys.
12. Include invasive species control in restoration planning and implementation.

4.9 Planning and Land Use

INTRODUCTION

Water quality is strongly influenced by the type and intensity of land uses that drain into a given waterbody. While each land use type impacts water quality differently, the higher the intensity of uses, the more likely it is that a waterbody will suffer from poor water quality. Waterbodies characterized by poor water quality often require expensive treatments to ensure their continued usability, which, in turn, can result in local tax increases or strained local services. Alternatively, preventing contamination in the first place is one of the least expensive and most effective means to provide high quality water. This is best accomplished through the creation and careful implementation of planning and land use practices that, combined with a commitment to protect water quality, can balance the need for economic development with environmental protection.

As the primary responsibility for ensuring the protection of local water supplies and other important water resources falls on local municipalities, the strategies and recommendations provided in this

section address how communities throughout the Black River watershed can incorporate water quality objectives into their local planning and land use practices. Specific recommendations for each of the 56 watershed municipalities based on a review of existing regulatory and planning documents is provided in Section 1.4.

One of the most powerful tools that municipalities can use to ensure quality water is through the adoption of strong local ordinances. Of the 56 municipalities in the Black River watershed:

- 77 percent have enacted zoning legislation
- 70 percent have enacted subdivision regulations
- 66 percent have enacted site plan review legislation
- 13 percent have enacted none of the above
- 25 percent are located partially or wholly within the Adirondack Park and are thus subject to its land use regulations

As it relates to water quality, approximately two-thirds of watershed communities have adopted local guidelines to protect lakes and streams, with more than one-third strictly regulating activities around these areas. Further, just over half of all communities have regulatory tools that address wetland protection and/or allow or require cluster development to preserve and protect natural resources.

GOALS

The following goal has been identified for the *Planning & Land Use* category:

- Align local planning and land use practices to minimize the water quality impacts of existing and future development in the Black River watershed.
- Incorporate BMPs for improved water quality into local land use ordinances and decision-making.

STRATEGIES & RECOMMENDATIONS

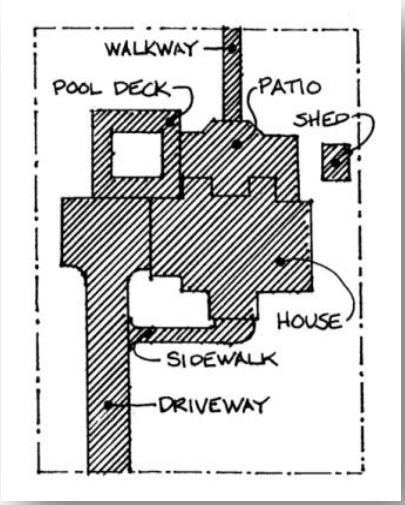
To address the impacts that planning and land use can have on water quality, recommendations were grouped into categories – Regulatory and Planning Activities.

Regulatory Recommendations

The regulatory recommendations provided below are general recommendations and may not apply to every community within the watershed. Regulatory recommendations specific to each municipality can be found in Section 6.2.4.

1. Add language to the Purpose and Objectives section of local zoning ordinances to address environmental objectives, especially concerning the restoration and protection of surface and ground water resources.
2. Add "total impervious surface area" to the definitions section of watershed zoning ordinances. This definition should encompass all impervious surfaces located on a particular plot of land, including, but not limited to structures (primary, accessory, and/or storage), sidewalks, driveways, and patios. This term can replace terms such as "building area" and "lot coverage".

3. Add "shorelines" to the definitions section of local zoning ordinances. This definition should encompass the shorelines of lakes, streams, creeks, ponds, wetlands, and other waterbodies.
4. Watershed municipalities should amend their zoning ordinance to include a detailed list of those design elements that should be included as part of an acceptable site plan submittal. In addition to the standard elements (e.g.; setbacks, location of accessory structures), design elements addressing the proposed development's impact on water resources and quality (e.g., stormwater management plans, soil erosion/sediment control plans, impervious surface coverage) should also be included. There are several model ordinances available for municipal administration of these development controls in New York State, including model floodplain, sewer, and stormwater management ordinances.



All of these features are considered impervious surfaces

5. Watershed municipalities should include the following programmatic elements in their site plan review procedures:
    a. Clearly identify staff responsible for each site plan review element and ensure that there is periodic feedback between the plan review staff and inspection staff to make sure that what is approved on the plans is actually installed and working in the field. This should include engaging organizations such as the Tug Hill Commission, the County SWCDs, or the Adirondack Park Agency as they all have staff members that are able to assist with site plan review.
    b. Track all plans submitted for review, including site plan specifics (e.g.; the size of the site, the review status of the stormwater site plan, other state and federal environmental permits). The system ideally also should track information on inspection and enforcement actions related to that site and identify the construction site operator.
    c. Provide training to plan review staff on local, state, and federal stormwater and other environmental regulatory requirements (e.g.; National Flood Insurance Program, wetlands).
6. Adding a Water Quality Restoration and Protection Overlay (WQO) section to zoning ordinances to encourage natural streambank vegetation.. This overlay district should be located along all waterbody shorelines in a given municipality (consistent with shoreline definition above). Each municipality should identify their own appropriate boundaries during a zoning update process. Include in the WQO provisions for consistent shoreline building and site improvement rules throughout the watershed. These provisions should include the following:
    a. Standards for total impervious surface areas and a requirement for a vegetated water quality buffer along shorelines of streams within the overlay.
    b. Requirements for a naturally vegetated (preserved or planted) water quality buffer a minimum of 50 feet in width adjacent to all shorelines. Provisions should also be

included that require the planting of such a buffer when improvements to an existing shoreline property or structure are proposed, and where such a buffer does not exist.

c. Continue to allow accessory structures of limited size by right if more than 50 feet from shorelines and by special use permit if less than 50 feet from the shoreline. No new or replacement accessory structure should be permitted for placement within 25 feet of the shoreline. The square footage of all accessory structures should count toward the total impervious surface area percentage allowed on a lot.

d. Provisions that trigger environmental site improvements (e.g.; a shoreline water quality buffer) when existing structures and sites are proposed for improvement or expansion. Such site improvements should be required when building improvements or expansions occur or when total impervious surface limitations are exceeded.

e. Additional provisions that address water quality not mentioned above. For example, the land use regulations adopted by the Adirondack Park Agency (APA) could be a model for addressing water quality in certain communities where appropriate.

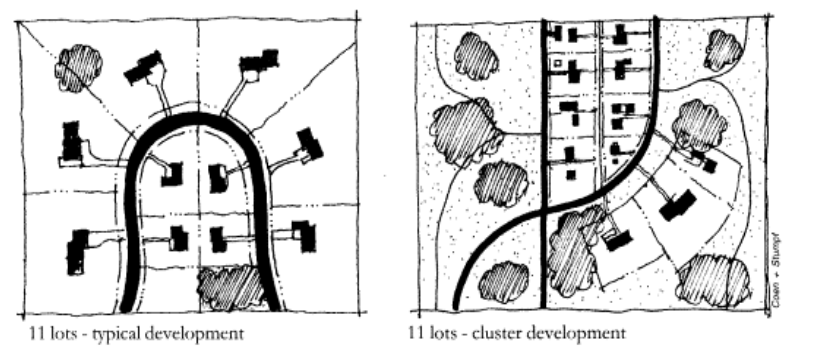
Mowing up to the bank increases runoff into the stream and negatively impacts water quality

A buffer strip of native trees and shrubs between your yard and the stream can improve water quality and reduce streambank erosion

7. Where not currently permitted, watershed municipalities should amend the zoning ordinance to allow cluster development and Planned Unit Development (PUDs). Where currently permitted, municipalities should continue to administer these provisions in accordance with the minimum acreage and density standards that they have determined are appropriate for their community. All cluster development and PUD provisions should include the following provisions:

   a. Cluster development and PUD's should be designed to support environmental objectives such as natural area preservation and stormwater absorption.

   b. Naturally vegetated common open space should be placed in lake or stream side areas of the property to buffer the developed areas of the property from these natural water features.



The cluster development approach results in the same number of lots and an increase in the amount of open space
Source: St. Croix Valley Community Foundation

8. Municipal regulations for mining operations should include environmental standards concerning water quality issues. This should include the use of riparian buffers, minimum distances to waterbodies, and other relevant restrictions.
9. Municipal regulations should prohibit junk yards and junked vehicles near waterbodies, within flood-prone areas and within groundwater recharge areas.
10. Municipalities should adopt and administer a local soil erosion and sedimentation control ordinance in which topsoil stripping and excavation is addressed. The ordinance should provide a means by which county and municipal governments can assure that site planning and development take potential erosion problems into account and include effective measures for their control. While the principal intent of the ordinance is preventive, it should also include provisions for enforcement action where this becomes necessary.
11. Municipalities outside of the Adirondack Park should add their own special building and impervious surface setback requirements from smaller wetlands not protected by the State of New York.
12. Watershed municipalities should enact, where appropriate, large lot zoning requirements that would allow maximum residential densities of 1 unit per 20 acres in areas characterized by agriculture and open space. The purpose of zoning for such large lot sizes is to stabilize the agricultural land base by keeping large tracts of land relatively free of non-farm development and to preserve open space. This can also reduce potential conflicts between farmers and their non-farming neighbors and help to maintain a critical mass of agricultural land and ensure that both agriculture and the local industries that sustain them remain viable. These requirements could be applied to distinct zoning districts or created as an overlay zone (Overlay zones build on the underlying zoning by establishing additional or stricter standards and criteria; the standards of the overlay zone apply in addition to those of the underlying zoning district). [PV, PT]

Planning Activities Recommendations

13. Watershed municipalities should develop protocols and recommendations for green infrastructure such as green roofs, pervious pavement, bio-retention, rain barrels or cisterns,

downspout diversions, rain gardens, soil reconditioning, native landscaping, and urban tree canopy expansion.

14. Identifying important natural resources and setting protection priorities provides a framework within which the impacts of proposed or existing development can be evaluated. Watershed municipalities and counties should incorporate the findings of the *Black River Watershed Management Plan* into their comprehensive planning efforts.
15. Work with local landowners to increase the amount of naturally vegetated riparian areas throughout the watershed. This can be accomplished through the use/development of incentive programs (e.g., annual payments, reduced tax assessments, etc.) or stream protection ordinances.

Municipalities should promote the use of green infrastructure for stormwater management

16. Work with local landowners, land trusts, and watershed counties and municipalities to develop a program for acquiring conservation easements on environmentally important lands such as Special Areas.
17. Ensure that appropriate mitigation measures (e.g., land conservation, avoidance of sensitive environmental resources) are in place for all infrastructure expansion projects.
18. Conduct additional detailed management studies and field assessments (i.e. streambank assessments) for those high priority subwatersheds identified in this management plan. This should include studies to build on existing GIS work to improve watershed data and models so as to incorporate the range of agricultural practices that occur within the Black River watershed, including the development of an updated land cover map based on field verification of cover types.

4.10 Recreation

INTRODUCTION

Given the beauty of the natural environment in the Black River watershed, combined with the relatively undeveloped, rural character of the region, it should come as no surprise that outdoor recreation opportunities add to the watershed's quality of life and play an important role in the region's economy. While more traditional pastimes are still popular in the watershed (e.g., boating, fishing, hunting, and hiking), the region's expansive network of trails has made ATV and snowmobile use increasingly popular. Snowmobiling is one of the largest generators of tourism dollars in the Black River watershed, with traffic in recent years increasing significantly. ATV use is also widely popular in the watershed, although much of the ridership is locally generated and does not draw as many out-of-state tourists. Both have considerable implications on water quality, as off-road vehicles have a disproportionate impact on the environment compared to many traditional forms of recreation.

GOALS

The following goal has been identified for the *Recreation* category:

- Ensure that recreation in the Black River watershed occurs in a responsible manner and does not negatively affect water quality.

Recreational opportunities are one of the primary reasons people choose to live in and visit the Black River watershed

STRATEGIES & RECOMMENDATIONS

The following recommendations have been arranged by the following user groups:

- Water-based recreation;
- Camping and hiking; and
- Off-road vehicle recreation.

Water-Based Recreation Recommendations

1. To prevent the spread of invasive and exotic species to and within the Black River watershed, boaters should inspect and clean their boats and trailers after exiting a waterbody.
2. All fueling and maintenance activities associated with motorized watercraft should be conducted on the trailer and not over the water. This will prevent harmful chemicals and petroleum products from entering the water and degrading water quality.
3. Commercial establishments that service motorized watercraft should locate their fuel storage tanks as far from the waterfront as possible. This will reduce the potential for waterbody contamination resulting from accidental spills or storage equipment failures.
4. Reduce boat wakes to prevent shoreline damage and erosion. Excessive boat wake and propeller wash can physically destroy shorelines and streambanks, which increases the sedimentation and turbidity of the water column and introduces nutrient-laden sediment that can promote algal blooms that further reduce habitat and water quality.
5. Anglers should fish responsibly by following the legal take limits and not depositing fish entrails or parts into waterbodies or shorelines.

Camping and Hiking Recommendations

Camping and hiking can have a large impact on the natural environment if not done in a responsible manner. Leave No Trace (LNT) is an internationally recognized program developed to assist outdoor enthusiasts in reducing the environmental impacts of their activities. LNT provides a wide range of recommendations that campers and hikers can incorporate into their recreational activities to reduce their impact on water quality. In addition to those recommendations provided below, further information can be found at www.lnt.org:

1. Be aware of the regulations and any special concerns for the area.
2. Avoid times of peak use and visit in small groups.

3. Travel and camping should be on established trails and campsites, rock, gravel, dry grasses or snow.
4. Camp sites, dishwashing, and latrines should be at least 200 feet from the nearest waterbody.
5. When you leave, pack out what you packed in, including all trash, leftover food, and litter.
6. Be considerate of other visitors and respect their desire for a quality experience.

Stick to established trails when hiking

Off-Road Vehicle Recreation Recommendations

1. Travel responsibly on roads, trails, and permitted areas. Always stay on existing roads and trails and do not make new trails.
2. Avoid sensitive areas like meadows, lakeshores, steep slopes, gullies, wetlands, and streams unless on a designated route. Frozen waterways and lakes should also be avoided.
3. Do your part to leave the area better than you found it. Pack out what you pack in.
4. Avoid "spooking" livestock and wildlife and keep your distance, particularly during winter months and breeding seasons.
5. Minimize harmful emissions and prevent unnecessary noise by keeping your engine in tune and minimizing the revving of engines.

4.11 Watershed Residents

INTRODUCTION

Everyone lives in a watershed. Watersheds are where we work and where we play. Everything we do on the land impacts the quality of water on which we rely for drinking, irrigation, and industry. From the disposal of household and yard wastes to the maintenance of healthy, native streamside buffers, residents of the Black River watershed play a major role in improving and maintain water quality in the basin. With more than 60,000 people residing in the watershed, there are several key actions that residents of the Black River watershed can take to improve water quality in the basin.

GOALS

The following goal has been identified for the *Watershed Residents* category:

- Reduce the impact that watershed households have on water quality.

STRATEGIES & RECOMMENDATIONS

1. Minimize the impact that individual households can have on water quality. There are a multitude of small changes that households can make that, collectively, can have a large impact

on water quality. households should make sure that pesticides and chemicals, automotive wastes, grass clippings and yard waste, pet and animal manure, and winter salt and de-icers are stored in areas not accessible by stormwater and are disposed of properly when no longer needed (not down a drain or into streams, septics, or stormwater collection systems). Additionally, using alternatives such as "green" household products, or reusing and recycling hazardous fluids and other products can reduce the amount of waste produced in the first place. Watershed residents can also reduce their effective imperviousness by installing rain barrels or rain gardens on their property, which will reduce the amount of overland runoff and the pollutants it carries.

Rain barrels collect and store water from roofs that would otherwise be lost to runoff and diverted to storm drains or streams

2. Watershed residents should get involved in their communities and watershed. Community involvement is a vital component in developing and implementing a successful watershed management plan. Public meetings, hearings, and workshops are excellent opportunities for residents to learn about what is occurring in their watershed, ask questions, and express concerns about water quality. By becoming involved in local land use decisions, residents can encourage local officials to consider how these activities affect the watershed. Each individual has a different set of skills and interests, so there are a variety of ways that residents can volunteer time – participating in streamside clean-up activities, monitoring water quality in local streams, or educating children about watersheds and water quality.
3. Watershed residents not part of a municipal wastewater treatment system should ensure that their on-site septic systems are properly maintained. While on-site treatment can be a cost-effective solution, it requires regular inspection and maintenance to ensure it functions properly and does not fail. Failing to maintain these systems can result in untreated wastewater being introduced into streams. This negatively affects water quality by increasing the amount of pollutants, which leads to water that is unattractive and unsuitable for use.
4. Watershed residents that reside along a stream, lake or other waterbody should maintain a healthy, native vegetated buffer of at least 50 feet between the yard and the waterbody. By trapping soil and sediments, these buffers can reduce the amount of soil and nutrients moving from upslope areas into streams, thus improving water quality, reducing streambank erosion, and decreasing the loss of in-stream habitat through siltation. Other ways in which residents can maintain healthy, native streamside buffers include:
    a. Create a "no-mow" zone, allowing the buffer strip to grow freely
    b. Gather grass clippings in a designated area in the corner of your yard as far from the streambank as possible,
    c. Remove large debris from the stream channel that are causing erosion, and
    d. Remove invasive and non-native plants.

5 Subwatershed Recommendations and Implementation

5.1 Introduction

The following are the subwatershed-specific recommendations for each of the 19 subwatershed comprising the Black River subwatershed. These recommendations and strategies were developed according to the characterizing features of each subwatershed as identified in Sections 2 and 3, particularly those features that have the greatest impact on water quality. These are intended to build upon the general recommendations provided in Section 4 and provide the second level of recommendations for the watershed. The discussion of each subwatershed begins with a list of the issues affecting water quality in that specific drainage basin, followed by those recommendations and best management practices (BMPs) identified as being most appropriate for addressing those issues. Subwatersheds are organized in order of their priority ranking as developed in Section 3.2.

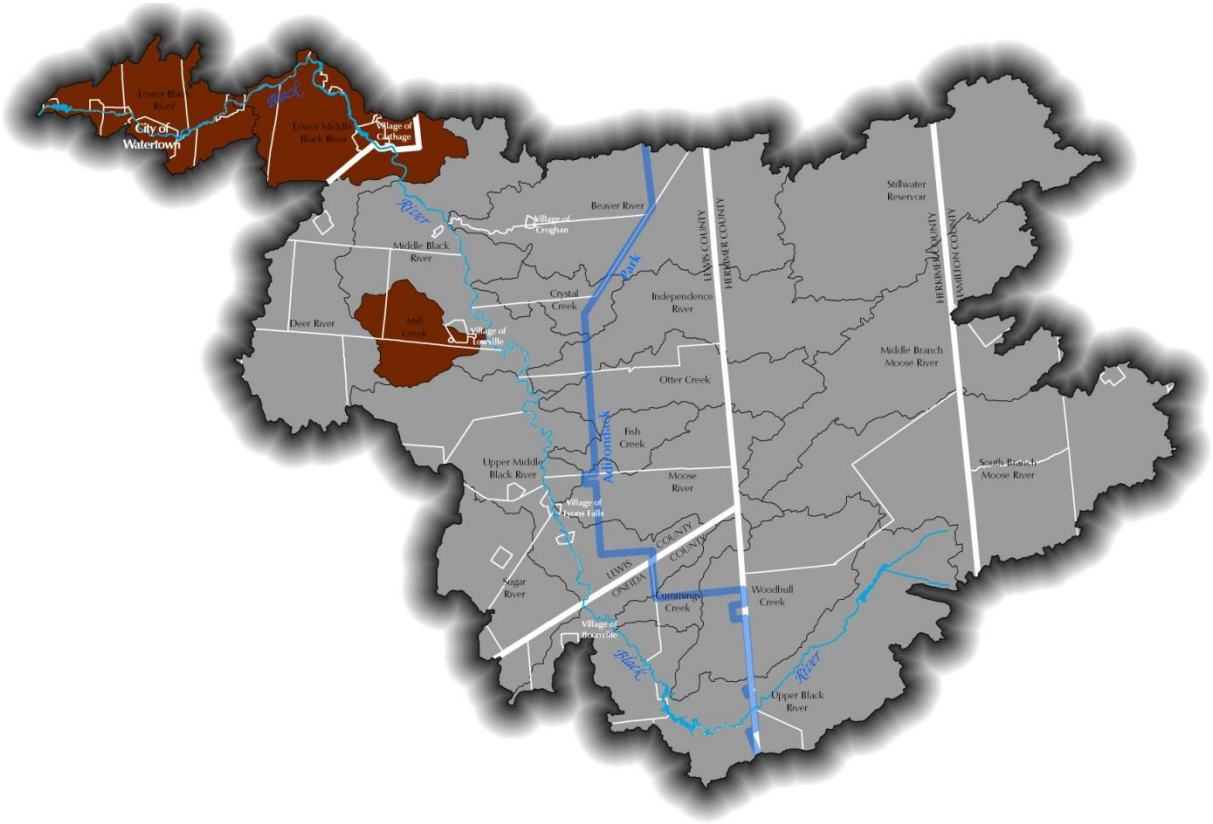
The recommendations identified below focus on the key issues facing each subwatershed and are not intended to provide a comprehensive list of everything that could be done. These recommendations were prioritized within each subwatershed based on the level of impact of a given key issue (e.g.; limiting nutrient runoff from developed lands is more important in the Lower Black River subwatershed than it is in the Moose River subwatershed). This is not meant to imply that other recommendations or Best Management Practices (BMPs) cannot be used, but that those listed below serve to remediate some of the higher priority issues at the subwatershed level.

In addition to the recommendations provided in the sections below, many, if not all of the General Recommendations for Watershed Health discussed in Section 4 also apply to these subwatersheds.

5.2 High Priority Subwatersheds

Three subwatersheds were classified as High Priority based on the results of the subwatershed analysis:

- Lower Black River subwatershed (total score = 105.5)
- Mill Creek subwatershed (total score = 96)
- Lower Middle Black River subwatershed (total score = 89.5)



High Priority (red) Subwatersheds of the Black River Watershed

LOWER BLACK RIVER SUBWATERSHED (105.5)

The following 11 municipalities are wholly or partially located within the Lower Black River subwatershed:

- City of Watertown
- Town of Brownville
- Town of Hounsfield
- Town of LeRay
- Town of Pamelia
- Town of Rutland
- Town of Watertown
- Village of Black River
- Village of Brownville
- Village of Dexter
- Village of Glen Park

Summary of Key Characteristics

Key characteristics of the Lower Black River subwatershed:

- Almost 40 percent of the total population of the Black River watershed resides in this subwatershed.
- Almost 19 percent of this subwatershed is characterized by urban development, most of which is associated with the City of Watertown and its surrounding communities. This is the largest amount of urban development of all 19 subwatersheds.
- Approximately 40 percent of the lands in this subwatershed are in agricultural production, three-quarters of which are classified as hay/pasture lands.
- Less than 17 percent of this subwatershed is classified as forest.
- Only 40 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- There are very few publicly-owned lands within this subwatershed.

Summary of Key Issues

Key issues affecting water quality in the Lower Black River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 3.25 kilograms per acre. This is slightly lower than the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 54 percent comes from hay/pasture lands and 24 percent from developed lands. This subwatershed also realizes relatively high loads from on-site septic systems.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.21 kilograms per acre. This is almost double the impairment threshold value of 0.12 kilograms per acre

identified in Section 2.5.4. Of the total phosphorous load, 55 percent comes from hay/pasture lands and 20 percent from developed lands.

- *High Erosion Areas* – This subwatershed is characterized by a large amount of erodible soils located in areas of steep slopes. Based on the results of the AVGWLF model, 38 percent of the total sediment load in this subwatershed results from croplands, 31 percent from streambanks, and 21 percent from hay/pasture lands.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Waters*.
- This subwatershed has a large number of potential and documented occurrences of threatened and endangered species. While this does not directly affect water quality, it does indicate the need for habitat preservation.

Priority Recommendations

Key recommendations for the Lower Black River subwatershed:

- Agricultural landowners should work with their County SWCD to enact hay/pasture land Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands (see Sections 4.5 and 8.4).
- Incorporate effective stormwater management practices into new construction and existing developments. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems (see Sections 4.3 and 4.9).
- Improve stormwater management on paved and unpaved roads (see Sections 4.3 and 4.9).
- Adopt and administer a local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.9).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.9).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands. This should be accomplished using BMPs based on in-field conditions.
- Local counties, municipalities, and land trusts should work with local landowners to increase the amount of naturally vegetated riparian areas throughout the watershed (see Sections 4.9 and 4.11).
- The subwatershed has relatively little public land, despite the occurrence of important habitats (e.g., grasslands). Local counties, municipalities, and land trusts should work with landowners to acquire conservation easements on environmentally sensitive lands in this subwatershed (see Section 4.9).

MILL CREEK SUBWATERSHED (96)

Portions of the following four municipalities are wholly or partially located within the Mill Creek subwatershed:

- Town of Harrisburg
- Town of Lowville
- Town of Martinsburg
- Village of Lowville

Summary of Key Characteristics

Key characteristics of the Mill Creek subwatershed:

- More than 60 percent of the lands in this subwatershed are in agricultural production, two-thirds of which are classified as hay/pasture lands.
- Approximately 23 percent of this subwatershed is classified as forest.
- Less than 50 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- There are very few publicly-owned lands within this subwatershed.

Summary of Key Issues

Key issues affecting water quality in the Mill Creek subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 4.17 kilograms per acre. This is above the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 45 percent comes from hay/pasture lands and 47 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.21 kilograms per acre. This is almost double the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 43 percent comes from hay/pasture lands and 50 percent from developed lands.
- *High Erosion Areas* – This subwatershed is characterized by a large amount of erodible soils located in areas of steep slopes. Based on the results of the AVGWLF model, 56 percent of the total sediment load in this subwatershed results from hay/pasture lands, 28 percent from croplands, and 12 percent from streambanks.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water*.
- *NYSDEC TMDL Requirement* –TMDLs are required for waterbodies within this subwatershed.

Priority Recommendations

Key recommendations for the Mill Creek subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands (see Sections 4.5 and 8.4).
- Reduce access of livestock to streams and stream banks vulnerable to erosion (see Sections 4.5 and 8.4).
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands. This should be accomplished using BMPs based on in-field conditions.
- Local counties, municipalities, and land trusts should work with local landowners to increase the amount of naturally vegetated riparian areas throughout the watershed (see Sections 4.9 and 4.11).
- Improve stormwater management on paved and unpaved roads, particularly in areas characterized by steep slopes associated with the Tug Hill Transition zone (see Section 4.3).
- Work with NYSDEC to complete TMDL work on Mill Creek/South Branch and tributaries (Water Index No. Ont. 19-51), including researching for specific, BMPs actions and programs that would assist in either meeting upcoming TMDL load allocations for nonpoint sources or addressing the impairment without establishing the BMP (4b alternative: http://www.epa.gov/owow/tmdl/results/pdf/36monschein_wef07_paper7.pdf). The segment consists of Mill Creek and its tributaries from its confluence with the Black River to Lowville. The segment is impaired by both nutrients and pathogens from agricultural sources (see Section 4.2)
- Incorporate effective stormwater management and erosion control practices into new construction (see Sections 4.3 and 4.9). This is important to this subwatershed as its upper portions are located on the Tug Hill Plateau, which may experience greater land use pressures for energy development (e.g., wind energy, logging, development of biofuel areas). These activities could affect water quality if done on steep slopes or near streams.

LOWER MIDDLE BLACK RIVER SUBWATERSHED (89.5)

Portions of the following 11 municipalities are wholly or partially located within the Lower Middle Black River subwatershed:

- Town of Champion
- Town of Croghan
- Town of Denmark
- Town of LeRay
- Town of Rutland
- Town of Wilna
- Village of Black River
- Village of Carthage
- Village of Deferiet
- Village of Herrings
- Village of West Carthage

Summary of Key Characteristics

Key characteristics of the Lower Middle Black River subwatershed:

- Almost 17 percent of the total population of the Black River watershed resides in this subwatershed.
- More than 7 percent of this subwatershed is characterized by urban development, most of which is associated with Fort Drum and its surrounding communities. This is the second largest amount of urban development of all 19 subwatersheds.
- Approximately 30 percent of the lands in this subwatershed are in agricultural production, two-thirds of which are classified as hay/pasture lands.
- Less than 30 percent of this subwatershed is classified as forest.
- Approximately 50 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- There are very few publicly-owned lands within this subwatershed.

Summary of Key Issues

Key issues affecting water quality in the Lower Middle Black River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 2.61 kilograms per acre. This is below the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 51 percent comes from hay/pasture lands, 18 percent from croplands, and 10 percent from developed lands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.16 kilograms per acre. This is above the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 50 percent comes from hay/pasture lands and 21 percent from croplands, and 10 percent from developed lands.

- *High Erosion Areas* – This subwatershed is characterized by a large amount of erodible soils located in areas of steep slopes. Based on the results of the AVGWLF model, 35 percent of the total sediment load in this subwatershed results from transition lands (e.g., bare lands, construction sites), 24 percent from croplands, and 25 percent from streambanks.
- *Projected Increase in Urban Lands* – Urban lands within this subwatershed are projected to increase by 7.7 percent from 2000 to 2020.
- *Known Hotspot Areas* – This subwatershed has a high concentration of SPDES sites and/or unremediated waste sites when compared with the other 18 subwatersheds. Additionally, as noted in Section 2.5.4, there are several key sites along the Black River with known PCB contamination.

Priority Recommendations

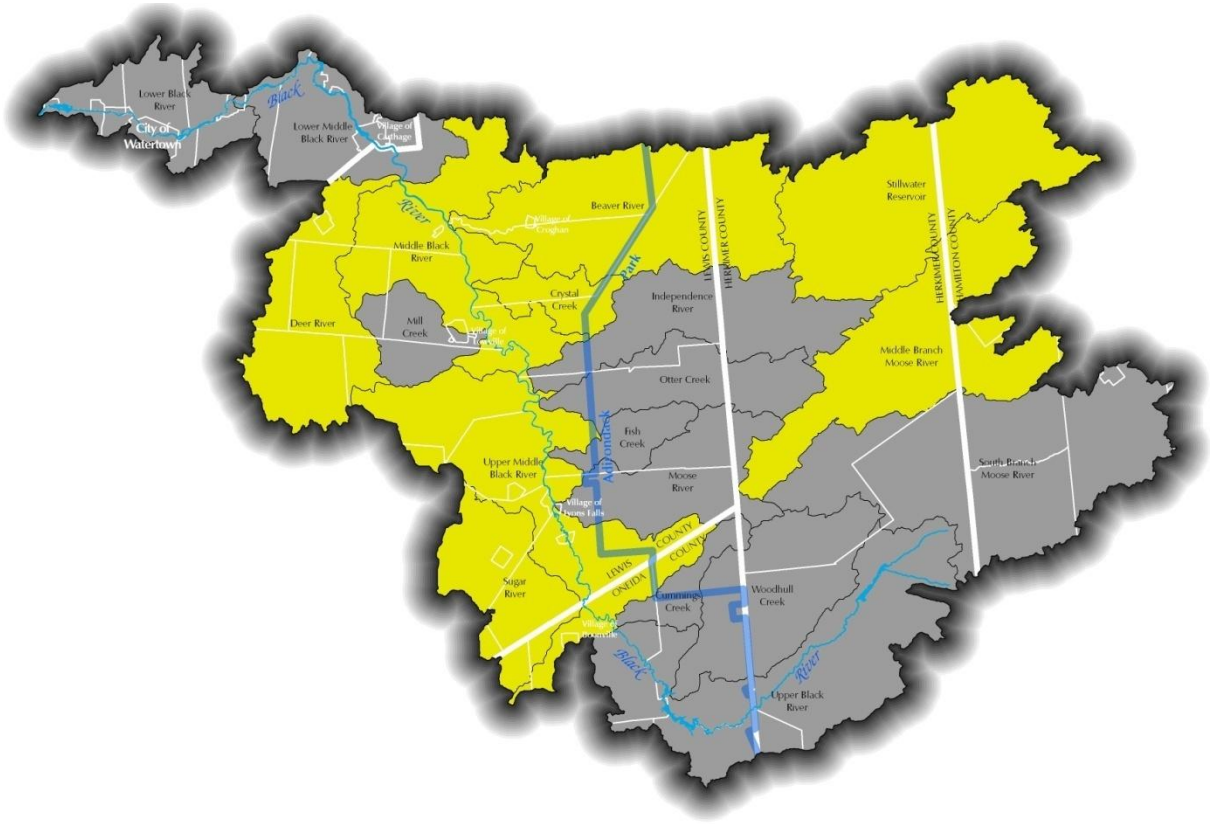
Key recommendations for the Lower Middle Black River subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands. These BMPs should focus on the reducing the nutrient loads from livestock (see Sections 4.5 and 8.4).
- Incorporate effective stormwater management practices into new construction and existing developments. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems (see Section 4.3).
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands. This should be accomplished using BMPs based on in-field conditions.
- Local counties, municipalities, and land trusts should work with local landowners to increase the amount of naturally vegetated riparian areas throughout the watershed (see Sections 4.9 and 4.11).
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.9).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.9).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).
- Continue remediation activities on unremediated hazardous waste/contaminated materials sites, including the PCB-contaminated sites noted in Section 2.5.4 (see Section 4.2).

5.3 Medium Priority Subwatersheds

Eight subwatersheds were identified as being of Medium Priority:

- Sugar River subwatershed (total score = 77.5)
- Middle Black River subwatershed (total score = 74.5)
- Upper Middle Black River subwatershed (total score = 69.5)
- Beaver River subwatershed (total score = 68.5)
- Crystal Creek subwatershed (total score = 61)
- Deer River subwatershed (total score = 53.5)
- Middle Branch Moose River subwatershed (total score = 51)
- Stillwater Reservoir subwatershed (total score = 50)



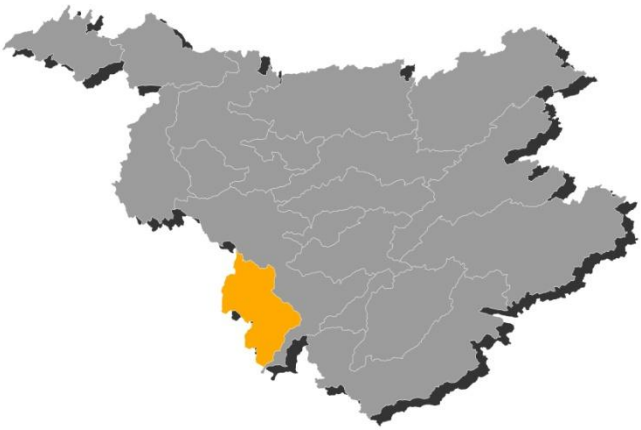
Medium Priority (yellow) Subwatersheds of the Black River Watershed

This page intentionally left blank

SUGAR RIVER SUBWATERSHED (77.5)

Portions of the following seven municipalities are wholly or partially located within the Sugar River subwatershed:

- Town of Ava
- Town of Boonville
- Town of Lewis
- Town of Leyden
- Town of Turin
- Town of West Turin
- Village of Constableville



Summary of Key Characteristics

Key characteristics of the Sugar River subwatershed:

- Approximately 38 percent of the lands in this subwatershed are in agricultural production, the majority of which are classified as hay/pasture lands.
- Almost 50 percent of this subwatershed is classified as forest.
- Approximately 70 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- There are very few publicly-owned lands within this subwatershed.
- This subwatershed receives the second largest amount of annual precipitation of all 19 subwatersheds.

Summary of Key Issues

Key issues affecting water quality in the Sugar River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 3.73 kilograms per acre. This is above the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 76 percent comes from hay/pasture lands and 21 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.22 kilograms per acre. This is almost double the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 76 percent comes from hay/pasture lands and 22 percent from croplands.
- *Livestock per Acre* – This subwatershed has the highest number of livestock per acre of subwatershed area (tied for first with the Mill Creek subwatershed.
- *High Erosion Areas* – This subwatershed is characterized by a large amount of erodible soils located in areas of steep slopes. Based on the results of the AVGWLF model, 37 percent of the total sediment load in this subwatershed results from croplands, 32 percent from streambanks, and 27 percent from hay/pasture.

Priority Recommendations

Key recommendations for the Sugar River subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands. These BMPs should focus on the reducing the nutrient loads form livestock (see Sections 4.5 and 8.4).
- Reduce access of livestock to streams and stream banks vulnerable to erosion (see Sections 4.5 and 8.4).
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands. This should be accomplished using BMPs based on in-field conditions.
- Improve stormwater management on paved and unpaved roads, particularly in areas characterized by steep slopes (see Section 4.3).

MIDDLE BLACK RIVER SUBWATERSHED (74.5)

Portions of the following nine municipalities are wholly or partially located within the Middle Black River subwatershed:

- Town of Croghan
- Town of Denmark
- Town of Harrisburg
- Town of Lowville
- Town of Martinsburg
- Town of New Bremen
- Town of Watson
- Village of Castorland
- Village of Lowville

Summary of Key Characteristics

Key characteristics of the Middle Black River subwatershed:

- Almost 11 percent of the total population of the Black River watershed resides in this subwatershed.
- Approximately 40 percent of the lands in this subwatershed are in agricultural production, with more than half classified as hay/pasture lands.
- Approximately one-third of this subwatershed is classified as forest.
- Approximately 55 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- There are very few publicly-owned lands within this subwatershed.

Summary of Key Issues

Key issues affecting water quality in the Middle Black River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 2.83 kilograms per acre. This is below the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 48 percent comes from hay/pasture lands and 37 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.14 kilograms per acre. This is above the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 48 percent comes from hay/pasture lands and 43 percent from croplands.
- *Livestock per Acre* – This subwatershed has a large number of livestock per acre of subwatershed area.

Priority Recommendations

Key recommendations for the Middle Black River subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands (see Sections 4.5 and 8.4).
- Reduce access of livestock to streams and stream banks vulnerable to erosion (see Sections 4.5 and 8.4).
- Local counties, municipalities, and land trusts should work with local landowners to increase the amount of naturally vegetated riparian areas throughout the watershed (see Sections 4.9 and 4.11).
- Maintain, enhance, and increase the connectivity of seasonally-flooded habitats along the Black River by using newly delineated floodplains to preserve the most sensitive riparian and lacustrine corridors through the prohibition of development, acquisition of development rights, or purchase of easements and rights-of-way. Additionally, clearing, grading, filling, and developing environmentally sensitive floodplain areas should be prohibited (see Section 4.6 and 4.9)
- Incorporate effective stormwater management practices into new construction and existing developments. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems (see Section 4.3).
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.9).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.9).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.4).
- Continue remediation activities on unremediated hazardous waste/contaminated materials sites (see Section 4.2).
- Work with NYSDEC to complete assessments of "Unassessed" streams. "Unassessed" streams are segments where there is insufficient water quality information available to assess the support of designated uses (see Section 4.2).

UPPER MIDDLE BLACK RIVER SUBWATERSHED (69.5)

Portions of the following 14 municipalities are wholly or partially located within the Upper Middle Black River subwatershed:

- Town of Ava
- Town of Boonville
- Town of Forestport
- Town of Greig
- Town of Leyden
- Town of Lyonsdale
- Town of Martinsburg
- Town of Turin
- Town of Watson
- Town of West Turin
- Village of Boonville
- Village of Lyons Falls
- Village of Port Leyden
- Village of Turin

Summary of Key Characteristics

Key characteristics of the Upper Middle Black River subwatershed:

- A small portion of this subwatershed is located within the Adirondack Park.
- Approximately 21 percent of the lands in this subwatershed are in agricultural production, with just under two-thirds being classified as hay/pasture lands.
- Approximately 51 percent of this subwatershed is classified as forest.
- 75 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Upper Middle Black River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 2.40 kilograms per acre. This is below the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 42 percent comes from hay/pasture lands and 36 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.15 kilograms per acre. This is above the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 42 percent comes from hay/pasture lands and 40 percent from croplands.
- *High Erosion Areas* – This subwatershed is characterized by a large amount of erodible soils located in areas of steep slopes. Based on the results of the AVGWLF model, 53 percent of

the total sediment load in this subwatershed results from streambanks and 24 percent from croplands.

Priority Recommendations

Key recommendations for the Upper Middle Black River subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands (see Sections 4.5 and 8.4).
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands. This should be accomplished using BMPs based on in-field conditions.
- Continue remediation activities on unremediated hazardous waste/contaminated materials sites (see Section 4.2).
- Incorporate effective stormwater management practices into new construction and existing developments. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems (see Section 4.3).
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

BEAVER RIVER SUBWATERSHED (68.5)

Portions of the following five municipalities are wholly or partially located within the Beaver River subwatershed:

- Town of Croghan
- Town of New Bremen
- Town of Watson
- Town of Webb
- Village of Croghan

Summary of Key Characteristics

Key characteristics of the Beaver River subwatershed:

- This subwatershed is situated in four distinct ecozones, including the Black River Valley, Central Adirondacks, Western Adirondack Foothills, and Western Adirondack Transition ecozones.
- Approximately one-half of this subwatershed is located within the Adirondack Park.
- Only 10 percent of the lands in this subwatershed are in agricultural production, three-quarters of which are classified as hay/pasture lands.
- Almost two-thirds of this subwatershed is classified as forest.
- Approximately 75 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).
- 40 percent of the lands in this subwatershed are publicly owned.

Summary of Key Issues

Key issues affecting water quality in the Beaver River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.
- *NYSDEC TMDL Requirement* – TMDLs are required for waterbodies within this subwatershed.
- *Known Hotspot Areas* – This subwatershed had a high concentration of SPDES sites and/or unremediated waste sites when compared with the other 18 subwatersheds.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water* resulting from atmospheric deposition.

Priority Recommendations

Key recommendations for the Beaver River subwatershed:

- Work with NYSDEC to complete TMDL work on the Lower Beaver River and tributaries (Water Index No. Ont. 19-40 (portion 1). The segment consists of the Lower Beaver River and all of its tributaries from it mouth upstream to Beaver Falls. The segment is impaired by both dissolved oxygen and pathogens from on-site waste treatment systems. The NYSDEC has proposed to delist the Beaver River as a result of the new wastewater treatment plant in the Town of Croghan.
- Continue remediation activities on unremediated hazardous waste/contaminated materials sites (see Section 4.2).
- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands. Although the subwatershed has relatively little agricultural lands, nutrient inputs per acre from pastures, hayfields and cropfields are estimated to be relatively large (see Sections 4.5 and 8.4).
- Flows in the Beaver River are highly modified for hydropower generation. Flow requirements have reduced many ecological impacts of flow modification. Periodic assessment of possible effects of flow management should be conducted.
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control (see Section 4.2).

CRYSTAL CREEK SUBWATERSHED (61.0)

Portions of the following two municipalities are wholly or partially located within the Crystal Creek subwatershed:

- Town of New Bremen
- Town of Watson

Summary of Key Characteristics

Key characteristics of the Crystal Creek subwatershed:

- A portion of this subwatershed is located in the Adirondack Park
- Only 12 percent of the lands in this subwatershed are in agricultural production, two-thirds of which are classified as hay/pasture lands.
- Almost two-thirds of this subwatershed is classified as forest.
- Approximately 18 percent of this subwatershed is classified as wetland.
- More than 90 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Crystal Creek subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 1.38 kilograms per acre. This is below the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 64 percent comes from hay/pasture lands and 20 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.10 kilograms per acre. This is just below the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 65 percent comes from hay/pasture lands and 23 percent from croplands.
- *Percent in a Groundwater Recharge Area* – Approximately 83.4 percent of this subwatershed is located within a groundwater recharge area.

Priority Recommendations

Key recommendations for the Crystal Creek subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands. Although the subwatershed has relatively little agricultural lands, nutrient inputs per acre from hay/pasture lands are estimated to be relatively large (see Sections 4.5 and 8.4).

- Incorporate effective stormwater management practices into new construction and existing developments. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems (see Section 4.3).
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

DEER RIVER SUBWATERSHED (53.5)

Portions of the following seven municipalities are wholly or partially located within the Deer River subwatershed:

- Town of Denmark
- Town of Harrisburg
- Town of Martinsburg
- Town of Montague
- Town of Pinckney
- Town of Worth
- Village of Copenhagen

Summary of Key Characteristics

Key characteristics of the Deer River subwatershed:

- This subwatershed receives the largest amount of annual precipitation of all 19 subwatersheds.
- One-third of all lands in this subwatershed are under public ownership.
- Approximately 17 percent of the lands in this subwatershed are in agricultural production, two-thirds of which are classified as hay/pasture lands.
- Almost 50 percent of this subwatershed is classified as forest.
- More than 25 percent of this subwatershed is classified as wetland.
- More than 85 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Deer River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a total nitrogen load of 1.75 kilograms per acre. This is below the impairment threshold value of 3.49 kilograms per acre identified in Section 2.5.4. Of the total nitrogen load, 73 percent comes from hay/pasture lands and 17 percent from croplands.
- *Total Phosphorus Load* – This subwatershed realizes a total phosphorus load of 0.11 kilograms per acre. This is just below the impairment threshold value of 0.12 kilograms per acre identified in Section 2.5.4. Of the total phosphorous load, 74 percent comes from hay/pasture lands and 19 percent from croplands.

Priority Recommendations

Key recommendations for the Deer River subwatershed:

- Agricultural landowners should work with their County SWCD to enact Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands. Although the subwatershed has relatively little agricultural lands, nutrient inputs per acre from hay/pasture lands are estimated to be relatively large (see Sections 4.5 and 8.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). This is important to this subwatershed as its upper portions are located on the Tug Hill Plateau, which may experience greater land use pressures for energy development (e.g., wind energy, logging, development of biofuel areas). These activities could affect water quality if done on steep slopes or near streams. Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).
- Continue the habitat restoration activities at the Sears Pond State Forest in Lewis County. This 5,648-acre state forest is named for a former large sawmill impoundment and contains the headwaters to sections of both the Deer River and the Mad River.

MIDDLE BRANCH MOOSE RIVER SUBWATERSHED (51.0)

Portions of the following four municipalities are wholly or partially located within the Middle Branch Moose River subwatershed:

- Town of Inlet
- Town of Long Lake
- Town of Ohio
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Middle Branch Moose River subwatershed:

- This subwatershed is located entirely in the Adirondack Park.
- Almost two-thirds of all lands in this subwatershed are under public ownership.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Approximately 60 percent of this subwatershed is classified as forest.
- Almost 25 percent of this subwatershed is classified as wetland.
- More than 75 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Middle Branch Moose River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.
- *Habitat & Biota* – This subwatershed has a large amount of special habitat areas.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water* resulting from atmospheric deposition.

Priority Recommendations

Key recommendations for the Middle Branch Moose River subwatershed:

- Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control (see Section 4.2).
- Provide washing stations at public marinas and boat launches to facilitate the removal of invasive species from boats before and after entering the water. This helps to prevent the transport of invasive species from Lake Ontario into the upper drainage, the transport of

species between locations within the drainage, and the export of species from the drainage (see Section 4.8).

- Educate anglers and other groups about the threats to native fauna posed by the unauthorized introduction of sport fishes into lakes (see Section 4.8).
- Educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials (see Section 4.8).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).

STILLWATER RESERVOIR SUBWATERSHED (50.0)

Portions of the following two municipalities are wholly or partially located within the Stillwater Reservoir subwatershed:

- Town of Long Lake
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Stillwater Reservoir subwatershed:

- This subwatershed is located entirely in the Adirondack Park and contains a large reservoir (6,700 acres)
- More than 75 percent of all lands in this subwatershed are under public ownership.
- There are no lands under agricultural production in this subwatershed.
- Almost two-thirds of this subwatershed is classified as forest.
- Almost 25 percent of this subwatershed is classified as wetland.
- Almost 75 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Stillwater Reservoir subwatershed:

- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water* resulting from atmospheric deposition.
- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.
- *Projected Increase in Urban Lands* – Urban lands within this subwatershed are projected to increase by 31.6 percent from 2000 to 2020.
- *Habitat & Biota* – This subwatershed has a large amount of special habitat areas.

Priority Recommendations

Key recommendations for the Stillwater Reservoir subwatershed:

- Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control (see Section 4.2).
- Provide washing stations at public marinas and boat launches to facilitate the removal of invasive species from boats before and after entering the water. This helps to prevent the

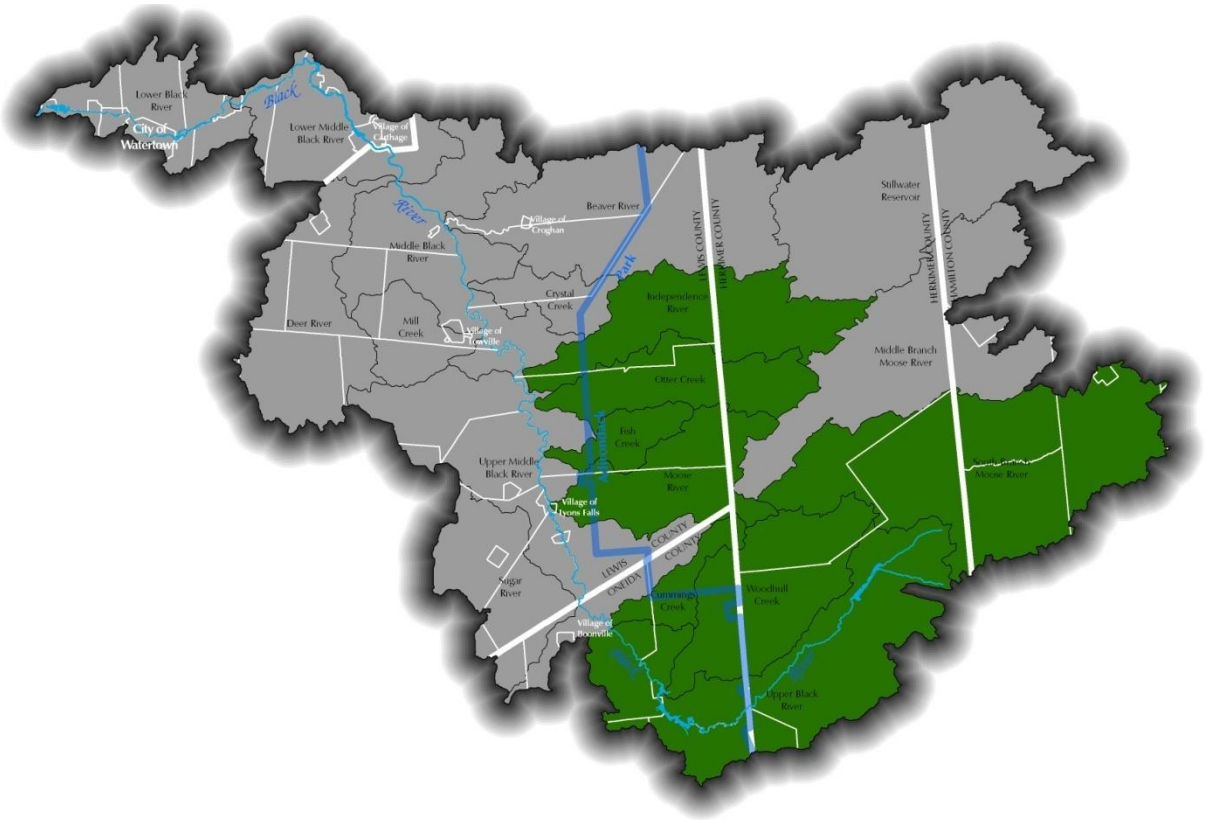
transport of invasive species from Lake Ontario into the upper drainage, the transport of species between locations within the drainage, and the export of species from the drainage (see Section 4.8).

- Educate anglers and other groups about the threats to native fauna posed by the unauthorized introduction of sport fishes into lakes (see Section 4.8).
- Educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials (see Section 4.8).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

5.4 Low Priority Subwatersheds

Eight subwatersheds were identified as being of Low Priority:

- Cummings Creek subwatershed (total score = 47)
- Fish Creek subwatershed (total score = 45.5)
- Moose River subwatershed (total score = 44)
- Otter Creek subwatershed (total score = 43)
- Upper Black River subwatershed (total score = 42.5)
- Independence River subwatershed (total score = 41)
- South Branch Moose River subwatershed (total score = 36)
- Woodhull Creek subwatershed (total score = 35.5)



Low Priority (green) Subwatersheds of the Black River Watershed

This page intentionally left blank

CUMMINGS CREEK SUBWATERSHED (47.0)

Portions of the following three municipalities are wholly or partially located within the Cummings Creek subwatershed:

- Town of Boonville
- Town of Forestport
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Cummings Creek subwatershed:

- More than one-half of his subwatershed is located in the Adirondack Park.
- Almost 40 percent of all lands in this subwatershed are under public ownership.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Almost 70 percent of this subwatershed is classified as forest.
- Approximately 18 percent of this subwatershed is classified as wetland.
- More than 90 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Cummings Creek subwatershed:

- *Percent in a Groundwater Recharge Area* – Approximately 78.8 percent of this subwatershed is located within a groundwater recharge area.

Priority Recommendations

Key recommendations for the Cummings Creek subwatershed:

- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Section 4.3).

- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

FISH CREEK SUBWATERSHED (45.5)

Portions of the following two municipalities are wholly or partially located within the Fish Creek subwatershed:

- Town of Greig
- Town of Lyonsdale

Summary of Key Characteristics

Key characteristics of the Fish Creek subwatershed:

- A majority of this subwatershed is located in the Adirondack Park.
- Just over one-third of all lands in this subwatershed are under public ownership.
- Only 1 percent of the lands in this subwatershed are in agricultural production.
- Almost 70 percent of this subwatershed is classified as forest.
- Almost 95 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Fish Creek subwatershed:

- *Percent in a Groundwater Recharge Area* – Approximately 69.6 percent of this subwatershed is located within a groundwater recharge area.
- *Projected Increase in Urban Lands* – Urban lands within this subwatershed are projected to increase by 188.0 percent from 2000 to 2020.

Priority Recommendations

Key recommendations for the Fish Creek subwatershed:

- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).

- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

MOOSE RIVER SUBWATERSHED (44.0)

Portions of the following five municipalities are wholly or partially located within the Moose River subwatershed:

- Town of Forestport
- Town of Greig
- Town of Lyonsdale
- Town of Webb
- Village of Lyons Falls

Summary of Key Characteristics

Key characteristics of the Moose River subwatershed:

- A majority of this subwatershed is located in the Adirondack Park.
- Almost 40 percent of all lands in this subwatershed are under public ownership.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Approximately 71 percent of this subwatershed is classified as forest.
- More than 90 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Moose River subwatershed:

- *Percent in a Groundwater Recharge Area* – Approximately 61.5 percent of this subwatershed is located within a groundwater recharge area.

Priority Recommendations

Key recommendations for the Moose River subwatershed:

- Continue remediation activities on unremediated hazardous waste/contaminated materials sites (see Section 4.2).
- Flows in the Moose River are highly modified for hydropower generation. Flow requirements have reduced many ecological impacts of flow modification. Periodic assessment of possible effects of flow management should be conducted.
- There may be increased forestry in this subwatershed (e.g., for biomass fuels) in the future. Management of logging to reduce impacts on streams is important (see Section 4.7).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include

improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.

- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.11).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.11).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

OTTER CREEK SUBWATERSHED (43.0)

Portions of the following three municipalities are wholly or partially located within the Otter Creek subwatershed:

- Town of Greig
- Town of Watson
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Otter Creek subwatershed:

- A majority of this subwatershed is located in the Adirondack Park.
- Almost 75 percent of all lands in this subwatershed are under public ownership.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Approximately 72 percent of this subwatershed is classified as forest.
- Almost 95 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Otter Creek subwatershed:

- *Projected Increase in Urban Lands* – Urban lands within this subwatershed are projected to increase by 35.3 percent from 2000 to 2020.
- *Habitat & Biota* – This subwatershed has a large amount of special habitat areas.

Priority Recommendations

Key recommendations for the Otter Creek subwatershed:

- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.
- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.9).
- Monitor stormwater and sediment control during construction activities (see Sections 4.3 and 4.9).

- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).
- Provide washing stations at public marinas and boat launches to facilitate the removal of invasive species from boats before and after entering the water. This helps to prevent the transport of invasive species from Lake Ontario into the upper drainage, the transport of species between locations within the drainage, and the export of species from the drainage (see Section 4.8).
- Educate anglers and other groups about the threats to native fauna posed by the unauthorized introduction of sport fishes into lakes (see Section 4.8).
- Educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials (see Section 4.8).

UPPER BLACK RIVER SUBWATERSHED (42.5)

Portions of the following seven municipalities are wholly or partially located within the Upper Black River subwatershed:

- Town of Boonville
- Town of Forestport
- Town of Ohio
- Town of Remsen
- Town of Russia
- Town of Steuben
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Upper Black River subwatershed:

- Approximately one-half of this subwatershed is located within the Adirondack Park.
- Just over one-half of the lands in this subwatershed are publicly owned.
- Only 2 percent of the lands in this subwatershed are in agricultural production.
- More than two-thirds of this subwatershed is classified as forest.
- Almost 20 percent of this subwatershed is classified as wetland.
- Almost 90 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Upper Black River subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.

Priority Recommendations

Key recommendations for the Upper Black River subwatershed:

- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).

This page intentionally left blank

INDEPENDENCE RIVER SUBWATERSHED (41.0)

Portions of the following three municipalities are wholly or partially located within the Independence River subwatershed:

- Town of Greig
- Town of Watson
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Independence River subwatershed:

- A majority of this subwatershed is located within the Adirondack Park.
- Almost 75 percent of the lands in this subwatershed are publicly owned.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Approximately two-thirds of this subwatershed is classified as forest.
- Almost 25 percent of this subwatershed is classified as wetland.
- Almost 95 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Independence River subwatershed:

- *Projected Increase in Urban Lands* – Urban lands within this subwatershed are projected to increase by 17.8 percent (15 acres) from 2000 to 2020.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water* resulting from atmospheric deposition.

Priority Recommendations

Key recommendations for the Independence River subwatershed:

- Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control (see Section 4.2)
- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).
- Incorporate effective stormwater management and erosion control practices into new construction (see Section 4.3). Potential stormwater management techniques include

improved detention basin design, infiltration trenches and basins (e.g., under parking lots), use of pervious pavement, and/or green roofs and roof water diversion systems.

- Improve stormwater management on paved and unpaved roads (see Section 4.3).
- Adopt and administer local soil erosion and sedimentation control ordinances in which topsoil stripping and excavation is addressed (see Sections 4.3 and 4.9).
- Monitor stormwater and sediment control during construction activities (see see Sections 4.3 and 4.9).
- Ensure that all new construction and substantial improvements meet the current NFIP floodplain requirements (see Section 4.6).

SOUTH BRANCH MOOSE RIVER SUBWATERSHED (36.0)

Portions of the following eight municipalities are wholly or partially located within the South Branch Moose River subwatershed:

- Town of Arietta
- Town of Inlet
- Town of Lake Pleasant
- Town of Long Lake
- Town of Morehouse
- Town of Ohio
- Town of Webb
- Village of Speculator

Summary of Key Characteristics

Key characteristics of the South Branch Moose River subwatershed:

- This subwatershed is located entirely within the Adirondack Park.
- Approximately 75 percent of the lands in this subwatershed are publicly owned.
- There are no lands under agricultural production in this subwatershed.
- More than 75 percent of this subwatershed is classified as forest.
- Almost 20 percent of this subwatershed is classified as wetland.
- Almost 90 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the South Branch Moose River subwatershed:

- Invasive species are of considerable importance in this drainage.
- *Habitat & Biota* – This subwatershed has a large amount of special habitat areas.
- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.
- *NYSDEC Stream Impairment* – All of the assessed streams within this subwatershed are considered to be *Impaired Waters, Waters with Minor Impacts, Waters Needing Verification,* or *Threatened Water* resulting from atmospheric deposition.

Priority Recommendations

Key recommendations for the South Branch Moose River subwatershed:

- Provide washing stations at public marinas and boat launches to facilitate the removal of invasive species from boats before and after entering the water. This helps to prevent the transport of invasive species from Lake Ontario into the upper drainage, the transport of

species between locations within the drainage, and the export of species from the drainage (see Section 4.8).

- Educate anglers and other groups about the threats to native fauna posed by the unauthorized introduction of sport fishes into lakes (see Section 4.8).
- Educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials (see Section 4.8).
- Continue to work at the regional and national level to reduce acidification in local waters. The drainage is affected by other influences that originate outside of the basin and are therefore largely outside local control (see Section 4.2).
- Make necessary improvements to existing municipal wastewater treatment systems and address the adequacy of the existing sewage system in the Fulton Chain of Lakes (see Section 4.4).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).

WOODHULL CREEK SUBWATERSHED (35.5)

Portions of the following three municipalities are wholly or partially located within the Woodhull Creek subwatershed:

- Town of Forestport
- Town of Ohio
- Town of Webb

Summary of Key Characteristics

Key characteristics of the Woodhull Creek subwatershed:

- This subwatershed is situated in the Central Adirondack, Western Adirondack Foothills and Western Adirondack Transition ecozones.
- Approximately two-thirds of this subwatershed is located within the Adirondack Park.
- Almost 60 percent of the lands in this subwatershed are publicly owned.
- Less than 1 percent of the lands in this subwatershed are in agricultural production.
- Approximately two-thirds of this subwatershed is classified as forest.
- More than 20 percent of this subwatershed is classified as wetland.
- More than 85 percent of the riparian areas in this subwatershed are naturally vegetated (i.e., forests, scrub/shrub, or grasslands).

Summary of Key Issues

Key issues affecting water quality in the Woodhull Creek subwatershed:

- *Total Nitrogen Load* – This subwatershed realizes a relatively large total nitrogen load from on-site septic systems.

Priority Recommendations

Key recommendations for the Woodhull Creek subwatershed:

- Make necessary improvements to existing municipal wastewater treatment systems (see Section 4.4).
- Work with landowners to reduce pollution from on-site septic systems (see Section 4.4).

This page intentionally left blank

6 Municipalities Role in the Watershed

This section examines the local regulatory conditions in each of the Black River watershed municipalities as they apply to water quality, including summaries of county regulations and agencies. More specifically, this section includes the following discussions:

- County Regulatory Authority;
- Review of Local Municipal Regulations Related to Watershed Health;
- Analysis of Local Laws, Programs, and Practices; and
- Recommended Changes to Local Laws, Programs, and Practices.

6.1 County Regulatory Authority

The following section discusses the regulatory authority of county agencies in the Black River watershed in relation to point and nonpoint source pollution and other water quality issues. Additionally, Table 6.1 provides a brief overview of the presence or absence of several relevant county-level land use planning tools in the counties traversed by the Black River watershed.

Table 6.1. Summary of Land Use Regulations, County-Level, Black River Watershed

COUNTY	PLANNING BOARD/ COMMISSION	WRITTEN COMPREHENSIVE PLAN	FARMLAND PROTECTION BOARD	FARMLAND PROTECTION PLAN	RIGHT-TO-FARM LAW
Hamilton	No	No	No	No	No
Herkimer	Yes	No	Yes	Yes	No
Jefferson	Yes	No	Yes	Yes	Yes
Lewis	Yes	Yes	Yes	Yes	Yes
Oneida	No	No	Yes	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

HAMILTON COUNTY

Hamilton County Soil and Water Conservation District

The mission of the Hamilton County Soil and Water Conservation District (HCSWCD) is to "manage and promote the wise use of natural resources in Hamilton County".[121] Established on February 4, 1965, the HCSWCD staff provides technical and educational assistance to land owners, communities, and municipalities through diversified conservation and water quality programs.

As with other Soil and Water Conservation Districts, the purpose of the HCSWCD is to conserve water and soil resources control erosion, conserve natural resources, reduce flooding, protect public lands, improve water quality, decrease pollution, preserve wildlife, and promote sustainable agriculture through proper drainage and irrigation techniques.[122] To accomplish these goals, the HCSWCD offers a wide variety of services and technical assistance, including:

- Private well testing
- GIS mapping

- Hydro-seeding
- Conservation planning
- Water Quality Monitoring & Testing
- Invasive Plant Monitoring & Control
- Dry Hydrant Installation
- Erosion Control
- Soils Information
- Conservation Education
- Alternative Septic System Assistance
- Development of Mining Plan Permits
- DEC/APA Permit Assistance
- Shoreline management

Hamilton County SWCD is a member of the Water Resources Board representing one of 25 counties in the Finger Lakes – Lake Ontario Watershed Protection Alliance (FL-LOWPA). Additional information can be obtained by contacting the Hamilton County Soil and Water Conservation District at:

PO Box 166, Route 8
Lake Pleasant, New York 12108
Phone: 518-548-3991
Fax: 518-548-5602
Email: hcswcd@frontiernet.net
Web : www.hamiltoncountyswcd.org

HERKIMER COUNTY

Herkimer County Planning

Herkimer and Oneida Counties share a somewhat unique relationship as it relates to planning in that three major planning organizations – the Oneida County Department of Planning, the Herkimer-Oneida Counties Comprehensive Planning Program, and the Herkimer-Oneida Counties Transportation Study – are housed in one location and are serviced by a combined, professional staff. This staff also contracts with Herkimer County to provide professional planning services to the Herkimer County Planning Board.[123]

Planning activities within Herkimer and Oneida Counties typically focus on one of the following eight categories:

- Transportation Planning;
- Land Use and Zoning;
- Economic Development;
- Human Services Planning;
- Census and Statistics;
- Water Resources and Environmental Planning;
- GIS Mapping; and
- Economic Development.

As it relates to water quality, activities that fall within the *Water Resources and Environmental Planning* category influence the many environmental and water resources within the two county region. Department staff provide technical assistance to local governments, county and state agencies, and the public on proper methods of using, protecting, and conserving the environment for the benefit of all people. Specific programs include the investigation and implementation of wellhead and watershed protection controls, community flood mitigation planning, source water assessment, and other miscellaneous projects and programs.[124] Two advisory boards in the region are primarily responsible for considering, discussing, and recommending environmentally and water related policy to county and local governments – the Oneida County Environmental Management and Water Quality Council and the Herkimer County Water Quality Coordinating Committee.

Additional information can be obtained by contacting the Oneida County Planning Department at:

Boehlert Center at Union Station
321 Main Street
Utica, NY 13501-1229
Phone: 315-798-5710
Fax: 315-798-5852
Email: planning@ocgov.net

Herkimer County Agriculture and Farmland Protection Plan

The purpose of this planning effort was to identify strategies for preserving and protecting agriculture and farmland in Herkimer County. As part of this effort, the Herkimer County Farmland Protection Board participated in a visioning exercise to identify the future of agriculture in the county. The resulting draft vision statement was presented to the community and amended based on their comments. The following statement expresses the long-term vision for agriculture in Herkimer County:

> *Agriculture in Herkimer County is known and appreciated for its contribution to the beauty, rural character and ambiance of the region, and for its important role in the county's economy and quality of life. A positive attitude towards farming by farmers, business people and the general population has developed. This attitude nurtures and preserves the integrity of the agricultural community.*
>
> *Although the dairy industry continues to be a strong component of agriculture in the County, there is a diversity of farming operations that support the remaining prime and important farmlands. Land is open and available for farming activities. Alternative forms of agriculture are encouraged and promoted, and they are recognized for the value they contribute to the area. Young aspiring farmers, and farmers from outside the area are welcomed to Herkimer's community.*
>
> *Herkimer's agricultural economy is strong and stable. All the core business services necessary to support area farms are easily accessible to farmers. A profitable farm economy fosters the continuation of family farms where agricultural sales have increased, farms are sold to other farmers, and development is controlled so that farms can compete as a viable land use. Farm business management is enhanced, and farm profitability has increased as a result. Agri-tourism plays a growing role in the*

agricultural economy. An abundance of educational programs exist to assist and support the agricultural community and concentrate on helping farmers be more productive and profitable. Agriculture is recognized as having an ongoing and important role in the overall economic development of Herkimer County.

In addition to developing a long-term vision statement for agriculture in the County, the plan also used a SWOT (strengths, weaknesses, opportunities, and threats) analysis to identify four primary goals, each with several specific objectives designed to achieve these goals. The four primary goals can be found below:

- *Goal 1*. Farms and agri-businesses in Herkimer County will be profitable and economically dynamic.
- *Goal 2*. A critical mass of farmland will be protected and available for active agricultural operations.
- *Goal 3*. Local and county government decision-makers and the general public will understand agriculture and the many important roles it plays in the County. These decision-makers will be active partners in preserving and nurturing farming. A positive attitude towards farming by farmers, other business people, and the general public will develop.
- *Goal 4*. Agriculture in Herkimer County will be diversified and include a wide variety of farm types and sizes.

This plan has been in effect since April 1, 2007.

Herkimer County Soil and Water Conservation District
Additional information can be obtained by contacting the Herkimer County Soil and Water Conservation District at:

5653 State Route 5
Herkimer, NY 13350
Phone: (315) 866-2520 ext.3
Fax: (315) 866-8870
Email: deb.michael@ny.nacdnet.net

Herkimer County SWCD is a member of the Water Resources Board representing one of 25 counties in the Finger Lakes – Lake Ontario Watershed Protection Alliance (FL-LOWPA).

JEFFERSON COUNTY

Jefferson County Agriculture and Farmland Protection Plan
Completed in 2002 under the guidance of the Jefferson County Agriculture and Farmland Protection Board, the Agriculture and Farmland Protection Plan (Plan) is based on guidelines specified by the New York State Department of Agriculture and Markets. As such, the Plan identifies a series of objectives and strategies to protect and conserve viable agricultural land and improve the overall profitability of the agriculture industry in Jefferson County. These strategies were grouped into six primary categories:

- Promote Agricultural Protection Programs
- Increase Educational Awareness Programming in Agriculture

- Support the Local Dairy Industry
- New Technologies and Product Development
- Capital Financing Programs
- Marketing

Agricultural and Farmland Protection Board

The Jefferson County Department of Planning is responsible for providing administrative support to the County's Agricultural and Farmland Protection Board, as well as assisting with maintenance and implementation of the County's Agriculture and Farmland Protection Plan.

Jefferson County Soil and Water Conservation District

The Jefferson County Soil and Water Conservation District (JCSWCD) was formed in 1956 with a mission to "bring people, government agencies, and private interests together to manage Jefferson County's natural resources".[125] The JCSWCD considers protecting water quality and preserving natural resources as its number one priority and offers a variety of agricultural and conservation programs and services designed to accomplish this goal. The list of the agricultural programs and services includes:

- Agricultural Environmental Management (AEM)
- Comprehensive Nutrient Management Planning
- Agricultural Non Point Source Grant Program
- Soil Group Worksheets for Ag Assessment Applications
- No-till Drill Rental

In terms of conservation practices, the following programs and services are offered:

- Septic Cost Share
- Forest Management
- Recreational Trail Coordinator
- Well Water Testing
- Hydroseeding
- Fort Drum Revegetation
- Dry Fire Hydrant Repair/Installation
- Mined Land Reclamation Plans
- Tree Planter

The JCSWCD is also home to the Jefferson County Water Quality Coordinating Committee. County Water Quality Coordinating Committees were formed across New York State to develop and implement County Water Quality Strategies to address NPS issues. As County Soil & Water Conservation Districts are authorized by law to implement local programs to reduce NPS pollution, they became the focal point for establishing these committees and are key to implementing the strategies that identify and set local priorities. Jefferson County SWCD is a member of the Water Resources Board representing one of 25 counties in the Finger Lakes – Lake Ontario Watershed Protection Alliance (FL-LOWPA).

Additional information can be obtained by contacting the Jefferson County Soil and Water Conservation District at:

21168 NYS Route 232
PO Box 838
Watertown NY 13601
Phone: (315) 782-2749
Fax: (315) 782-3054
Email: bwohnsiedler@centralny.twcbc.com
Web: www.jeffersoncountyswcd.org

Jefferson County Planning Board

The Jefferson County Department of Planning provides staff assistance on a monthly basis in support of the County Planning Board's authorized functions, particularly as they relate to section 239-m (NYS General Municipal Law) project reviews for development projects and local zoning actions referred by municipalities.

LEWIS COUNTY

Comprehensive Plan

To foster a regional and collaborative approach to effectively leverage its assets and overcome challenges in order to continuously improve the quality of life of its citizens, Lewis County recently completed a County-wide Comprehensive Plan. The purpose of the plan is to create a unified vision and framework of policies, goals, and objectives for County government, while setting the foundation for County-level decision making over the next 10 to 15 years.[126]

This planning effort built on previous planning efforts of local municipalities and provides guidance and identifies tools for implementation, while promoting knowledge sharing and inter-municipal collaboration. The County Comprehensive Plan also builds on the strategies developed in the Lewis County Comprehensive Economic Development Strategy (CEDS).[127]

The vision statement developed for the comprehensive plan can be found below:

> *In Lewis County, we take pride in our small town culture, pristine landscape, tremendous recreation opportunities, rich farming and forestry heritage, vast energy resources, and overall quality of life. As we protect and enhance these assets, we will work to be the premier rural county in New York State. To achieve this, we will:*
>
> - *Encourage economic growth by supporting existing businesses, attracting new employers, fostering emerging industries and revitalizing our downtowns;*
> - *Explore opportunities that will improve our standing as a leader in renewable and sustainable energy;*
> - *Adhere to sustainable policies that address environmental stewardship, economic health, and government operations;*
> - *Develop strategic partnerships between government, citizens, and leaders in the fields of education, industry, agriculture and forestry, health and human services, housing, and tourism to achieve a vibrant community;*
> - *Enhance and expand our extensive recreational opportunities in a manner that balances tourism interests with environmental impacts;*
> - *Employ a strategic and cooperative approach to the provision of infrastructure and other scarce resources; and*

- *Be governed by officials that are mindful of the quality of life enjoyed in Lewis County and are fully equipped to enforce all of these values and priorities.*

In terms of policies, objectives, and action items, the plan has identified the following seven policy areas:

- Tourism and Recreation
- Economic Development
- Infrastructure and Transportation
- Community Resources and Housing
- Agriculture and Forestry
- Natural Resources and the Environment
- Regional Coordination

Agricultural Enhancement Plan

The purpose of the Lewis County Agricultural Enhancement Plan (AEP) is to provide a strategy for enhancing agriculture in Lewis County. Developed under the guidance of a steering committee made up of members of the County's Agricultural and Farmland Protection Board, the AEP identifies six individual vision statements that highlight opportunities for agriculture in Lewis County, including:

- Agriculture in Lewis County will continue to thrive and play an essential role as the most important industry in the region's economy.
- Our community will understand and support the importance of agriculture to our economy and quality of life.
- Agriculture will be enhanced as a viable and profitable profession.
- Lewis County will maintain its strong agricultural infrastructure and support network and continue to be a place where farming excels.
- Lewis County and the region will be at the forefront of agricultural innovation.
- Lewis County will be a leader in regional agricultural initiatives.

Based on these vision statements, the AEP identified three goals that form the more precise framework for recommendations. The three goals and their associated recommendations can be found below:

- *Goal 1* – Improve the community's understanding of agriculture and its importance to the county's economy and quality of life.
  - Recommendation #1: Increase government's awareness and support for agriculture
  - Recommendation #2: Increase youth participation and understanding of agriculture
  - Recommendation #3: Enhance the general community's understanding and appreciation of agriculture
- *Goal 2* – Increase the profitability of agriculture in Lewis County.
  - Recommendation #1: Continue and enhance existing marketing efforts
  - Recommendation #2: Identify and take advantage of new marketing opportunities
  - Recommendation #3: Encourage diversification and value-added initiatives
  - Recommendation #4: Ensure that those involved with agriculture have access to the tools necessary to be successful in business

- *Goal 3* – Increase the competitiveness of the county and region in future farming initiatives.
    - Recommendation #1: Increase regional cooperation
    - Recommendation #2: Target agricultural research and development
    - Recommendation #3: Maintain our Natural Environment

Lewis County Soil and Water Conservation District

The Lewis County Soil and Water Conservation District (LCSWCD) was established on January 8, 1946 with the initial purpose of improving and increasing the amount of land in agricultural production in the county.[128] Over time, however, the District's focus evolved to emphasizing drainage and water management. The mission of the Lewis County SWCDis to support a comprehensive natural resource program for county residents and landowners by implementing projects and programs that will preserve, protect and enhance the wise use of the county's soil, water and related natural resources.

To accomplish its goals, the LCSWCD has implemented four key programs:

- Agricultural Environmental Management (AEM)
- Water Quality Monitoring
- Fish Stocking Program
- Tree Program

The LCSWCD is also home to the Lewis County Water Quality Coordinating Committee and a member of the Water Resources Board representing one of 25 counties in the Finger Lakes – Lake Ontario Watershed Protection Alliance (FL-LOWPA).

In addition to these programs, the LCSWCD also offers a variety of services to local municipalities, land owners, and farms to ensure sound use and management of soil, water, and other related resources.[129] These services include:

- Agricultural Value Assessments
- Municipal Assistance
- Dry Hydrant Installation
- Mined Reclamation Plans
- Geographical Information System
- Erosion Control
- Permit Assistance

Additional information can be obtained by contacting the Lewis County Soil and Water Conservation District at:

5274 Outer Stowe Street, Suite #1
Lowville, NY 13367
Phone: (315) 376-6122
Fax: (315) 376-8717
Email: nbillhardt@lewiscountyny.org
Web: www.lewiscountysoilandwater.com

Lewis County Planning Board

The Lewis County Planning Board was created by the Lewis County Board of Legislators in 1966 pursuant to Article 12-B of the General Municipal Law, Section 239-b of the State of New York. Currently, there are eight board members, each with three-year terms. Under current practice, these appointments are made by the Lewis County Board of Legislators.[130] The Lewis County Planning Board will generally consider the following matters of importance to the County:

- Compatibility of land use;
- Traffic generation and its effect upon existing traffic and the adequacy of existing and/or proposed highways;
- The impact of such proposed land use upon existing and proposed facilities;
- Protection of community character;
- Population density;
- Community appearance;
- Drainage, sewer, and other community facilities; and,
- The impact upon official land development policies at municipal, county, and state levels.[131]

Planning staff support is provided to the planning board by the Lewis County Department of Economic Development.

ONEIDA COUNTY

Oneida County Planning

As previously noted, the Oneida County Department of Planning provides a variety of services, including technical assistance to local governments, counties, and state agencies for *Water Resources and Environmental Planning* activities. Further discussion can be found under Herkimer County Planning section.

Farmland Protection Plan / Board

Not available for review during plan preparation.

Oneida County Soil and Water Conservation District

The mission of the Oneida County Soil and Water Conservation District (OCSWCD) is to "provide leadership in the development, wise use and management of soil, water and related resources in a way that will restore, enhance, protect and maintain their quality and quantity for the benefit of Oneida County and its residents".[132] To accomplish this mission, the OCSWCD offers a number of natural resources programs and services, including technical assistance for farmers and landowners, environmental education programs, and a Tree & Shrub sale. More specifically, the OCSWCD offers the following programs:

- Agricultural Environmental Management (AEM)
  - Ag Non-Point Source Control
  - Concentrated Animal Feeding Operation (CAFO) Farm Plannning
  - Comprehensive Nutrient Management Planning (CNMP's)
  - Agricultural Best Management Practices (BMP's)
  - Farmland Protection
  - Access to NRCS Conservation Programs (WRP, WHIP, CREP, EQIP)
- Community Environmental Management (CEM)

  - Stormwater Management
  - Flood Control
  - Streambank Stabilization
  - Subdivision Reviews
- Tree and Shrub Seedling Sale
- Envirothon
- Dry Hydrant Program
- Farm Safety Program
- Water Quality Monitoring
- Hazard Mitigation Plan

The primary focus of the OCSWCD is on the Agricultural Environmental Management (AEM) Program and the Community Environmental Management (CEM) Program. The AEM Program is a voluntary program that helps integrate environmental protection and improvement with the needs of farmers and communities, while coordinating technical and financial assistance with individual farmers.[133] The goal of AEM is to help farmers protect the environment, while maintaining the health and vitality of their farm operations. Currently, the District is working with USDA NRCS to develop and implement AEM plans for farms in watersheds across the county.

The CEM Program is a toolbox of educational assessment, technical assistance, and planning tools targeted towards local communities. The purpose of the program is to address environmental concerns including nonpoint source pollution, natural resource degradation, and drinking water supply protection in local communities. [134]

Oneida County SWCD is a member of the Water Resources Board representing one of 25 counties in the Finger Lakes – Lake Ontario Watershed Protection Alliance (FL-LOWPA).

Additional information can be obtained by contacting the Oneida County Soil and Water Conservation District at:

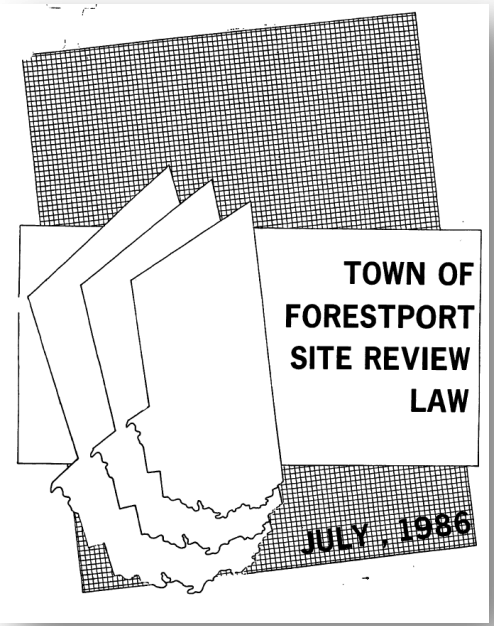
9025 State Route 49
Marcy, NY 13403
Phone: (315) 736-3334
Fax: (315) 736-9547
Email: Kevin-lewis@oneidaswcd.org
Web: www.oneidaswcd.org

6.2 Local Planning and Regulations

6.2.1 Overview

As the New York State Constitution provides for home rule, the primary authority for guiding community planning and development is vested in cities, towns and villages. This provides local municipalities with the power to define how their community grows, or doesn't grow. Confronted with both the opportunities and challenges of development, communities are recognizing that local planning and zoning laws are valuable tools that can be used to ensure the vision for their community is fulfilled. Tables 6.2 through 6.6 provide a summary of the basic land use planning and regulatory tools used by the city, town, and village governments within the watershed, organized by County.

These land use planning tools may include comprehensive plans, zoning and subdivision regulations, site plan review regulations, and the creation of planning boards/commissions. While some municipalities in the watershed have a comprehensive set of land use regulations and guidelines, other communities have zoning but lack other planning tools. They may have no comprehensive plan to provide an overall vision for future land use and/or no planning board or commission to assist in the decision-making process with regards to new development and other activities that can influence the character of the community. This is important to a watershed planning project because land uses can have a direct impact on water quality within the watershed. Understanding existing land use regulations and the tools that are in place in each of the municipalities is important as considerations are given to how land use changes and development has the potential to influence water quality within the watershed.



Many municipal ordinances in the Black River watershed may require updating

Table 6.2 lists each of the municipalities within Jefferson County that are wholly or partially within the Black River Watershed. The land use regulations and tools currently in place for each are identified.

Table 6.2. Summary of Land Use Regulations, Jefferson County

MUNICIPALITY	WRITTEN COMPREHENSIVE PLAN	ZONING	SUBDIVISION REGULATIONS	SITE PLAN REVIEW	PLANNING BOARD
JEFFERSON COUNTY					
City of Watertown	Yes	Yes	Yes	Yes	Yes
Town of Brownville	Yes	Yes	Yes	Yes	Yes
Town of Champion	Yes	Yes	Yes	Yes	Yes
Town of Hounsfield	Yes	Yes	Yes	Yes	Yes
Town of Le Ray	No	Yes	Yes	Yes	Yes
Town of Pamelia	No	Yes	Yes	Yes	Yes
Town of Rutland	No	Yes	Yes	Yes	Yes
Town of Watertown	Yes	Yes	Yes	Yes	Yes
Town of Wilna	No	Yes	Yes	Yes	Yes
Town of Worth	No	Yes	Yes	Yes	Yes
Village of Black River	No	Yes	Yes	Yes	Yes
Village of Brownville	Yes	Yes	Yes	Yes	Yes
Village of Carthage	Yes	Yes	Yes	Yes	Yes
Village of Deferiet	Yes	Yes	Yes	Yes	Yes
Village of Dexter	Yes	Yes	No	Yes	Yes
Village of Glen Park	No	Yes	No	No	No
Village of Herrings	Yes	No	No	Yes	No
Village of West Carthage	Yes	Yes	Yes	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

Table 6.3 lists each of the municipalities within Lewis County that are wholly or partially within the Black River Watershed. The land use regulations and tools currently in place for each are identified.

Table 6.3. Summary of Land Use Regulations, Lewis County

MUNICIPALITY	WRITTEN COMPREHENSIVE PLAN	ZONING	SUBDIVISION REGULATIONS	SITE PLAN REVIEW	PLANNING BOARD
LEWIS COUNTY					
Town of Croghan	No	Yes	No	Yes	No
Town of Denmark	No	Yes	Yes	No	Yes
Town of Greig	No	Yes	Yes	No	Yes
Town of Harrisburg	No	Yes	No	No	Yes
Town of Lewis	No	Yes	Yes	No	Yes
Town of Leyden	No	Yes	No	Yes	No
Town of Lowville	Yes	Yes	Yes	No	Yes
Town of Lyonsdale	No	No	Yes	Yes	No
Town of Martinsburg	No	Yes	Yes	Yes	Yes
Town of Montague	No	No	No	No	Yes
Town of New Bremen	No	Yes	No	Yes	Yes
Town of Pinckney	No	Yes	Yes	No	Yes
Town of Turin	No	No	Yes	No	Yes
Town of Watson	No	Yes	No	No	Yes
Town of West Turin	No	Yes	Yes	No	Yes
Village of Castorland	No	No	Yes	Yes	Yes
Village of Constableville	No	No	No	No	No
Village of Copenhagen	No	No	Yes	Yes	Yes
Village of Croghan	No	No	No	No	No
Village of Lowville	Yes	Yes	No	No	Yes
Village of Lyons Falls	No	No	No	No	No
Village of Port Leyden	No	No	No	No	No
Village of Turin	No	No	No	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

Table 6.4 lists each of the municipalities within Herkimer County that are wholly or partially within the Black River Watershed. The land use regulations and tools currently in place for each are identified.

Table 6.4. Summary of Land Use Regulations, Herkimer County

MUNICIPALITY	WRITTEN COMPREHENSIVE PLAN	ZONING	SUBDIVISION REGULATIONS	SITE PLAN REVIEW	PLANNING BOARD
HERKIMER COUNTY					
Town of Ohio	No	No	No	No	No
Town of Russia	Yes	Yes	Yes	Yes	Yes
Town of Webb	Yes	Yes	Yes	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

Table 6.5 lists each of the municipalities within Hamilton County that are wholly or partially within the Black River Watershed. The land use regulations and tools currently in place for each are identified.

Table 6.5. Summary of Land Use Regulations, Hamilton County

MUNICIPALITY	WRITTEN COMPREHENSIVE PLAN	ZONING	SUBDIVISION REGULATIONS	SITE PLAN REVIEW	PLANNING BOARD
HAMILTON COUNTY					
Town of Arietta	Yes	Yes	Yes	Yes	Yes
Town of Inlet	Yes	Yes	Yes	Yes	Yes
Town of Lake Pleasant	Yes	Yes	Yes	Yes	Yes
Town of Long Lake	No	No	No	No	Yes
Town of Morehouse	Yes	Yes	Yes	Yes	Yes
Village of Speculator	Yes	Yes	Yes	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

Table 6.6 lists each of the municipalities within Oneida County that are wholly or partially within the Black River Watershed. The land use regulations and tools currently in place for each are identified.

Table 6.5. Summary of Land Use Regulations, Oneida County

MUNICIPALITY	WRITTEN COMPREHENSIVE PLAN	ZONING	SUBDIVISION REGULATIONS	SITE PLAN REVIEW	PLANNING BOARD
ONEIDA COUNTY					
Town of Ava	Yes	Yes	Yes	Yes	Yes
Town of Boonville	Yes	Yes	Yes	Yes	Yes
Town of Forestport	Yes	No	Yes	Yes	Yes
Town of Remsen	No	No	No	No	Yes
Town of Steuben	No	No	No	No	Yes
Village of Boonville	No	Yes	Yes	Yes	Yes

Source: New York Land Use Tools: A 2008 Survey of Land Use Planning & Regulations in NYS (NYS Legislative Commission on Rural Resources)

6.2.2 Analysis of Local Laws, Programs, and Practices

As watershed boundaries rarely conform to municipal boundaries, water management can become more complicated as the number of municipalities increases. This is clearly illustrated in the Black River watershed – each subwatershed within the Black River drainage traverses, on average, five municipalities, with the largest subwatershed draining portions of 14 municipalities. This local municipal regulatory review provides an analysis of existing municipal regulations for communities located wholly or partially within the Black River watershed. The analysis was undertaken to determine the level of attention given to addressing environmental and water quality issues at the local level.

The following section summarizes local laws, programs, and policies in each municipality within the Black River watershed to gauge their effectiveness in affecting point and nonpoint source pollution in the watershed. The narrative provides an overview of municipal land use regulatory tools with discussion focusing on:

- Zoning
- Comprehensive Plans and other relevant planning efforts
- Subdivision Regulations
- Site Plan Review

As previously noted, one city (Watertown), 37 towns, and 18 villages are wholly or partially located within the Black River watershed. The following statistics apply to these 56 municipalities:

- 55 percent have, or are currently preparing a Comprehensive Plan
- 77 percent have enacted zoning legislation
- 70 percent have enacted subdivision regulations

- 66 percent have enacted site plan review legislation
- 13 percent have enacted none of the above

Additionally, 14 municipalities are located partially or wholly within the Adirondack Park and are thus subject to the land use regulations noted in Section 1.4.2 of this report.

To identify the strengths and weaknesses of local efforts as they relate to the management of point and nonpoint source pollution and protection of watershed hydrology and ecology, each of the four aforementioned land use regulatory tools was reviewed in regards to the following 20 factors (these factors were selected based on the impacts to water quality that could potentially result from each):

- Environmental Impacts Identified as Overarching Issue
- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Junkyards
- Environmental Impacts of Marinas
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Environmental Impacts of Mining
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Development Limited on Steep Slopes
- Stormwater Management Addressed
- Cluster Development Allowed
- Waterfront Development Standards in place
- Nonconformity based on 50% Rule
- Maximum Lot Coverage

To account for the varying levels of regulatory action that occurs across municipalities and help to identify any gaps that might exist, a ranking system was developed to identify the overall level to which a particular issue is addressed within each community. This scoring system does not identify the specific mechanism addressing each factor (i.e., zoning, subdivision regulations), only the level to which it is addressed. A brief summary of this system can be found below:

N: No document or ordinance addresses this issue within a given municipality
C: This issue is addressed in a Comprehensive Plan or other relevant planning documents
1: This issue is addressed in an ordinance, but defers to Federal/State/County regulations
2: This issue is addressed in an ordinance, but few to no specific local guidelines are provided
3: This issue is addressed in an ordinance, with specific local guidelines provided
4: This issue is addressed in an ordinance, with strict specific local guidelines provided

As is depicted in Table 6.6, approximately two-thirds of the communities within the Black River watershed have adopted local guidelines to protect lakes and streams, with more than one-third strictly regulating activities around these areas. Further, just over one-half of the communities have regulatory tools that address wetland protection, while another 50 percent allow, or possibly require, cluster development to preserve and protect natural resources. Note that information for several of the municipalities was not available at the time of analysis. Additionally, Table 6.6 does not include Adirondack Park regulations.

Table 6.6. Levels to Which Watershed Factors are Addressed in Local Municipalities

FACTORS	PERCENT OF MUNIPALITIES ADDRESSING A GIVEN FACTOR AT A PARTICULAR LEVEL					
	N	1	2	3	4	C
Environmental Impacts Identified as Overarching Issue	63%	0%	16%	6%	14%	31%
Environmental Impacts of Accessory Structures	78%	0%	0%	2%	20%	0%
Environmental Impacts of Impervious Surfaces	84%	0%	6%	8%	2%	2%
Environmental Impacts of Junkyards	49%	12%	0%	6%	33%	0%
Environmental Impacts of Marinas	90%	0%	0%	4%	6%	4%
Environmental Impacts of On-Site Wastewater	20%	39%	2%	4%	35%	10%
Environmental Impacts of Roads/Sidewalks	90%	0%	0%	10%	0%	8%
Environmental Impacts of Timber Harvesting	94%	0%	0%	2%	4%	6%
Environmental Impacts of Agriculture	94%	0%	0%	2%	4%	4%
Environmental Impacts of Mining	78%	2%	10%	2%	8%	4%
Lake/Stream Protection	33%	0%	18%	12%	37%	24%
Wetland Protection	43%	4%	29%	10%	14%	22%
Floodplain Protection	49%	6%	12%	6%	27%	12%
Unique Natural Areas Protection	41%	0%	53%	4%	2%	18%
Development Limited on Steep Slopes	73%	0%	2%	16%	8%	2%
Stormwater Management Addressed	29%	0%	31%	27%	14%	8%
Cluster Development Allowed	49%	0%	8%	10%	33%	16%
Waterfront Development Standards in place	94%	0%	2%	0%	4%	16%
Nonconformity based on 50% Rule	90%	0%	0%	4%	6%	0%
Maximum Lot Coverage[1]	73%	27%				

1. The analysis of this factor was binary – either maximum lot coverages were provided or they were not.

In terms of regulatory gaps, only 3 of the 49 municipalities (six percent) within the watershed address the environmental impacts of agriculture, which can be a major contributor of nonpoint source runoff. Additional gaps were identified for impervious surfaces and the environmental impacts of roads and sidewalks – only 8 of the 49 municipalities address impervious surfaces, while only 5 have developed regulatory tools to lessen the environmental impacts of roads and sidewalks. Finally worth noting is the lack of regulatory control over development on steep slopes, with almost three-quarters of all communities not utilizing any regulatory tool to address this issue.

It should be noted that some of the documents and ordinances reviewed as part of this analysis were created during the 1970s and 1980s, many of which have not been updated since. Additionally, this analysis does not account for the degree to which each tool is utilized within a given community, only whether a particular tool exists and the degree to which it addresses each factor. Finally, the results of this analysis indicate where regulatory gaps occur as they relate to specific environmental factors; more specific details regarding how these gaps can be addressed are provided below.

6.2.3 Recommended Changes to Local Laws, Programs, and Practices

This section provides the municipal-level recommendations based on the results of the analysis of local laws, programs, and practices for each of the 56 municipalities located in the Black River watershed. Given that each subwatershed encompasses several sets of regulations, a review for any regulatory gaps that might exist in regards to the 20 review factors was conducted at the municipal level. Generally, a regulatory gap was determined to exist if a given municipality failed to address a particular factor at a level of 3 or 4. A discussion of each municipality can be found below (organized by county) and includes the following:

- The regulatory tools currently in place;
- The subwatersheds located within each municipality; and
- Recommendations as to which of the 20 review factors should be addressed to improve and protect water quality.

To determine how the identified review factors should be addressed, Table 6.7 provides those recommendations developed in Section 4 that correspond to each of the 20 review factors noted in Table 6.7. Additionally, the identification of the subwatersheds located within each municipality provides a link to the subwatershed-specific recommendations developed in Section 5.

Table 6.7. Recommendations that Address the Watershed Review Factors

FACTORS	Recommendations					
	Section 4.3	Section 4.4	Section 4.5	Section 4.6	Section 4.7	Section 4.9
Environmental Impacts Identified as Overarching Issue						Rec. 1
Environmental Impacts of Accessory Structures						Rec. 4, 6
Environmental Impacts of Impervious Surfaces						Rec. 2, 6, 11
Environmental Impacts of Junkyards						Rec. 8
Environmental Impacts of Marinas						Rec. 8
Environmental Impacts of On-Site Wastewater		Rec. 1, 2				
Environmental Impacts of Roads/Sidewalks	Rec. 5, 6, 7, 8					
Environmental Impacts of Timber Harvesting					Rec. 2	
Environmental Impacts of Agriculture			All			
Environmental Impacts of Mining						Rec. 8
Lake/Stream Protection						Rec. 3, 6
Wetland Protection						Rec. 3, 6, 11
Floodplain Protection				Rec. 1, 2, 3, 4		
Unique Natural Areas Protection						Rec. 14
Development Limited on Steep Slopes	Rec. 1					Rec. 4, 10
Stormwater Management Addressed	Rec. 1					Rec. 4, 10
Cluster Development Allowed						Rec. 7
Waterfront Development Standards in place						Rec. 3
Nonconformity based on 50% Rule						Rec. 6
Maximum Lot Coverage						Rec. 2, 6, 11

HAMILTON COUNTY

Town of Arietta

The Town of Arietta is located in the eastern-most portion of the drainage and traverses a portion of only one subwatershed – the South Branch Moose River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Additionally, the Town of Arietta is entirely within the Adirondack Park boundary and the only municipality within the Black River watershed that has adopted an APA-approved local land use regulatory program. As such, the Town's regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

Town of Inlet

Located between the Town of Arietta and the Hamilton-Herkimer County line, the Town of Inlet traverses portions of two subwatersheds:

- Middle Branch Moose River subwatershed
- South Branch Moose River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

The Town of Inlet is also located entirely within the Adirondack Park and thus subject to the land use regulations implemented by the APA. As such, the APA regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

Town of Lake Pleasant

Only a small portion (91 acres) of the Town of Lake Pleasant is within the Black River watershed and, more specifically, the South Branch Moose River subwatershed. Like the two preceding municipalities, the Town of Lake Pleasant has implemented the following regulatory tools:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Additionally, the Town is located entirely within the Adirondack Park and thus subject to the land use regulations implemented by the APA. As such, the APA regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

Town of Long Lake

Located in the northeast corner of the Black River watershed, portions of this Adirondack Park community traverse two subwatersheds:

- Middle Branch Moose River subwatershed
- Stillwater Reservoir subwatershed

Although the Town of Long Lake is located entirely within the Adirondack Park, it has not implemented any of the four regulatory tools noted in Section 6.2.2. While many of the land use regulations under the authority of the APA apply to activities within the Town, Long Lake should identify its own regulatory framework through a comprehensive planning process and subsequent development of zoning, site plan review, and subdivision regulations. In doing so, some focus should be applied to gaps that might exist in the APA regulatory program, including, but not limited to:

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks
- Limit Development on Steep Slopes

Town of Morehouse

The Town of Morehouse is located in the eastern-most portion of the drainage, between the Towns of Inlet and Arietta and the Hamilton-Herkimer County line. The Town traverses a portion of only one subwatershed – the South Branch Moose River subwatershed. To regulate land use and development activities, the Town has the following regulatory tools in place:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

The Town of Morehouse is also located entirely within the Adirondack Park and thus subject to the land use regulations implemented by the APA. As such, the APA regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

Village of Speculator

Only a small portion of the Village of Speculator (127 acres) falls within the Black River watershed. Located in the eastern-most portion of the basin, the Village traverses only one subwatershed – the South Branch Moose River subwatershed. While the Village of Speculator has implemented all four land use regulatory tools noted in Section 6.2.2, none were available for review at the time of analysis. The Village is also located entirely within the Adirondack Park and is thus subject to its land use regulatory program. As such, the APA regulatory tools provide considerable protection to the

natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

HERKIMER COUNTY

Town of Ohio

Located along the southern boundary of the Black River watershed, the Town of Ohio traverses three subwatersheds:

- South Branch Moose River subwatershed
- Upper Black River subwatershed
- Woodhull Creek subwatershed

Although the Town of Ohio is located entirely within the Adirondack Park, it does not have any Town-specific planning or regulatory mechanisms in place.

While many of the land use regulations under the authority of the APA apply to activities within the Town, the Town should undertake a planning process to develop a comprehensive plan that will guide land use decision-making, as well as the development of zoning, subdivision regulations, and site plan review. By adopting these tools, the Town of Ohio will have the regulatory mechanism necessary to implement its preferred land use development scenario. In developing these regulatory mechanisms, some focus should be applied to gaps that might exist in the APA regulatory program, including, but not limited to:

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks
- Limit Development on Steep Slopes

Town of Russia

The Town of Russia is located along the southern boundary of the Black River watershed between the Town of Ohio and the Herkimer-Lewis County line and traverses only one subwatershed – the Upper Black River subwatershed.

While the Town has all four land use regulatory tools in place, none were available for review at the time of analysis. The Town of Russia is also located entirely within the Adirondack Park and is thus subject to its land use regulatory program. As such, the APA regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

Town of Webb

As the largest municipality in the watershed in terms of overall size, the Town of Webb traverses eight subwatersheds:

- Beaver River subwatershed
- Independence River subwatershed
- Middle Branch Moose River subwatershed
- Moose River subwatershed
- Otter Creek subwatershed

- South Branch Moose River subwatershed
- Stillwater Reservoir subwatershed
- Woodhull Creek subwatershed

In addition to implementing all four land use regulatory tools noted in Section 6.2.2, the Town of Webb is also located entirely within the Adirondack Park and thus subject to its regulatory program. As such, the APA regulatory tools provide considerable protection to the natural environment. Thus, no additional regulatory elements are required for water quality protection in this municipality.

JEFFERSON COUNTY

City of Watertown

The City of Watertown, the only city in the watershed, is the regional population center and is located along the Black River near its mouth at Lake Ontario. This municipality traverses only one subwatershed – the Lower Black River subwatershed.

To regulate land use and development activities within its boundaries, the City of Watertown has enacted the following regulatory tools:

- Zoning;
- Comprehensive Plans and other relevant planning efforts including a Local Waterfront Revitalization Plan and the *Erosion Management Plan for the Black River Corridor*;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these regulatory tools, the City of Watertown should focus efforts to improve its land use regulatory tools by addressing the following topics:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Junkyards
- Environmental Impacts of Roads/Sidewalks
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Allow Cluster Development

Town of Brownville

Located at the mouth of the Black River, the Town of Brownville traverses only one subwatershed – the Upper Black River subwatershed. While the Town has implemented all four land use regulatory tools noted in Section 1.3.1, none were available for review at the time of analysis.

Town of Champion

Located along the Black River between the Town of Rutland and the Jefferson-Lewis County line, the Town of Champion falls within the boundaries of the Lower Middle Black River subwatershed. To regulate land use and development activities within its boundaries, the Town has enacted the following regulatory tools:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of the existing regulatory program, efforts to improve the land use regulatory tools as they relate to improving water quality should focus on:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Junkyards
- Environmental Impacts of Marinas
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management

Town of Hounsfield

The Town of Hounsfield, falling within the Lower Black River subwatershed, is located at the mouth of the Black River along its southern shore. The Town has enacted the following tools to regulate land use within its boundaries:

- Zoning;
- Subdivision Regulations; and
- Site Plan Review.

As no comprehensive plan has been developed for this municipality, the Town of Hounsfield should use the comprehensive planning process as a starting point to ensure that the following elements are incorporated into its land use regulatory program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Marinas
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management

Town of Le Ray

Located along the northern shore of the Black River in the Lower Black River subwatershed, the Town of Le Ray has implemented all four land use regulatory tools noted in Section 1.3.1 to regulate land use and development within its boundaries. While regulatory gaps exist for several of the 20 review factors, five of these gaps are addressed in the Town's comprehensive plan, thus increasing the likelihood that they would be incorporated into the existing regulatory program in the future.

Based on a review of the four land use regulatory tools utilized by the Town of Le Ray, efforts to improve the existing regulatory program should focus on incorporating the following elements (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces*
- Environmental Impacts of Roads/Sidewalks*
- Environmental Impacts of Agriculture*
- Wetland Protection*
- Floodplain Protection
- Unique Natural Areas Protection*
- Limit Development on Steep Slopes

Town of Pamelia

The Town of Pamelia is located within the Lower Black River subwatershed immediately north of the City of Watertown. While the Town has implemented all four land use regulatory tools noted in Section 1.3.1, none were available for review at the time of analysis.

Town of Rutland

The Town of Rutland, located along the southern shore of the Black River, falls within the following two subwatersheds:

- Lower Black River subwatershed
- Middle Black River subwatershed

To regulate land use and development activities within its boundaries, the Town of Rutland has enacted the following regulatory tools:

- Zoning;
- Subdivision Regulations; and
- Site Plan Review.

The Town should use the comprehensive planning process to ensure that the following elements are incorporated into its existing land use regulatory program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Junkyards
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks

- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Town of Watertown

Straddling the City of Watertown, the Town of Watertown is located along the southern shore of the Black River in the Lower Black River subwatershed. To regulate land use and development activities within its boundaries, the Town has the following regulatory tools in place:

- Zoning;
- Subdivision Regulations; and
- Site Plan Review.

The comprehensive planning process can help to establish a framework for future decision-making and policy development as it relates to land use. The Town of Watertown should develop a comprehensive plan and also update its regulatory tools to address the following topics:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes

Town of Wilna

Located between the eastern shore of the Black River and the Jefferson-Lewis County line in the Lower Middle Black River subwatershed, the Town of Wilna has implemented all four land use regulatory tools noted in Section 6.2.2. While regulatory gaps exist for several of the 20 review factors, four of these gaps are addressed in the Town's comprehensive plan, thus increasing the likelihood that they could be incorporated into the existing regulatory program.

Based on a review of three of the land use regulatory tools utilized by the Town of Wilna (the Town's subdivision regulations were not available at the time of analysis), efforts to improve the existing regulatory program as it relates to water quality should focus on incorporating the following elements (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces

- Environmental Impacts of Junkyards
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection*
- Wetland Protection*
- Floodplain Protection*
- Unique Natural Areas Protection*
- Limit Development on Steep Slopes

Town of Worth

Only a small portion (89 acres) of the Town of Worth is within the Black River watershed and, more specifically, the Deer River subwatershed. To regulate land use and development activities within its boundaries, the Town has enacted the following regulatory tools:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

While regulatory gaps exist for several of the 20 review factors, the Town of Worth has used its existing regulatory program to address many environmental issues associated with poor water quality. Based on a review of this regulatory program, efforts to improve the land use regulatory tools in the Town should focus on incorporating the following elements into its existing program (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surface
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture*
- Limit Development on Steep Slopes

Village of Black River

Bisected by its namesake, the Village of Black River is located in both the Lower Black River and Lower Middle Black River subwatersheds. . To regulate land use and development activities within its boundaries, the Village has enacted the following regulatory tools:

- Zoning;
- Subdivision Regulations; and
- Site Plan Review.

While the Village has implemented three of the four land use regulatory tools noted in Section 6.2.2, none were available for review at the time of analysis.

Village of Brownville

The Village of Brownville is located along the northern shore of the Black River, between the Towns of Hounsfield and Brownville. Located entirely within the Lower Black River subwatershed, the Village has enacted the following tools to regulate land use and development activities within its boundaries:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these regulatory tools, the Village of Brownville should focus efforts to improve its land use regulatory tools as they relate to water quality by incorporating the following elements into its existing program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Lake/Stream Protection*
- Wetland Protection*
- Unique Natural Areas Protection*
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Village of Carthage

Located along the northeastern shore of the Black River between the Town of Wilna and the Jefferson-Lewis County line, the Village of Carthage has implemented all four land use regulatory tools. Based on a review of this regulatory program, efforts to improve the land use regulatory tools in the Village should focus on addressing the following factors (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surface
- Environmental Impacts of Junkyards
- Environmental Impacts of Roads/Sidewalks
- Lake/Stream Protection*
- Wetland Protection*
- Unique Natural Areas Protection
- Limit Development on Steep Slopes

Village of Deferiet

The Village of Deferiet is located along the eastern shore of the Black River in the Lower Black River subwatershed. To regulate land use and development activities within its boundaries, the Village has

enacted all four land use regulatory tools noted in Section 6.2.2. While the Town has implemented these regulatory tools, none were available for review at the time of analysis.

Village of Dexter

Standing at the mouth of the Black River along its northern shore, the Village of Dexter falls within the Lower Black River subwatershed. The Village has enacted the following tools to regulate land use within its boundaries:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Site Plan Review.

Based on a review of this regulatory program, efforts to improve the land use regulatory tools in the Village should focus on developing land subdivision regulations, as well as incorporating the following elements into its existing program (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Roads/Sidewalks
- Lake/Stream Protection
- Wetland Protection*
- Unique Natural Areas Protection
- Limit Development on Steep Slopes*
- Stormwater Management

Village of Glen Park

Located along the northern shore of the Black River, the Village of Glen Park is sandwiched between the Towns of Brownville, Pamelia, and Watertown; the entirety of the Village falls within the Lower Black River watershed.

The only tool currently used by the Village of Glen Park to regulate land use and development activities within its boundaries is zoning. The current zoning legislation, however, fails to address at any level the 20 review factors noted in Section 6.2.2. As no comprehensive plan has been developed for this municipality, the Village should use the comprehensive planning process as a framework for updating its existing zoning legislation and land use regulatory program to ensure that these factors are addressed.

Village of Herrings

The Village of Herrings is located in along the northern shore of the Black River in the Lower Middle Black River subwatershed. To regulate land use and development activities within its boundaries, the Village has enacted the following regulatory tools:

- Comprehensive Plans and other relevant planning efforts;
- Site Plan Review.

While the Village has implemented these regulatory tools, none were available for review at the time of analysis. Based on a cursory review of its regulatory program, however, the Village of Herrings should develop zoning and subdivision regulations in order to effectively address water quality.

Village of West Carthage

Located along the southern shore of the Black River, across from the Village of Carthage, the Village of West Carthage traverses only one subwatershed – the Lower Middle Black River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Village:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these tools, the Village of West Carthage should update its land use regulatory tools to incorporate the following elements (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Junkyards
- Environmental Impacts of Roads/Sidewalks
- Wetland Protection*
- Unique Natural Areas Protection
- Limit Development on Steep Slopes

LEWIS COUNTY

Town of Croghan

The Town of Croghan is located along the northern boundary of the Black River watershed in Lewis County and traverses portions of three subwatersheds:

- Beaver River subwatershed
- Middle Black River subwatershed
- Lower Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning; and
- Site Plan Review.

Additionally, a small portion of this town is located within the Adirondack Park and thus subject to the land use regulations implemented by the APA. These regulations, however, apply to less than seven percent of the Town's area within the Black River watershed and, as such, have little impact on

activities within the Town of Croghan. Thus, based on a review of only the Town's regulatory program, efforts to improve the land use regulatory tools in the Town of Croghan should focus on incorporating the following elements into its existing program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Marinas
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Allow Cluster Development

As no comprehensive plan has been developed for this municipality, the Town should undertake a comprehensive planning process to initiate a regulatory update process to ensure these factors are addressed.

Town of Denmark

Located on the northeastern portion of the Tug Hill Plateau, west of the Black River near its confluence with the Deer River, the Town of Denmark traverse portions of three subwatersheds:

- Deer River subwatershed
- Lower Middle Black River subwatershed
- Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning; and
- Subdivision Regulations.

The Town of Denmark should use the comprehensive planning process as a starting point to ensure that the following elements are incorporated into its existing land use regulatory program:

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Wetland Protection
- Unique Natural Areas Protection

Town of Greig

The Town of Greig is situated between the Black River and the Lewis-Herkimer County line in the southeastern corner of Lewis County. Portions of five subwatersheds are located within the Town's boundaries:

- Fish Creek subwatershed
- Independence River subwatershed
- Moose River subwatershed
- Otter Creek subwatershed
- Upper Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning; and
- Subdivision Regulations.

Additionally, approximately 75 percent of this town is located within the Adirondack Park and thus subject to the land use regulations implemented by the APA. As such, many of the environmental impacts of concern are addressed by the APA's land use regulatory program. For the remaining 25 percent of the Town that is located outside the Adirondack Park, however, a review of the Town's regulatory program indicates that it should focus its efforts on incorporating the following elements into its existing program:

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Wetland Protection
- Unique Natural Areas Protection

A comprehensive plan and site plan review regulations could assist the Town in meeting its water quality goals by identifying and incorporating additional policies and regulations.

Town of Harrisburg

The Town of Harrisburg, located on the northeastern portion of the Tug Hill Plateau immediately south of thee Town of Denmark, traverse portions of three watersheds:

- Deer River subwatershed
- Middle Black River subwatershed
- Mill Creek subwatershed

To regulate land use and development activities, the Town of Harrisburg has implemented all four land use regulatory tools noted in Section 6.2.2. Based on a review of these tools, the Town should focus efforts to improve its land use regulatory tools as they relate to water quality by incorporating the following elements into its existing program:

- Environmental Impacts of Impervious Surfaces

- Environmental Impacts of Roads
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection

Town of Lewis

Located in the southwestern corner of the Black River watershed along the Lewis-Oneida County line, the Town of Lewis traverses only one subwatershed – the Sugar River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Subdivision Regulations.

To reduce the environmental impacts to water quality resulting from unwise land use practices, the Town should focus efforts to improve its land use regulatory tools by developing site plan review regulations and by incorporating the following elements into its existing program:

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Town of Leyden

Located along the western shore of the Black River, between the Towns of West Turin and Lewis and the Lewis-Oneida County line, the Town of Leyden traverses the following two subwatersheds:

- Sugar River subwatershed
- Upper Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning; and
- Site Plan Review.

To ensure that land development practices do not negatively impact water quality, the Town of Leyden should prepare a comprehensive plan so that a framework exists for updating its existing zoning and site plan review legislation, as well as for developing new land subdivision regulations. The comprehensive plan and updated regulatory program should address the following elements:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Allow Cluster Development

Town of Lowville

The Town of Lowville is located in the center of Lewis County along the western shore of the Black River and traverses two subwatersheds – the Middle Black River subwatershed and the Mill Creek subwatershed. The Town has implemented the following regulatory tools to regulate land use and development activities within its boundaries:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Subdivision Regulations.

Based on a review of these tools, the Town of Lowville should focus efforts to improve its land use regulatory tools by developing site plan review regulations and by incorporating the following elements into its existing program (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Lake/Stream Protection*
- Wetland Protection*
- Unique Natural Areas Protection
- Limit Development on Steep Slopes

Town of Lyonsdale

Situated in the southeastern corner of Lewis County, sandwiched between the Black River, the Lewis-Oneida County line, and the Lewis-Herkimer County line, the Town of Lyonsdale traverses portions of three subwatersheds:

- Fish Creek subwatershed
- Moose River subwatershed
- Upper Middle Black River subwatershed

Although more than two-thirds of the Town is located entirely the Adirondack Park, the only land use regulatory tool in use by the Town is site plan review. While many of the land use regulations under the authority of the APA apply to activities within the Town of Lyonsdale, the Town should prepare its own policy and regulatory framework, including the development of a comprehensive plan, zoning regulations, site plan review regulations, and land subdivision regulations. When developing these tools, the Town should focus on incorporating the following elements:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Marinas
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Cluster Development Allowed

Town of Martinsburg

The Town of Martinsburg is located along the western shore of the Black River in central Lewis County. Portions of the Town traverse the following four subwatersheds:

- Deer River subwatershed
- Middle Black River subwatershed
- Mill Creek subwatershed
- Upper Middle Black River subwatershed

To regulate land use and development activities, the Town of Martinsburg has implemented all four land use regulatory tools noted in Section 6.2.2. While regulatory gaps exist for several of the 20 review factors, the Town of Martinsburg has used its existing regulatory program to address many of the environmental issues associated with diminished water quality. Based on a review of Martinsburg's regulatory program, efforts to improve the land use regulatory tools in the Town should focus on addressing the following elements:

- Environmental Impacts of Impervious Surface
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Floodplain Protection
- Unique Natural Areas Protection

Town of Montague

The Town of Montague, located on the Tug Hill Plateau immediately south of the Towns of Pinckney and Harrisburg, traverses a portion of one subwatershed – the Deer River subwatershed. The Town has implemented the following regulatory tools to regulate land use and development activities within its boundaries:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Subdivision Regulations.

Based on a review of these tools, the Town of Montague should focus efforts to improve its land use regulatory tools by developing site plan review regulations and by incorporating the following elements into its existing program (factors addressed in the comprehensive plan are denoted by an asterisk):

- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks*
- Environmental Impacts of Timber Harvesting*
- Floodplain Protection
- Unique Natural Areas Protection*
- Stormwater Management
- Allow Cluster Development*

Town of New Bremen

Located along the eastern shore of the Black River in Central Lewis County, the Town of New Bremen traverses portions of three subwatersheds:

- Beaver River subwatershed
- Crystal Creek subwatershed
- Middle Black River subwatershed

To regulate land use and development activities, the Town of New Bremen has implemented only two of the land use regulatory tools noted in Section 6.2.2 – zoning and site plan review. The Town should undertake the planning processes necessary to develop a comprehensive plan, update its existing zoning and site plan review regulations, and develop land subdivision regulations. These processes should focus on addressing requirements associated with:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection

- Unique Natural Areas Protection
- Allow Cluster Development

Town of Pinckney

Situated along the Tug Hill Plateau, only a small portion of the Town of Pinckney is located within the Black River watershed and, more specifically, the Deer River subwatershed. The Town has implemented the following regulatory tools to regulate land use and development activities within its boundaries:

- Zoning; and
- Site Plan Review.

The Town of Pinckney should prepare a comprehensive plan so that a framework exists for updating its existing regulatory program to ensure that land development practices do not negatively impact water quality. The comprehensive plan and updated regulatory program should address the following elements as they relate to water quality:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Town of Turin

Located along the western shore of the Black River in the upstream reaches of the Black River Valley, the Town of Turin traverses a portion of only one subwatershed – the Upper Middle Black River subwatershed.

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Subdivision Regulations.

The Town of Turin has used its existing regulatory program to address many of environmental issues associated with reduced water quality. Based on a review of this regulatory program, efforts to improve the land use regulatory tools in the Town should focus on developing site plan review regulations and incorporating the following additional elements into the existing program:

- Environmental Impacts of Impervious Surface

- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Unique Natural Areas Protection
- Stormwater Management

Town of Watson

Covering more than 74,000 acres, the Town of Watson extends from the eastern shore of the Black River, through the Black River Valley, and up into the foothills of the Adirondack Mountains. This expansive Town traverses portions of four subwatersheds:

- Beaver River subwatershed
- Crystal Creek subwatershed
- Independence River subwatershed
- Middle Black River subwatershed

Additionally, more than 55,000 acres (75 percent) of the land in the Town of Watson is located within the boundaries of the Adirondack Park and thus subject to the land use regulations implemented by the APA. Although the Town utilizes zoning as its only land use regulatory tool, many of the environmental issues associated with diminished water quality are being adequately addressed. Based on the attention currently provided to the 20 review factors by the APA and Town regulatory programs, the Town should focus on updating its regulatory program to address the following:

- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Unique Natural Areas Protection
- Allow Cluster Development

Although the current zoning regulations address the environmental issues associated with diminished water quality, the Town should undertake a comprehensive planning process to develop a framework for creating new subdivision and site plan review regulations.

Town of West Turin

The Town of West Turin is located in the south-central portion of Lewis County and traverse portions of the following two subwatersheds:

- Sugar River subwatershed
- Upper Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been implemented by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Subdivision Regulations.

The Town of West Turin's existing regulatory program already addresses many of the land use and development issues that are associated with reduced water quality. The Town should thus focus its efforts to improve the land use regulatory tools by developing site plan review regulations and by incorporating the following topics into the existing program:

- Environmental Impacts of Impervious Surface
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Floodplain Protection
- Unique Natural Areas Protection
- Stormwater Management

Village of Castorland

Located in the Black River Valley, this small village covers 170 acres and traverses one subwatershed – the Middle Black River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Village of Castorland:

- Subdivision Regulations; and
- Site Plan Review.

Given that this municipality has little regulatory authority to address the environmental issues associated with diminished water quality, the Village should undertake a comprehensive planning process to develop a plan that will guide land use decision-making, including the development of new zoning regulations. This process should also inform the updating of existing subdivision and site plan review regulations. During this process, the Village of Castorland should ensure that the following elements are incorporated into the regulatory program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Village of Constableville

Situated in the upstream reaches of the Black River Valley, the Village of Constableville is located entirely within the Sugar River subwatershed. At the time of this analysis, the Village has not enacted any of the four regulatory tools noted in Section 6.2.2 and thus has little authority in regulating the environmental impacts of various land uses. The Village should thus adopt its own regulatory framework beginning with the comprehensive planning process that includes zoning, site plan

review, and subdivision regulations. In doing so, the overall program should strive to address as many of the 20 review factors as is possible.

Village of Copenhagen

The Village of Copenhagen is located in the northeastern portion of the Tug Hill Plateau and drains into only one subwatershed – the Deer River subwatershed. The Village has implemented the following regulatory tools to regulate land use and development activities within its boundaries:

- Subdivision Regulations; and
- Site Plan Review.

Although the Village of Copenhagen has enacted two of the four land use regulatory tools noted in Section 6.2.2, these tools do not effectively address the 20 water quality review factors. To limit the negative impacts that land use and development activities can have on water quality, the Village should use the comprehensive planning process as a starting point for developing new zoning regulations and updating its existing subdivision and site plan review regulations. During this process, the Village of Castorland should strive to incorporate the following elements into its regulatory program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Village of Croghan

Straddling the Towns of Croghan and New Bremen, the Village of Croghan is located entirely within the Beaver River subwatershed. At the time of this analysis, the Village has not enacted any of the four regulatory tools noted in Section 6.2.2 and thus has little authority in regulating the environmental impacts of various land uses. Using the comprehensive planning process as a guide, the Village should develop its own regulatory framework that includes zoning, site plan review, and subdivision regulations. In doing so, the overall program should address as many of the 20 review factors as is possible.

Village of Lowville

The second largest village in the Black River watershed, the Village of Lowville covers almost 1,200 acres and traverses portions of two subwatersheds – the Middle Black River subwatershed and the Mill Creek subwatershed. To regulate land use and development activities, the Village has implemented all four of the land use regulatory tools noted in Section 6.2.2. As much of this municipality has already been developed and is thus less likely to realize activities associated with

large-scale development, the Village should focus on incorporating the following elements into its program:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Agriculture
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Village of Lyons Falls

Located at the confluence of the Black and Moose Rivers, the Village of Lyons Falls is situated along both the eastern and western shores of the Black River, as well the southern shore of the Moose River. The Village traverses two subwatersheds:

- Moose River subwatershed
- Upper Middle Black River subwatershed

At the time of this analysis, the Village has not enacted any of the four regulatory tools noted in Section 6.2.2 and thus has little authority in regulating the environmental impacts of various land uses. The Village of Lyons Falls should undertake a planning process to develop a comprehensive plan that will guide land use decision-making, as well as the development of zoning, subdivision, and site plan review regulations. By adopting these tools, the Village will have the regulatory mechanism necessary to implement its preferred land use development scenario. During development of these tools, the Village should strive to incorporate as many of the 20 review factors as is possible.

Village of Port Leyden

Straddling both shores of the Black River, the Village of Port Leyden is located in the southeastern portion of Lewis County and traverses one subwatershed – the Upper Middle Black River subwatershed. At the time of this analysis, the Village has not enacted any of the four regulatory tools noted in Section 6.2.2 and, as a result, has little authority in regulating the environmental impacts of various land uses. The Village of Port Leyden should adopt its own regulatory framework through the comprehensive planning process, including zoning, site plan review, and subdivision regulations. In doing so, the overall program should address as many of the 20 review factors as is possible.

Village of Turin

The Village of Turin is located in the south-central region of Lewis County and traverses only the Upper Middle Black River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Village:

- Zoning;
- Comprehensive Plans and other relevant planning efforts; and
- Site Plan Review.

Based on a review of these tools, the Village of Turin should focus efforts to improve its land use regulatory tools by incorporating the following elements:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Agriculture
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

ONEIDA COUNTY

Town of Ava

The Town of Ava is located along the southeastern boundary of the Black River watershed between the Oneida-Lewis County line and the Town of Boonville. Portions of two subwatersheds are located within the Town boundaries:

- Sugar River subwatershed
- Upper Middle Black River subwatershed

Although the Town of Ava has enacted all four of the land use regulatory tools noted in Section 6.2.2, these tools do not effectively address the 20 review factors noted above. The Town should focus efforts to improve its land use regulatory tools as they relate to water quality by incorporating the following topics:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting
- Environmental Impacts of Agriculture
- Lake/Stream Protection
- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Stormwater Management
- Allow Cluster Development

Town of Boonville

Located in the southern-most region of the Black River Valley, the Town of Boonville drains into four different subwatersheds:

- Cummings Creek subwatershed
- Sugar River subwatershed
- Upper Black River subwatershed
- Upper Middle Black River subwatershed

To regulate land use and development activities, the following regulatory tools have been developed and are utilized by the Town:

- Zoning;
- Comprehensive Plans and other relevant planning efforts;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these tools, the Town of Boonville should focus efforts to improve its land use regulatory tools by incorporating the following topics into the existing regulations:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of On-Site Wastewater
- Environmental Impacts of Timber Harvesting
- Lake/Stream Protection
- Wetland Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes
- Allow Cluster Development

Town of Forestport

The Town of Forestport is located in the northeast corner of Oneida County and, as the largest Oneida County town in the Black River watershed, traverses five subwatersheds:

- Cummings Creek subwatershed
- Moose River subwatershed
- Upper Black River subwatershed
- Upper Middle Black River subwatershed
- Woodhull Creek subwatershed

To regulate land use and development activities, the following tools have been implemented by the Town:

- Comprehensive Plans and other relevant planning efforts (the Town is currently updating its comprehensive plan);
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these tools, the Town of Forestport should focus efforts to improve its land use regulatory tools by developing a zoning code that includes the following elements:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of Impervious Surfaces
- Environmental Impacts of Marinas
- Environmental Impacts of Roads/Sidewalks
- Environmental Impacts of Timber Harvesting

- Wetland Protection
- Floodplain Protection
- Unique Natural Areas Protection

Town of Remsen

Located at the southern-most tip of the Black River watershed, the Town of Remsen drains into only one subwatershed – the Upper Black River subwatershed. At the time of this analysis, the Town has not enacted any of the four regulatory tools noted in Section 6.2.2 and, as a result, has little authority in regulating the environmental impacts of various land uses. A small portion of the Town is located within the Adirondack Park and is subject to the land use regulations implemented by the APA. These regulations, however, apply to only two percent of the Town's area within the Black River watershed and, as such, have little impact on land use activities within the Town of Remsen.

To ensure that land use and development activities do not negatively impact water quality, the Town should use the comprehensive planning process to develop and adopt its own regulatory framework, including zoning, site plan review, and subdivision regulations. Any regulations developed as a result of this process should address as many of the 20 review factors as is possible.

Town of Steuben

The Town of Steuben is located between the Towns of Boonville and Remsen and drains into only one subwatershed – the Upper Black River subwatershed. At the time of this analysis, the Town has not enacted any of the four regulatory tools noted in Section 6.2.2 and has little authority in regulating the environmental impacts of various land uses. The Town of Steuben should use the comprehensive planning process to develop a plan that will provide a framework for creating land use and development regulations. In doing so, the regulations should address as many of the 20 review factors as is possible.

Village of Boonville

Located along the southern edge of the Black River watershed, the Village of Boonville drains into the Upper Middle Black River subwatershed. To regulate land use and development activities, the following regulatory tools have been implemented by the Village:

- Zoning;
- Subdivision Regulations; and
- Site Plan Review.

Based on a review of these tools, the Village should prepare a comprehensive plan so that a framework exists for updating its existing regulatory program to ensure that land development practices do not negatively impact water quality. The comprehensive plan and updated regulatory program should address the following elements as they relate to water quality:

- Environmental Impacts of Accessory Structures
- Environmental Impacts of On-Site Wastewater
- Wetland Protection
- Unique Natural Areas Protection
- Limit Development on Steep Slopes

7 Implementation

7.1 Next Steps – Setting Up an Implementation Framework

As the appropriate strategies and recommendations essential to protect and improve water quality in the Black River watershed have been identified (see Sections 4, 5, and 6), the next step is to develop an implementation framework to ensure that these recommendations are put into practice. There are four primary activities involved when developing an implementation framework:

- Identifying the implementation team;
- Developing a monitoring program and evaluation framework;
- Preparing a work plan; and
- Communicating achievements and results.

Establishing the Implementation Team

As noted throughout this management plan, the Black River watershed traverses 56 municipalities and five counties, while also draining a portion of the Adirondack Park. Due to the very nature of watersheds, downstream communities often bear the largest burden in terms of negative water quality impacts and the costs associated with remediating these impacts (e.g., increasing treatment capacity at wastewater treatment plants). Conversely, upstream communities often bear the largest burden when it comes to watershed restoration and protection, with forest lands being protected and removed from the tax rolls, farmers made to adhere to new environmental regulations, or by limiting the amount and type of new development. To ensure that the burden of improving water quality is spread equally throughout the watershed, an Intermunicipal Coordinating Organization (ICO) should be created through a Memorandum of Understanding. The ICO would consist of representatives (preferably elected officials) from each of the municipalities located within the Black River watershed, as well as members from the County Soil & Water Conservation Districts. The ICO would be the lead organization responsible for plan implementation.

To implement the recommendations identified in Sections 4 and 5, the ICO should immediately address the following issues:

- Encourage non-participating watershed municipalities to continue to sign onto the Memorandum of Understanding;
- Identify existing gaps in skills and resources (e.g., technical assistance for designing and installing both structural and non-structural measures) and develop a strategy for meeting those needs;
- Evaluate the need for a Watershed Coordinator whose primary responsibility would be implementing and monitoring the recommendations in this management plan, as well as communicating the results;
- Identify and manage funding opportunities; and
- Coordinate activities among stakeholders, municipalities, county and state agencies, and the ICO.

In addition to the tasks listed above, much of the work listed below may also be managed through the ICO.

Developing a Monitoring Program and Evaluation Framework

One of the most important elements of a watershed implementation program is the monitoring and evaluation framework. Developing a set of criteria that can be monitored and evaluated enables progress to be tracked to determine whether the goals identified in the watershed management plan are being met. Additionally, a well-developed monitoring and evaluation framework allows for an adaptive management approach in which implementation activities are continually re-evaluated and revised to ensure the overall goals are met.

It is important that any criteria selected for monitoring and evaluation be quantifiable, easily communicated, and directly related to the management objectives outlined in the watershed management plan. Additionally, the selected criteria should include in-water and land-based elements so that links between implementation of management recommendations and water quality improvements can be demonstrated. Examples of monitoring criteria include:

- In-stream nutrient concentrations;
- Linear feet of restored streambanks;
- Acres of newly created riparian buffers;
- Percent of farms implementing water quality BMPs;
- Linear feet of streams fenced-off from livestock;
- Number of failing septic systems repaired or replaced;
- Percent of new developments using green infrastructure; or
- Number of municipalities that adopt water quality buffer ordinances.

Efforts should also be made to select evaluation criteria that build on and compliment existing sampling and data collection efforts (i.e., monitoring). The ICO should coordinate with the NYSDEC, the Tug Hill Commission, the Adirondack Park Agency and other relevant agencies and organizations when selecting evaluation criteria.

It is also important to consider how the criteria will be evaluated and reported so as to not waste valuable time and resources collecting data that does not link the implementation of management strategies back to water quality outcomes. Specific to watershed management, there are two types of study designs that should be considered – controlled studies and covariate studies. Controlled studies can be cross-sectional (e.g., measurements are collected upstream and downstream of a given water quality project, or measurements are collected in two subwatersheds in which a water quality project was implemented in only one) or longitudinal (e.g., measurements are collected at the same location before and after a water quality project was implemented). Covariate studies attempt to explain the impact of a particular independent variable (e.g., flow) on a dependent variable (e.g., nutrient loads). The particular evaluation design should be selected based on the pollutant(s) of concern, the length of the monitoring program, the size of the study area, and the objectives of the monitoring program.

Developing a well-thought monitoring program and evaluation framework is critical to accurately evaluating the effectiveness of the implementation effort on water quality and overall watershed

health. If, based on the results of these evaluations, it is determined that the implementation is not effective, the appropriate changes in strategies can be made.

Preparing a Work Plan

Work plans serve to categorize the recommendations and strategies provided in the watershed management plan into short-term (0 to 3 years) time frames and act as specific to-do lists over much shorter periods of time. Work plans should include the following key pieces of information:

- All planned activities for the identified time frame (e.g., water quality improvement projects, monitoring activities);
- The date on which each activity will occur/will be accomplished;
- The resources required for each activity (e.g., funding, time); and
- The individual(s) or organization(s) responsible for each activity.

Work plans should also contextualize the activities currently planned by providing a brief summary of those watershed implementation items that were completed as part of the previous work plan, as well as those items still left to be accomplished. This will provide continuity from year to year by institutionalizing implementation progress.

When developing the first work plan, it is important to include action items that are easy to implement and allow the implementation team to demonstrate success early on. Being able to demonstrate success during the early phases of project implementation is a key factor in building support for further implementation projects among stakeholders and decision-makers.

In addition to being a proactive approach that allows for the effective and efficient management of resources, ensures that tasks are completed on time, and prevents smaller subtasks from being overlooked, work plans can also be useful templates for preparing grant applications to fund watershed management plan implementation activities. By specifying the individual(s) and organization(s), procedures, and materials required to complete a specific task, work plans can also act as standard operating procedures by ensuring consistency across individual projects.

Communicating Achievements and Results

Equally important to monitoring and evaluating implementation results is communicating those results. As with any planning and implementation process, continuous communication is essential for establishing credibility and building support in the receiving communities. Given that watershed management planning is a stakeholder-driven process, one of the biggest impediments to successful implementation of a watershed management plan is the lack of communication between the implementing organization(s) and the various stakeholders. By communicating regularly with stakeholders, transparency is increased and accountability among watershed partners is strengthened, both of which build trust and confidence in the implementation process.

While providing stakeholders with regular updates as to the progress of implementation should be comprehensive, it does not need to be exhaustive. What most stakeholders are interested in is whether the plan is actually making a difference, what resources have been used to date, and whether additional resources will be required. There are a variety of formats that can be used to communicate implementation achievements and results to stakeholders, such as quarterly press

releases or ads in local newspapers, presentations at community meetings, or television or radio public service announcements.

In addition to providing stakeholders with progress updates, it is also important to present municipal and County officials, elected local and state officials, and other decision-makers with more detailed information relating to implementation results and the resources required to continue implementation activities. This can be accomplished by issuing a quarterly or annual report, regular progress summary fact sheets, or a watershed "report card", depending on the level of detail required. The most detailed of these three reporting techniques is the annual report. This report generally includes a copy of the current work plan, a summary of the results from the previous work plan, a summary of the cumulative results, an inventory of the resources used to date, and an estimate of the resources that will be required in the future. In addition to providing summary information, the annual report should also provide a more detailed account of one or two specific projects that have recently been completed or are currently underway.

While progress summary fact sheets would provide information similar to that provided in an annual report, they would be targeted towards specific audiences (e.g., Lewis County Legislature, Champion Town Supervisor) and would thus only include information relevant to that audience. Report cards, the least detailed of the three techniques, provide information as to whether water quality conditions are improving overall and allow for a comparison of results across specific areas. Watershed "grades" could be based entirely on water quality improvements (e.g., decreases in phosphorous loads), or could also incorporate the cost-effectiveness of water quality improvements (e.g., decreases in phosphorous loads per dollar spent).

Providing regular implementation updates to watershed stakeholders and decision-makers is an effective way to build awareness of the watershed issues and the progress of watershed plan implementation, while also ensuring a more consistent approach at the subwatershed and municipal levels. Additionally, as more people see that progress is being made, the number of stakeholders will increase as more people become involved in the effort and work toward making the plan a success. As noted above, the ICO may be the most appropriate organization for communicating any achievements and results associated with the implementation of the *Black River Watershed Management Plan*.

7.2 Five-Year Action Plan

7.2.1 Introduction

The purpose of Five-Year Action Plan is to provide a summary of those strategies and recommendations considered to be of highest priority to the Black River watershed and its 19 subwatersheds. All attempts should be made to implement these recommendations within the first five years following completion of the *Black River Watershed Management Plan* (i.e., 2010 to 2015).

While the high priority recommendations provided below are generally ordered from highest to lowest priority, this ordering is not intended to preclude a recommendation found lower on the list from being implemented prior to a recommendation found higher on the list. It is likely that the actual order of implementation will depend on a combination of funding availability, landowner participation, and political leadership.

The high priority strategies and recommendations provided below are classified into two general categories – high priority general recommendations and high priority subwatershed recommendations.

7.2.2 High Priority General Recommendations

The strategies and best management practices identified below were drawn from the general watershed recommendations provided in Section 4. These recommendations provide an overarching framework of actions that should be undertaken, as appropriate, to improve and maintain good water quality in the first five years.

- Develop an Intermunicipal Coordinating Organization (ICO) through a Memorandum of Understanding that would consist of representatives (preferably elected officials) from each of the municipalities located within the Black River watershed, as well as members from the County Soil & Water Conservation Districts (see Section 4.2).
- The ICO should investigate the need for a Watershed Coordinator position (see Section 4.2).
- The ICO should develop a monitoring program and evaluation program and prepare a work plan that outlines specific activities to be conducted in the near-term (see Section 7.1).
- The ICO should promote the networking of stakeholders by providing an avenue for participants to input, share and compare information gathered on the watershed (and their individual subwatersheds) to increase environmental knowledge, stewardship, and community service in the basin. This could include, but is not limited to the following (see Section 4.2):
    - Develop and hold an annual Black River Watershed Conference, where stakeholders will have the opportunity to learn about and discuss issues that face the Black River, as well as how to become better stewards of the Black River.
    - Create an internet-based forum (e.g., Facebook) where stakeholders can meet to discuss issues and ideas, including internet meetings and conference calls.
- The ICO should work with watershed municipalities to update their regulatory frameworks with those items necessary to protect and enhance water quality as identified in Sections 4.9 and 6.2.4. Of highest priority is the addition of a Water Quality Restoration and Protection Overlay (WQO) section to zoning ordinances to encourage natural streambank and riparian vegetation. Other high priority regulatory items include (see Sections 4.2, 4.9, and 6.2.4):
    - Local soil erosion and sedimentation control ordinances;
    - Allowances for cluster development and planned unit developments;
    - Standards limiting the amount of impervious surfaces allowed in new developments; and
    - Design standards addressing a proposed development's impact on water resources and quality (e.g., stormwater management plans, soil erosion/sediment control plans, impervious surface coverage).
- Conduct additional detailed management studies and field assessments (i.e. streambank assessments) for those high priority subwatersheds identified in this management plan so that

restoration and management priorities can be further refined. This should include studies to build on existing GIS work to improve watershed data and models, including the development of an updated land cover map based on field verification of cover types (see Section 4.9).

- County Soil & Water Conservation Districts should continue to work with local farmers to implement best management practices (BMPs) that can improve water quality in the watershed. This includes continuing to use and promote the Agricultural Environmental Management (AEM) program as an initial review tool from which additional needs can be determined (see Sections 4.5 and 8.4). These activities should initially be target towards the high priority subwatersheds identified in Section 3.
- The ICO should encourage community service within the watershed with such organizations as the Boy Scouts, Girl Scouts or other service-based organizations on such items as watershed cleanup, developing environmental problem solving skills and becoming environmentally conscious citizens (see Section 4.2).
- The ICO should develop a watershed education program that provides specific areas of focus for the various watershed stakeholders. This should include, but is not limited to the following (see Sections 4.2 and 4.8):
    - Brochures provided to residents informing them of the issues facing the watershed and how their actions can affect these issues. This could include proper lawn care techniques for environmentally sensitive areas, proper on-site septic system use and maintenance, and information on the importance of cleaning watercraft to prevent the spread of invasive species, just to name a few.
    - Develop issue-specific brochures that detail successful strategies for improving water quality. An agricultural brochure, for example, could include successful strategies for nutrient management, manure handling, and erosion control.
    - Continue to educate land owners and other groups, including boaters, about the threats posed by invasive species. This can be accomplished through the development of informational brochures and pamphlets, watershed-specific websites, signage at launch sites and trailheads. Where available, use existing materials.
- The ICO should work with its member organizations to develop education workshops for municipal employees (e.g., highway departments, local floodplain administrators, code enforcement officers), elected and appointed officials, developers, engineers, construction inspectors, and planning board members. These workshops should focus on the following topics (see Sections 4.2, 4.3, 4.5, and 4.6):
    - Stormwater and erosion control BMPs;
    - Proper streambank and shoreline management;
    - Floodplain management;
    - Existing regulatory programs that affect water quality;
    - Agricultural BMPs; and
    - Other watershed-specific issues of interest.

- The ICO should work with its member organizations, local municipalities, counties, and regulatory agencies to develop a local invasive species rapid response program (see Section 4.8).
- The ICO and its members should continue to coordinate with SLELO and APIPP to prevent and manage the spread of invasive plants. This should also include providing support to the *iMapInvasives* Consortium (http://imapinvasives.org/) in their efforts to develop an on-line, GIS-based, all-taxa invasive species mapping tool (see Section 4.8).
- The ICO should work with counties to implement a program to repair or replace failing septic systems (see Section 4.4).

7.2.3 High Priority Subwatershed Recommendations

The following are the high priority subwatershed-specific recommendations for the Black River subwatershed. These recommendations and strategies were drawn from those High Priority subwatersheds identified in Sections 3.3 and 5.2. Additional high priority subwatershed recommendations were drawn from medium or low priority subwatersheds that where characterized by individual factors having a large impact on basin-wide water quality.

- Agricultural landowners should work with their County SWCD to enact hay/pasture land Best Management Practices (BMPs) to reduce the amount of nutrients and sediment entering local waterbodies from their lands (see Sections 4.5 and 8.4) in the following subwatersheds:
    - Lower Black River subwatershed
    - Mill Creek subwatershed
    - Lower Middle Black River subwatershed
    - Sugar River subwatershed
    - Middle Black River subwatershed
    - Upper Middle Black River subwatershed
- Reduce access of livestock to streams and stream banks vulnerable to erosion in the following subwatersheds:
    - Mill Creek subwatershed
    - Lower Middle Black River subwatershed
    - Sugar River subwatershed
- Restore unstable streambanks, particularly in areas characterized by steep slopes and highly erodible lands, in the following subwatersheds:
    - Lower Black River subwatershed
    - Lower Middle Black River subwatershed
- Incorporate effective stormwater management practices into new construction and existing developments in the following subwatersheds:
    - Lower Black River subwatershed

  - Lower Middle Black River subwatershed
- Improve stormwater management on paved and unpaved roads in the following subwatersheds:
  - Lower Black River subwatershed
  - Mill Creek subwatershed
  - Lower Middle Black River subwatershed