1.0 INTRODUCTION

1.1 PURPOSE

This State of the Basin Report comprises an evaluation of the Black Creek Watershed which is located in New York State in the Counties of Genesee, Monroe, Orleans and Wyoming. The objectives of this report are to:

- Characterize the watershed with respect to its unique physical features (topography, geology, vegetation, wildlife, water quality and hydrology) and cultural characteristics (infrastructure, land use, municipal plans and ordinances and demographics);
- Identify resources within the watershed that are of value for aesthetic, recreational and/or educational reasons or because they are unique;
- Analyze current water quality and quantity conditions to determine existing problems and threats related to land use impacts; and
- Identify critical issues facing the watershed.

It is intended that this State of the Basin Report be followed by the development of a Black Creek Watershed Plan that will propose methods for improving water quality and mitigating flooding conditions in the watershed and to ensure its long-term health and the sustainability of its resources.

1.2 BACKGROUND

1.2.1 Intermunicipal watershed planning

Large watersheds cross municipal boundaries, often making it impossible for any one town or county to conduct comprehensive watershed planning on its own. Towns and villages within counties often work together on watershed planning and counties work with other counties with which it shares a watershed. As part of the planning process, sometimes municipalities enter into intermunicipal agreements (IMA) stating that they will work together to improve and protect water quality in the named watershed.

Intermunicipal watershed planning began in the Black Creek Watershed counties with the Rochester Embayment Remedial Action Plan (RAP). The 1987 U.S./Canada Great Lakes Water Quality Agreement required “Areas of Concern” to prepare RAPs. The Rochester Embayment was named an Area of Concern and its RAP, completed in 1997, was developed by representatives of the six counties that share the Genesee River/Rochester Embayment watershed. Genesee, Monroe and Wyoming Counties are among those that worked on the RAP. Orleans County was not included because such a small part of the County was in the watershed compared to the other six counties. Since 1997 the Counties have participated in watershed planning for smaller local watersheds, including Irondequoit Creek, Oatka Creek and the North Chili Tributary of Black Creek.

Under an IMA, Monroe County and the Town of Chili work cooperatively on water quality and drainage issues. A Town and County Planning Group formed to address several problems in the North Chili tributary of the Black Creek Watershed. The Planning Group described watershed problems, gathered data, developed goals and objectives and made 28 proposals for remedial actions, monitoring, education and regulations (Watershed Plan for the North Chili Tributary of Black Creek, 2001). A high priority recommendation in the plan was to initiate preparation of a watershed plan for the entire Black Creek Watershed. The plan received endorsement by the Town of Riga which shares the watershed.

1.2.2 Initiation of planning for the Black Creek Watershed

The Black Creek Watershed consists of all the land that drains to Black Creek and its tributaries (Map 1, Black Creek Watershed). It incorporates all or part of the Towns of Bethany, Batavia, Stafford, Elba, Byron, LeRoy and Bergen in Genesee County and the Towns of Riga, Ogden, Wheatland, Sweden and Chili in Monroe County. Clarendon in Orleans County and Middlebury in Wyoming County also contain small portions of the watershed.

On behalf of the Black Creek Watershed, Monroe County applied for and received a Watershed Assistance Grant (WAG) from River Network, a national river and watershed conservation organization. The U.S. Environmental Protection Agency supports the WAG program. The grant made possible a six-hour Black Creek Watershed Symposium, the formation of the Black Creek Watershed Coalition and the preparation of the State of the Basin report.

The Symposium took place on March 7, 2002, at Black Creek Park's Woodside Lodge and initiated the watershed planning process. The Symposium was moderated by George Squires of the Genesee County Soil and Water Conservation District and included the following speakers:

- Tim Tatakis, professor at Monroe Community College and author of the Oatka Creek State of the Basin Report;
- Joe Carr, Chili Superintendent of Public Works and member of the planning group for the North Chili Tributary of Black Creek;
- Pete Widener, Town of Chili Historian, and Ron Belczek, Town of Riga Historian
- Doug Bassett, Letchworth State Park naturalist;
- Donna Alder, professor at Roberts Wesleyan College, who with her students had performed chemical and biological testing at sites on the creek;
- Parks Department representatives of Genesee County (Paul Osborn) and Monroe County (Eric Johnson).

The 81 participants then chose between two breakout groups. Breakout Group 1 listed and discussed problems and concerns about the watershed. Breakout Group 2 focused on recreational and educational opportunities in the watershed. At the conclusion of the symposium, George Squires urged participants to take part in watershed planning.

The first meeting of the Black Creek Watershed Coalition (BCWC) was held on April 11, 2002. The first tasks of the BCWC were to prepare a State of the Basin Report outline and to select a consultant to prepare the report.

1.3 GOALS AND OBJECTIVES

The BCWC came to consensus on goals and objectives to guide the group's efforts.

1.3.1 Goals

Goal 1 The Black Creek Watershed municipalities, organized as the BCWC, work together cooperatively on water quality and quantity issues in the Black Creek Watershed.

Goal 2 Waterways in the Black Creek Watershed meet the best use classification goals set for them by the New York State Department of Environmental Conservation (NYSDEC).

Goal 3 Water quality in the Black Creek Watershed is such that there are minimal obstacles for local intended uses.

Goal 4 Sources of nonpoint source pollution are reduced.

Goal 5 Natural wetlands and wetland and stream buffer zones are preserved in order to protect water quality and manage flooding.

Goal 6 Flooding due to natural events and human activities is minimized.

Goal 7 There is sufficient high quality habitat for aquatic, wetland and shoreline plants and animals.

Goal 8 Development impacts water quality and quantity in the Black Creek Watershed to the least extent possible.

Goal 9 Citizens are knowledgeable about water quality and quantity issues.

Goal 10 There are ample water and wetland-related educational opportunities for citizens.

1.3.2 Objectives

Objective 1 Plan a strategy, including funding, to follow the State of the Basin Report with watershed level planning and actions that remediate identified water quality problems, prevent future water quality problems and address water quantity issues.

Objective 2 Expand the Intermunicipal Agreement between Monroe, Genesee, and Orleans Counties to include towns and villages in the Black Creek Watershed and encourage ongoing participation.

Objective 3 Establish Memoranda of Understanding with County Health Departments and Soil and Water Conservation Districts (SWCD) to address the issues of failing onsite wastewater disposal systems and other nonpoint source pollution problems.

Objective 4 Use a newsletter, web-site and/or other means to inform and educate citizens, including youth, about the work of the BCWC and water quality and quantity issues.

Objective 5 Develop information and programs that will help and encourage municipalities to preserve natural vegetation along Black Creek and its tributaries to trap sediment and associated pollutants, prevent streambank erosion, buffer effects of floodwater, provide habitat, maintain proper stream temperature and encourage a healthy biodiversity.

Objective 6 Develop information and programs that will help and encourage municipalities to provide protection to wetlands and their 100-foot buffer areas that goes beyond existing State and Federal regulations to protect water quality, minimize flooding and provide fish and wildlife habitat.

Objective 7 Partner with people and groups to implement the federally mandated Stormwater Phase II regulations and educate municipalities and developers regarding best management practices (BMPs).

Objective 8 Encourage agricultural landowners to partner with SWCD and Natural Resource Conservation Service (NRCS) offices to manage agricultural runoff, soil erosion and associated pollutants.

Objective 9 Research and review road-deicing and snow removal practices and develop information and programs that will encourage the use of those practices that have the least impact on water quality.

Objective 10 Communicate with publicly owned treatment works to maintain awareness of the action plan to reduce the infiltration/inflow within the sanitary sewer system.

Objective 11 Where appropriate, work with municipal utilities to maximize, through proper management, the available capacity of the sanitary sewer transmission system for future development needs.

Objective 12 Secure grant money to conduct a study on what influences flooding in various stream segments.

Objective 13 Work with Genesee River Mt. Morris and Court Street dam operators (U.S. Army Corps of Engineers) on reviewing and implementing policy affecting Black Creek.

Objective 14 Develop a watershed policy on debris removal to reduce flooding and improve navigability including: clearing streams of debris on a regular basis; identifying impediments to debris removal; identifying workers to clean streambeds; and identifying funding sources.

Objective 15 Work with municipal utilities to investigate and remediate flooding resulting from sediment-clogged pipes.

Objective 16 Identify problems associated with activities in floodways and develop a watershed policy regarding future land use in the floodway.

Objective 17 Work with SWCD to conduct streambank erosion surveys to identify areas in need of remediation.

Objective 18 Secure grant money to conduct a survey of the effect of dams and fallen trees on streambank erosion.

Objective 19 Expand the Great Lawns/Great Lakes program throughout the Black Creek Watershed to reduce the overuse of fertilizers and pesticides in the watershed and to educate the community about water quality.

Objective 20 Maintain existing active Community Water Watch teams and organize new ones to monitor the waterways and educate the community about water quality.

Objective 21 Seek a grant for a water quality study of Black Creek to serve as a benchmark and track progress towards established water quality goals via monitoring programs undertaken by Monroe County staff, university researchers and/or the United States Geological Survey (USGS).

Objective 22 Promote an increase in access to the waterways.

1.4 RELATIONSHIPS TO GOVERNMENTAL AND LOCAL PROGRAMS

There are many agreements, regulations and partnerships that help to protect water quality or manage water quantity in the Black Creek Watershed.

1.4.1 International programs

The purpose of the Great Lakes Water Quality Agreement between the United States and Canada is to "...restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem." As part of the effort to fulfill this mission, the International Joint Commission identified 43 Areas of Concern within the Great Lakes Basin that are characterized by serious pollution problems and are the focal points of remedial activities. The Agreement requires that a RAP be developed for the Rochester Embayment which includes the Genesee River and Black Creek.

The Stage I RAP, completed in 1993, established water quality goals and objectives, described water quality conditions/problems and identified pollutant sources. The Stage II RAP, completed in 1997, identified and recommended new actions and remedial measures that are needed to restore and maintain water quality. Many of the recommended actions are currently being implemented.

1.4.2 Federal programs

The Clean Water Act (Water Pollution Prevention and Control, U.S. Code Title 33 Section 1251) requires states to classify waters according to their best uses and to adopt water quality standards that support those uses.

Section 404 of the Clean Water Act requires that anyone interested in depositing dredged or fill material into waters of the United States, including wetlands, must receive authorization for such activities. The U.S. Army Corps of Engineers (USACE) has been assigned responsibility for administering the Section 404 permitting process.

The National Flood Insurance Program (NFIP) is a three-part program that addresses flood insurance, floodplain management and flood hazard mapping. To get secured financing to buy, build or improve structures in Special Flood Hazard Areas, a property owner is required to purchase flood insurance. Flood insurance is available to any property owner located in a community participating in the NFIP.

1.4.2.1 U.S. Army Corps of Engineers

The Buffalo District of the USACE operates and maintains the Mt. Morris Dam as part of its flood control program. The dam regulates water levels on the lower Genesee River, and therefore reduces flood impacts on lower Black Creek near its confluence with the Genesee River. USACE is also responsible for maintaining navigable waterways and permitting wetland use activities.

1.4.2.2 U. S. Geological Survey

The Ithaca Subdistrict of the USGS has a cooperative agreement with the USACE to collect water quantity data as part of the maintenance effort for the Mount Morris Dam. In the Black Creek Watershed a monitoring station is maintained at Churchville as part of this effort. A second cooperative agreement between Monroe County and USGS supports collection of water quality data at this site.

1.4.2.3 U.S. Department of Agriculture

The NRCS is a U.S. Department of Agriculture (USDA) agency that assists owners of private land with conserving soil, water and other natural resources. Services include Agricultural Conservation Plans, Conservation Reserve Program, Wetlands Reserve Program, Comprehensive Nutrient Management Plans, assistance to Confined Animal Feeding Operations (CAFO) and technical assistance to farmers on water quality and erosion control issues.

The Resource Conservation and Development (RC&D) program is a national program that helps communities improve their economies through the wise use of natural resources. Currently there are 368 RC&D Areas designated for USDA assistance by the Secretary of Agriculture. The purpose of the RC&D program is to improve the capability of state, tribal and local units of government and local nonprofit organizations in rural areas to plan, develop and carry out programs for resource conservation and development. The NRCS provides administrative support for the RC&D program including office space and staff. The Ontario Lake Plains Resource Conservation and Development Area (Lake Plains RC&D) received official authorization by the Secretary of Agriculture in March of 1998. The Lakes Plains RC&D covers approximately 2,378,600 acres within a six-county area in western New York. The counties include Wayne, Monroe, Orleans, Genesee, Niagara and Erie. The member sponsors include the six County SWCD and six County Legislatures and Supervisors. The member sponsors formed the Lake Plains RC&D Council, Inc. a non-profit tax-exempt organization [IRS 501(c) (3)] to oversee their activities.

1.4.2.4 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) mission is to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people. The USFWS helps protect a healthy environment for people, fish and wildlife and helps Americans conserve and enjoy the outdoors and our living treasures. The USFWS major responsibilities are for migratory birds, endangered species, certain marine mammals and freshwater and anadromous fish. The USFWS takes jurisdiction over listing for terrestrial and native freshwater species. Under the Endangered Species Act the USFWS determines critical habitat for the maintenance and recovery of endangered species and requires that the impacts of human activities on species and habitat be assessed.

1.4.3 New York State Programs

A number of State agencies and programs are relevant to Black Creek Watershed management goals and objectives.

1.4.3.1 Stormwater management regulations

The NYSDEC Division of Water regulates Point Source State Pollution Discharge Elimination System (SPDES) permits. For permitting details see http://www.dec.state.ny.us/website/dcs/spdes/index.html. Regulations address point source discharges to surface waters and groundwater through the SPDES permit program. SPDES permits limit the amounts and concentrations of pollutants in wastewater and are written to assure that New York State water quality standards are met. Limits are based upon achieving minimum waste treatment technology, further treatment to meet the water quality standard of the receiving water for the contaminant, other known sources of the contaminant upstream and downstream and the analytical methods and detection limits for the substances. To control pollutant concentrations some industrial source owners are required to pretreat wastewater before discharging it to a sewer system. Another component of the SPDES program is wastewater treatment plant and collection system operations.

Phase I of the SPDES program requires stormwater permit coverage for discharges from municipal separate storm sewer systems (MS4s) located in incorporated places or counties with populations of 100,000 or more, and construction that disturbs five or more acres of land. These requirements have been in place for several years.

Phase II requires stormwater permit coverage for all MS4s within defined urbanized areas with population less than 100,000. The MS4s are required to develop a stormwater management plan that includes six minimum control measures:

- Public education and outreach;
- Public involvement and participation;
- Detection and elimination of illicit discharges;
- Control of runoff from construction sites disturbing one acre or more;
- Control of post-construction runoff; and
- Pollution prevention/good housekeeping for municipal operations.

Within the Black Creek Watershed Phase II requirements apply to the Towns of Chili and Ogden.

Phase II also includes changes to the way NYSDEC regulates stormwater discharges from construction activities by reducing the applicability threshold to 1 acre of disturbance. The NYSDEC issued two permits on January 8, 2003 which regulate stormwater discharges from Phase II MS4s and construction activities. While the MS4 permit applies only to the communities mentioned above, the construction permit applies to all activities regardless of location which exceed the 1-acre disturbance threshold.

1.4.3.2 NYS Water Quality Standards

The NYS water quality standards (6NYCRR parts 700-705) contain the classification system for NYS surface and groundwater. The standards and guidance values for surface water and groundwater quality and groundwater effluent limitations are employed in these regulations, including in the SPDES system. Also included are sections on definitions, references, appendices and a section on thermal discharge limits.

1.4.3.3 NYSDEC Priority Waterbodies List

The NYSDEC Priority Waterbodies List (PWL) is required by Section 303(d) of the Clean Waters Act and is a section of the 305(b) Water Quality Report made by NYSDEC to the U.S. Environmental Protection Agency (USEPA). The PWL identifies waters that have one or more uses that are not fully supported or are threatened by conditions or practices that could lead to declining water quality. The PWL is used as a base for water program management.

1.4.3.4 NYS Unified Watershed Assessment Report

The 1998 Clean Water Action Plan required each state to prepare a Unified Watershed Assessment (UWA) to determine where additional funding will help achieve fishable and swimmable waters. New York State assigned each of the state's 54 watersheds to one of 3 categories: in need of restoration, meets water quality goals, or insufficient data.

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

The Lower Genesee Watershed (Hydrologic Unit Code (HUC) – 04130003) is in a Category II in the UWA report. The report describes Category II as watersheds meeting goals including those needing action to sustain water quality. The schedule outlined in the UWA report stated that the development of restorative and protective strategies for the Lower Genesee was scheduled to be initiated in the fiscal year beginning April 1, 2001. This process, referred to as the WRAPS, was begun by the Genesee/Finger Lakes Regional Planning Council.

1.4.3.5 NYS Freshwater Wetlands Act

The NYSDEC has classified regulated freshwater wetlands (NYS Freshwater Wetlands Act, ECL 24-0403) according to their respective function, values and benefits. Wetlands may be Class I, II, III or IV. Class I wetlands are the most valuable and are subject to the most stringent standards. A wetland must be 12.4 acres or larger for protection under the Freshwater Wetlands Act. Smaller wetlands may be protected when the NYSDEC Commissioner determines they have unusual local importance in providing one or more of the wetland functions described in Article 24. The wetland buffer zone, an adjacent area that extends 100 feet from the wetland boundary, may also be regulated.

1.4.3.6 NYS Use and Protection of Waters

New York has classified the waters of the State (6NYCRR Part 608, ECL Article 15 Title 5) according to an evaluation of their "best usages" per 6 NYCRR Part 701. Fresh surface waters receive a classification from AA-S (highest protection) to C (lowest protection). At a minimum, the quality of the water shall be suitable for fish propagation. Certain stream segments may also be denoted with a (T) or (TS) symbol following the classification letter. These symbols indicate the presence of trout waters (T) and trout spawning waters (TS). Stream segments with a classification of C(T) or higher are considered "protected" by State law. 6 NYCRR Part 608, Section 608.2 requires that no disturbance of the bed or banks of a protected stream occur without a permit issued by

NYSDEC. Certain stream segments within the Black Creek Watershed have been indicated as protected. Work done on C(T)-, B- or A-class streams needs an article 15 Permit from the NYSDEC. If in doubt about actions in a particular segment of stream, contact NYSDEC at (585) 226-2466. This classification is intended to identify best usage, so it is possible that some of these tributaries are classified as trout waters and protected, but they are not necessarily currently populated with trout. There is no detailed data on the aquatic habitats for segments in the Black Creek Watershed, but NYSDEC classifications are as follows.

Class B segments

- Horseshoe Lake, Godfrey Pond and Seven Springs Pond in the Town of Stafford;
- Black Creek Main Channel from eastern end of Bergen Swamp to Churchville Dam in the Towns of Bergen and Riga; and
- Blue Pond on Mill Creek in the Town of Wheatland.

Class C(T) segments

- Spring Creek and Unnamed Tributary (Ont. 117-19-28-6) in the Towns of Stafford and Byron;
- Mill Creek in the Towns of Wheatland, Riga and Chili;
- Tributaries of Black Creek in the Town of Chili.

1.4.3.7 NYS Canal Corporation

The Canal Corporation owns and operates the Court Street Dam. The operation of the dam can impact the water level of the Genesee River and Black Creek near its junction with the Genesee River. The dam is regulated by the Federal Energy Regulatory Commission.

1.4.3.8 NYS Environmental Quality Review

The NY State Environmental Quality Review (SEQR) requires all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. This means these agencies must assess the environmental significance of all actions they have discretion to approve, fund or directly undertake. Additional information on Environmental Impact Assessment in New York State is found at http://www.dec.state.ny.us/website/dcs/seqr/.

1.4.4 Regional programs

The Finger Lakes-Lake Ontario Watershed Protection Alliance is an alliance of 25 counties in the Lake Ontario Watershed. Its mission is to protect and enhance water resources by promoting the sharing of information and resources related to the management of watersheds, to foster dynamic and collaborative watershed management programs and partnerships and to emphasize an ecosystem-based approach to water quality improvement and protection.

The Genesee/Finger Lakes Regional Planning Council (G/FLRPC) is a public organization created to facilitate cooperation among neighboring communities. It is a forum for the exchange of ideas and problem resolution and to initiate actions that enhance the economic, environmental and social qualities of the region. Genesee, Monroe, Orleans and Wyoming Counties are part of the G/FLRPC. Most recently, G/FLRPC has undertaken development of the WRAPS for the Genesee River Basin, of which Black Creek is a part, in conjunction with the NYSDEC Division of Water.

The North Chili Tributary of Black Creek Planning Group consists of Town of Chili and Monroe County representatives who created a watershed plan for a tributary located mostly in the northwest corner of Chili. The plan addressed both water quality and quantity issues. One recommendation of the plan was to initiate watershed planning for the entire Black Creek Watershed (Watershed Plan for the North Chili Tributary of Black Creek, 2001).

1.4.5 County programs

Water Quality Coordinating Committees (WQCCs) represent municipalities, agencies and organizations that conduct planning, education, regulation or operations that affect water quality. The WQCC identifies water quality problems, prioritizes needed actions, seeks funding for projects, coordinates programming and recommends policy to protect and improve water resources in the County and its watersheds.

Community Water Watch (CWW) was established as a volunteer stream monitoring program developed by the Monroe County Water Quality Management Advisory Committee (WQMAC). The WQMAC was comprised of volunteers who advised Monroe County on water quality issues and assisted with educational outreach. The purpose of the CWW program is to utilize citizen volunteers to track the health of our local streams, identify problems that may need correction and foster stewardship of our local water resources. Participation in the program consists of the following core activities:

- Adopt a one-half mile segment of stream;
- Conduct an annual watershed walk;
- Conduct a visual survey and analyze benthic macro-invertebrates four times per year at two different locations along an adopted stream;
- Perform an educational outreach activity; and
- Submit data to the Volunteer Coordinator.

Community Water Watch volunteers monitor the numerous smaller streams throughout their communities. Each team conducts a visual survey of a location on a stream and identifies benthic macro-invertebrates as an indicator of water quality. All the supplies needed are included in a kit that is available from the Volunteer Coordinator. The program has several optional activities such as tree planting, litter pick-ups and storm drain stenciling that teams may wish to perform. Teams are asked to commit to the program for at least two years so as to facilitate data collection continuity.

SWCDs provide technical assistance and programs including erosion control, stormwater management, agricultural conservation practices, pond management, fish stocking, tree and shrub planting and educational outreach.

Cornell Cooperative Extension (CCE) has programs to conserve and ensure the quality of water supplies, promote environmental stewardship and community, agricultural and residential environmental enhancement, prepare youth to make informed environmental choices and enhance science education through the environment.

County Health Departments manage and regulate county sanitary codes and are responsible for onsite sewage disposal systems. Counties without health departments may assume responsibility for upholding the State Sanitary Code by adopting their own sanitary codes, which may be stricter than the State's. In a county with neither a health department nor a code, the local code enforcement officer administers the New York State Sanitary Code. Genesee, Orleans, Wyoming and Monroe Counties have health departments.

1.4.6 Local programs in towns and villages

In New York State, Towns and Villages have significant land use powers that impact water quality and quantity that include comprehensive plans/master plans, policies and ordinances. Often a town or village hires an engineering consultant to perform drainage studies that informs the municipality how to apply its land use planning authority wisely in regard to water quality and quantity.

The Town of Chili has a Drainage Committee that is made up of 7 members that serve 3-year terms. They review drainage complaints, propose drainage improvement projects and develop long-term goals regarding drainage throughout the Town in both the consolidated district and other areas.

Review of the Comprehensive Plans for eight towns in the Black Creek Watershed provided insight into potential local issues, objectives and goals relevant to watershed management. The data gathered provide representative examples of town policies used in the Black Creek Watershed. The review was focused on six areas: governmental practices, land development, agriculture, ecology, hydrology and aesthetics.

Towns with higher population density treat planning in a more comprehensive manner because they tend to have a greater number and complexity of watershed management issues. Towns with lower population density tend to emphasize agriculture as their key economic development and land management issue. Across the

Black Creek Watershed commonly held views include a desire to maintain rural character, preserve existing open space, maximize agricultural use of prime farmlands and minimize environmental impacts associated with land development. Common concerns about watershed issues include interest in watershed management planning, a desire to preserve sensitive areas, establish and manage floodplain corridors, practice wetland and flood zone regulations and establish and implement groundwater protection strategies.

Each Town in the Black Creek Watershed has zoning ordinances related to flood zones, riparian zones, agriculture, community development and other activities that impact the goals of the BCWC. The BCWC can assist with coordination of critical town regulatory activities that can help the BCWC achieve its goals and objectives.

1.5 COALITION MEMBERS AND PUBLIC PARTICIPATION

Watershed Planning for small local watersheds within Monroe County has been underway since the Rochester Embayment Remedial Action Plan was completed in 1997. One result of the planning effort related to the North Chili Tributary of Black Creek was the recommendation to initiate planning for the greater Black Creek Watershed. Further need for a Black Creek Watershed planning effort was discussed at the Caring for Creeks Conference held at the Genesee Country Village on April 28, 2000. Participants who live and work in the Black Creek Watershed gathered to identify problems in the watershed, resources that should be preserved, and persons, agencies and organizations that should be involved in preparation of a watershed plan.

As a result of the community interest in developing a watershed plan for the Black Creek Watershed, Monroe County applied for and received a WAG from River Network, a national river and watershed conservation organization. The grant made possible a six-hour Black Creek Watershed Symposium. The Black Creek Watershed Symposium was the “kick off” to the Black Creek Watershed planning process. The Symposium’s agenda was designed to introduce the concept and benefits of watershed planning and to share information about the Black Creek Watershed. Speakers presented information on development history along the watershed, plant and animal life it supports, chemical and biological health of the Creek and active and passive recreation opportunities within the watershed. The Black Creek Watershed Symposium also was the starting point for the formation of the BCWC.

The BCWC was formed to work cooperatively in overseeing the development of the Black Creek Watershed Plan. One of the guiding principles in the watershed planning process is noted in the Coastal Conservancy Watershed Planning Guide (02/27/01) "All too often, planning efforts fail to consult the ones most affected: landowners and other stakeholders…. If community concerns are truly validated from the beginning, with stakeholder participation in setting the goals and priorities, there is a much greater likelihood of success." With this in mind, one of the most important goals of the BCWC is to inform people about the study and to encourage participation. From the beginning of the planning process the BCWC outreach goals have included the following:

- Present the planning process to the community;
- Solicit comments regarding local concerns, local resources and historical information;
- Capture the range of public issues from as broad a group of participants as possible;
- Clarify the community's role in the process and ways to get involved;
- Educate the public and decision-makers about water resource issues;
- Obtain useful information from stakeholders;
- Establish realistic citizen expectations about the study scope and outcomes; and
- Create a mechanism for communications with individuals and groups.

To achieve these goals, the following tasks were identified:

- Publicize and organize community meetings with newsletters, a web site and local news articles.
- Prepare a presentation summarizing the project, watershed issues, the need for the watershed plan and ways to get involved.
- Conduct monthly open meetings, capturing local concerns and opportunities.
- Based on feedback, refine the list of plan goals, objectives, critical questions and work program as necessary.
- Prepare a document addressing all concerns identified by the community. For those concerns not included, explain why they are beyond scope or are more appropriate for future planning efforts. The State of the Basin Report should be followed by development of a Black Creek Watershed Plan.
- Add public meeting attendees to the mailing list data base.

The BCWC has developed a series of initiatives designed to stimulate public interest in the Black Creek Watershed planning process and provide public education of the relevance of watershed issues.

1.5.1 Black Creek Watershed Symposium

In September 2001 a “core of four” representatives from Monroe and Genesee County developed a list of people interested in the Black Creek Watershed and invited them to help plan the symposium. The invitation resulted in 13 symposium planners.

The Black Creek Watershed Symposium, considered to be a “kick off” to the State of the Basin Report and watershed planning, was held on March 7, 2002 at Black Creek Park, which adjoins the creek. The symposium planners identified the Black Creek Watershed stakeholders as state, regional, county, town and village governments; businesses and farmers; residents; environmental conservationists; and those who enjoy recreation in the watershed. The group specifically invited members from the following constituencies:

- New York State Department of Environmental Conservation Region 8;
- Genesee/Finger Lakes Regional Planning Council;
- County legislators, health and/or planning departments, parks departments, transportation departments, fishery advisory boards;
- Soil and Water Conservation District, Natural Resource Conservation Service and Cornell Cooperative Extension offices;
- Town supervisors, village mayors, planning and conservation boards;
- Farm Bureaus, farmers and Farmland Protection Boards;
- Homeowners associations;
- Environmental organizations;
- Recreation organizations;
- Country clubs and golf courses;
- Teachers and professors; and
- Interested citizens.

Speakers included two people who had previously participated in watershed planning, two historians, a naturalist, a chemistry professor who had performed tests on Black Creek with student and parks representatives. After the presentations by the speakers, the 81 participants had the chance to either express their concerns about watershed problems or to learn more about recreational and educational opportunities. A summary of comments from workshop participants is included as Appendix 7.2). Publicity included articles in newspapers and municipal and organization newsletters, the mailing of 300 flyers/brochures to municipal officials, environmental and recreation organizations, educators and citizens throughout the watershed.

Participants in the symposium included state, regional, county, town and village officials, citizens, high school and college educators and representatives of environmental, recreation and homeowners associations.

1.5.2 Black Creek Watershed Coalition

People on the symposium brochure mailing list and the symposium participants list, as well as others, were invited to attend the first meeting of the BCWC. The first meeting was held on April 11, 2002. Since this initial "kick off meeting" meetings have been held once a month. The BCWC wants to include as many people from as many parts of the watershed as possible. Meetings are held throughout the watershed on various nights to involve as many people as possible. These meetings are open to the public. So far 41 individuals have attended meetings and 25 have been very active.

The active members of the BCWC include state, regional, county, town and village officials, citizens, college educators, and representatives of environmental, recreation and homeowners associations. The current public interest database includes over 450 names. Names can be selected from the database, for example, for those who wish to receive agendas and minutes, those who are official municipal representatives or those who want to be notified about recreational opportunities.

1.5.3 Intermunicipal agreement between counties

An IMA is a good tool to teach county legislators about the BCWC. Genesee and Monroe Counties began working together in April, 2002 to develop the wording of an agreement and to seek the approval of county lawyers. When the draft IMA was presented to the BCWC for comment, the group recommended that Orleans and Wyoming Counties (a small area of the watershed is in each of those counties) be approached immediately to see if they were interested being included in the agreement. Contacts were made in the two additional counties. Orleans County agreed to become part of the agreement immediately. Wyoming County decided to wait. The IMA was approved by the legislatures of Genesee, Monroe and Orleans Counties.

1.5.4 Encourage participation by all municipalities in the watershed

It is essential to involve every watershed municipality in the process. Municipal representatives were contacted to obtain local information and to learn about local problems and concerns. In developing the BCWC database, representatives from every county, town, village, SWCD and CCE were included. A BCWC member volunteered to contact municipalities to find out who their official representative would be. In the few cases where a representative was not identified, the Town Supervisor or Village Mayor is considered the representative. Even though every municipality cannot currently be actively involved, in almost all cases the municipalities wanted to keep up-to-date on BCWC activities. This is done through monthly mailings of meeting agendas and minutes.

1.5.5 BCWC newsletters and mailings

The primary method of contact with residents in the watershed who have expressed interest in the watershed planning effort and water quality issues in general continues to be through the web site and direct mailings. Approximately 450 families, individuals and community representatives receive regular correspondence and updates through this medium. A newsletter was prepared and widely distributed on December 1, 2002. Subsequent newsletters are planned as part of a continuing public information effort.

1.5.6 News media coverage

The North Edition of the Suburban News announced receipt of the WAG (12/31/01). The Black Creek Watershed Symposium was advertised in the Chili Times (January, 2002), and the Suburban News (Gates Edition, 2/25/02 and North Edition, 2/4/02). The Batavia Daily News advertised and covered the Symposium on March 1,7, and 8, 2002 and May 25, 2002.

Public agency newsletters that covered Black Creek Watershed planning activities include:

- Improving Water Quality in Monroe County, A Newsletter of the Monroe County Health Department and the USGS, Fall, 2002, cover story on BCWC;
- The Dirt, Monroe County SWCD, March, 2002, advertised the Symposium;
- Soil and Water, Genesee County SWCD, March, 2002, advertised the Symposium;
- The Sphere, The Center for Environmental Information, Winter, 2002, advertised the Symposium;
- Monroe County Developments, MCDPD, Spring, 2002, advertised the Symposium;
- Riga Town Newsletter, February and March, 2002, advertised the Symposium.

Natalie Hansen of the Gates Chili Post, did a lead story about the BCWC in the Gates-Chili Post (February 5, 2003).

Other news coverage includes the Gates-Chili Post, Editorial Viewpoints, “Do your part for Black Creek’s health,” April 23, 2003; and Suburban News lead article, “Black Creek Watershed Coalition presents report April 29, “ April 28, 2003 interview with BCWC meeting Chair.

A local television station, R News Channel 9, ran two taped stories concerning the State of the Basin Report Planning, the BCWC, and the March 26, 2003 meeting. The Chairperson and another member of the BCWC were interviewed and the two stories ran numerous times on Sunday March 23, 2003.

The news media will be informed of the completion of the Black Creek Watershed State of the Basin report and BCWC plans for the future in September 2003.

1.5.7 Web site development

A web site was created by Carol Zollweg early in the planning process (November, 2002) and temporarily was located on the consultant's academic web site. A dedicated home page for the Black Creek Watershed web site was established in December, 2002. The Black Creek Watershed web site is being hosted by Genesee Gateway Rochester Free-Net, Inc. We thank Genesee Gateway Rochester Free-Net, Inc. for providing this valuable service. The address is www.blackcreekwatershed.org. The web site includes:

- Meeting announcements and directions;
- Meeting minutes;
- General information about the watershed;
- Photographs;
- Recreational information;
- All maps in PDF format; and
- This report.

1.5.8 Consultant team

The BCWC determined that hiring consultants to prepare the State of the Basin Report should be undertaken as one of the first tasks. The BCWC initially met every three weeks to discuss the outline, the "Request for Qualifications" and publicity for attracting a good pool of consultants and to choose the candidates that would be interviewed. Ten sets of qualifications were submitted for consideration.

1.5.9 Field tours within the watershed

The first guided Bergen Swamp hike was on September 29, 2002; the second hike was on May 17, 2003. The hikes lasted two hours and covered 2 miles of trail within Bergen Swamp. The hikes were limited to 25 people. The hikes were sponsored by the Black Creek Watershed Coalition and Bergen Swamp Preservation Society; Barbara Drake, Lee Drake and Patty Coan led the hikes.

A canoe trip was held on May 31, 2003, from Bergen Swamp to Churchville Park. The trip was sponsored by the Black Creek Watershed Coalition and Adventure Calls Rafting Co.

1.6 HISTORICAL AND GEOGRAPHICAL SETTING

1.6.1 Black Creek

Black Creek was known by Native American people as Checkanango Creek. The creek begins in Wyoming County and is little more than a drainage ditch before entering Genesee County Park. It flows north and slightly east through the Towns of Bethany and Stafford, veering east at the western edge of the Bergen Swamp northeast of the Village of Byron. The Creek flows southwest through the center of the Village of Churchville and meanders eastward through the Towns of Riga and Chili until it reaches the confluence with the Genesee River.

1.6.2 Town of Bethany

Black Creek heads in Wyoming County and flows north through Genesee County Park and across the Town of Bethany. At one time, enough water was pumped from 7 springs and 2 wells in the Park to supply the Genesee County Home with enough water to operate the entire building complex, the farm and still maintain flow in the creek. The springs were cleaned out and the pump was oiled daily and routinely maintained as long as the County Home was in operation. When the County Home was moved to Batavia the water supply system was no longer maintained. Current owners have to haul water to the site.

A sizable dam impounded the water of Black Creek about one-quarter mile north of the Goose Hollow Road (now Raymond Road). This was used as a source of ice for the Genesee County Home.

Little Canada (Bennetts Mills) is on Black Creek in the northeastern part of Bethany. In the early 19th century the creek supplied a grist mill, saw mill, cooper shop, wagon shop, Methodist Church, dance hall, Erie County Savings Bank and a tavern. At that time locals called the creek “Chicoungie” Creek.

1.6.3 Town of Stafford

After flowing through the Genesee County Park and Little Canada in the Town of Bethany, Black Creek meanders into the Town of Stafford. The Indian word for Stafford was "ya-go-ogebe" (place of hearing). Black Creek flows north through the villages of Stafford and Morganville. Morganville received its name from William Morgan, a prominent Mason. Morganville was a valuable source of waterpower since the creek cascades down over stones and under a bridge on the Northeast Morganville Road.

1.6.4 Godfrey's Pond

Godfrey's Pond, in the Town of Stafford and southwest of Byron, has a unique history related to 19th century industrial development. Bigelow Creek was originally dammed to create Godfrey's Pond as a private recreation area. Later, the New York Central (NYC) Railroad constructed a water line, 24 inches in diameter and approximately 2.5 miles long, from Godfrey's Pond to South Byron. The purpose of the water line was to fill a water tank by gravity feed in order to supply water for steam engines so that trains could travel between South Byron and Batavia, the longest grade in the NYC Railroad System.

In 1931, when the NYC Railroad sold the property at Godfrey's Pond for residential use, water rights were written into the deed for all landowners. Landowners who would maintain the water line could continue to get water. The last landowner to give up water rights did so in 1994.

1.6.5 Town of Byron

The Town of Byron was named for Lord Byron and lies in the northeastern part of Genesee County. Black Creek flows in a northeasterly direction through the central part of the Town, and Spring Creek and Bigelow Creek join from the west as its principal tributaries. A short distance north of Byron on Black Creek is a sulphur spring emitting hydrogen sulfide gas. Byron Center, the most important village in Byron, is situated near the center of the town on Black Creek and near the West Shore Railroad. The Genesee Mills was established one-half mile east of the village on Black Creek.

In the Town of Byron, Black Creek has been used for agricultural irrigation and livestock watering on properties bisected by the creek. Black Creek tends to have a very low flow during the summer months in Byron, making the creek unsuitable as the basis of business ventures. Increased flow from the tributary at the junction with Bigelow Creek usually sustains some flow through the Town of Byron. Spring Creek merges into Black Creek in the Byron-Bergen Swamp.

At one time, the floodplain was used as pasture for cattle grazing. Grazing prevented trees from growing along the banks of the creek. As dairy farms grew larger and fewer in number, forest cover returned to the Black Creek floodplain. Trees along the banks now fall into the creek and create local obstacles to flow.

1.6.6 Town of Bergen

Bergen is the most northeasterly town in Genesee County. Black Creek flows in an easterly direction through the town north of its center. Bergen is bounded on the east and north by Monroe County. When the road from LeRoy to Lake Ontario was established in 1801, a path around the Bergen Swamp and a ford across Black Creek were needed. That is the reason that Route 19 is so crooked in the Bergen area.

A woolen mill was established just north of Black Creek and west of West Sweden Road in an area called Little Boston. Only fieldstone foundations mark the location of the homes and buildings that once stood in that area. The land, composed of layers of sand and marl, was used to grow strawberries and broccoli. In the early days trees were cut down and burned to make potash which was used to fertilize the soil.

Marl deposits in the Bergen Swamp attracted settlers and businessmen interested in mining. A newspaper article from 1899 says that a vice president from Portland Cement was in town to obtain rights to several marl sites in the swamp. The marl had too much mineral soil in it to mine for national distribution. Some of the marl was sold to the Holley Lime Co. in the 20th century. The marl was used to fertilize soil. The numerous springs in the vicinity of the marl pits caused the pits to fill with water as soon as they were dug and they soon became ponds.

The quaint Village of Bergen maintains a thriving historic downtown that provides a commercial and cultural center for the Town. Bergen's main claim to fame is the nearby Bergen Swamp, a unique primeval wetland habitat rich in rare and endangered species.

1.6.7 Bergen Swamp

Black Creek flows through the Bergen Swamp in the Towns of Byron and Bergen in Genesee County. The swamp consists of 2,000 plus acres in the two towns and is home to rare plants and endangered wildlife. It is one of the lingering remnants of a group of post glacial lakes that evolved into a series of swamps that once stretched from Niagara Falls to Rochester, NY. This history of the Bergen Swamp is taken from the following web sites and accounts of members of the Bergen Swamp Preservation Society (BSPS):

- Western New York Regional Informational Network
  http://rin.buffalo.edu/c_gene/envi/berg_pres_soci.html
- The Bergen Swamp Preservation Society
  http://www.bergenswamp.org/history.htm
- Kurt Fox and Robert McKinney
  http://home.eznet.net/~kfox/wny/sites/bergensw.htm.

The retreat of glacial ice about 10,000 years ago from a depression in the bedrock initiated the formation of the Bergen Swamp. In 1964 the Bergen Swamp was among the first sites in the United States to receive the distinguished designation of Natural History Landmark by the U. S. Department of the Interior. The swamp is now a private nature preserve. For over 100 years, the unique vegetation and wide variety of wildlife has attracted naturalists who study rare and endangered species of flora and fauna. It is managed by the BSPS.

The BSPS was established as an educational institution in 1836 to hold and preserve the lands of the Bergen Swamp, as well as any other property it may acquire. Its purpose is to conserve the flora and fauna of the lands under its control and to offer to schools, colleges and other interested parties access for observation and study. Two BSPS properties, Bergen Swamp and Zurich Bog, are designated by the National Park Service as National Natural Landmarks.

1.6.8 Town of Riga and Village of Churchville

The Village of Churchville, within the Town of Riga, was named for the Church family that originally settled there. In the Village of Churchville, a large park of 742 acres was established in 1926. Churchville Park is on the north bank of Black Creek; canoeing is possible upstream of the Churchville dam site and west into the Bergen Swamp.

One of this area’s greatest natural resources that served our pioneer ancestors and contributed to the development of the Village of Churchville was Black Creek. For over one hundred years this meandering stream supplied the power to turn the wheels of the local grist and saw mills. It also served as a source of recreation, fishing, boating and swimming during the warm months, and ice skating during the coldest months of the year.

1.6.9 Town of Chili

At the western boundary of the Town of Chili are the remnants of a 25-acre mill pond which continues east to the Chili Mills Conservation Area, listed on the State and National Register of Historic Places by the U.S. Department of the Interior. This site also includes the landmark Stuart Road Bridge which was restored by Monroe County in 2002. The bridge spans Black Creek along the original roadway from Chili to Buffalo, NY, and now adjoins the northwest corner of Black Creek Park on the south.

Grouped around a mill pond, the houses, mill, dam, metal bridge and archeological sites of the Chili Mills Conservation Area illustrate the relationships and scale of a rural family milling enterprise of the early nineteenth century. The flour milling industry was a significant economic industry in Monroe County and western New York State. This well-preserved catalogue of buildings and sites not only contributes to local historical and architectural knowledge, but also presently serves as an example of a significant historical archaeological site. The Stuart Road Bridge over Black Creek is one of nine landmarks on the State and National Register of Historic Places designated in the Chili Mills Conservation Area (1975).

Black Creek is largely the northern boundary of the 1,500-acre Black Creek Park. Black Creek crosses Union Street to the east and then meanders along a residential area where it forms the northern boundary to the 65-acre Town of Chili Union Station Park. The Creek is also the southern boundary of Chili's Nature Center at Stottle Road.

Between Stottle Road and Chili-Scottsville Road is a town-owned 100-acre parcel on the south side of Black Creek recently donated to the town by the Pfrengle family. A large tributary called Mill Creek enters Black Creek from the south. This creek powered the mills in the Hamlet of Clifton in southwest Chili. At the confluence stands a historic stone bridge built by a wealthy industrialist in the 19^{th} century.

Joseph Sibley, a pioneer settler in the Black Creek area, reminisced as follows: "The greatest amount of sickness and death that I knew of in any locality in the Genesee country was as late as 1821 in the settlements along Black and Sandy Creeks. The prevailing disease had all the distinctive character of the yellow fever, and in a dense population, would have been equally as fatal. It was principally owing to the erection of mill dams, and consequent flooding of timbered lands. When the mill dams were drawn off, the sickness subsided. In one of the earlier years, when Riga and Chili were one town, it was ascertained that 60 died in a population of less than 3,000." The disease was locally known as the "Genesee Fever."

After crossing Chili-Scottsville Road, Black Creek meanders and crosses Beaver Road to the east. The creek runs under a railroad bridge near the Genesee Junction, and also beneath the double arched stone culverts of the Genesee Valley Greenway before passing the settlement of Ballantyne. This area was often flooded before the construction of the Mt. Morris Dam upstream on the Genesee River. Black Creek flows by a small park and boat launch site located on the south bank of Black Creek, close to the junction of Black Creek with the Genesee River. Black Creek then flows under Scottsville Road to the east and enters the Genesee River.

Stage coaches, the Genesee Valley Canal and the Genesee River all provided transportation corridors into Monroe County through the Town of Chili. The Genesee Valley Canal was constructed in the first half of the 19^{th} century to connect the Southern Tier to the Erie Canal. This canal provided a water route to avoid the Genesee River rapids that prevented river traffic into the City of Rochester. The canal had to cross over Black Creek before entering the city. A double arched dressed stone culvert was constructed across Black Creek in ca. 1840 which can be seen today as representative of 19^{th} century architecture still in use.

2.0 GEOGRAPHICAL DESCRIPTION OF THE WATERSHED

2.1 GEOLOGY

2.1.1 Bedrock geology

Approximately 360 to 440 million years ago during the Devonian and Silurian periods of the Paleozoic Era, unconsolidated sediments were deposited when the region now containing the Black Creek Watershed was part of a continental sea (Isachsen and others, 1991). At this time the Appalachian Mountains were uplifting to the east, and the Michigan Basin to the northwest was subsiding. Paleozoic sediments, including clay, fine sand, limestone, rock salt and gypsum, were eventually compacted into rock formations.

The bedrock of the Black Creek Watershed (Map 2, Bedrock Geology) originated from this sediment deposition and compaction. Silurian to middle Devonian age bedrock is primarily limestone and dolostone while late Devonian age bedrock consists mostly of shales with some interbedded siltstone and limestone. Rock salt and gypsum beds are restricted to the subsurface but have had an important impact on both natural surface processes and mineral resources extraction.

Paleozoic strata dip to the south at approximately one degree resulting in the exposure of younger bedrock to the south and older bedrock to the north. After deposition, lithification, uplift and erosion, the bedrock was then subjected to a long period of erosion prior to the glaciations that affected the landscape of western New York. Permeable bedrock formations serve as groundwater aquifers and participate in both recharge and discharge between deeper bedrock aquifers and the surface water flow of Black Creek and its tributaries.

The Clarendon-Linden fault zone is a regional compressive fault system that crosses western New York in a general north-south direction. This fault zone crosses the western side of the Black Creek Watershed. Three prominent fault segments, known as splinter faults, are identified across the watershed. The Clarendon-Linden fault zone makes a rather prominent topographic escarpment that can be viewed on the campus of Genesee Community College. The northerly flowing segment of Black Creek parallels the fault zone. This fault zone is seismically active and has generated low to moderate scale historic earthquakes with a sporadic and poorly known recurrence interval.

2.1.2 Surficial geology

Glaciation over the last two million years had a dramatic influence in shaping surface topographic features in the Black Creek Watershed (Map 3, Surficial Geology). An ice sheet of greater than one mile in thickness advanced and retreated several times across western New York during the Pleistocene Epoch (Isachsen and others, 1991).

Repeated advances and retreats of glaciers were the primary influence on landscape processes in the Black Creek Watershed, however, most landscape features owe their origins to the last glaciation from about 30,000 to 10,000 years ago.

Ice advance scoured bedrock with resistant rock formations persisting as higher areas and less resistant bedrock being carved into landscape lows. A thin blanket of glacial till was spread across most areas and distinct elliptical drumlins pointing to the southwest mark the local ice advance flow direction. Brief pauses in ice retreat resulted in deposition of moraine ridges, the Batavia moraine being the most notable in the Black Creek Watershed. Ice stagnation created broad areas of hummocky topography to the north of the moraine ridges. The ice stagnation areas are locally interrupted by kames, eskers and outwash deposits formed by melt water within the glacier or flowing beyond the glacial margin. After glacial ice retreated from the Black Creek Watershed, lake deposits, mucklands and stream alluvium partly infilled the lowest topographic areas. Modern streams flow in these low floodplain areas and continue to nourish wetland swamps and deposit alluvial sediments.

Surficial sediments provide the geologic parent material for soil formation, contribute significantly to the infiltration and storage of precipitation, are a source of sediment load to surface waters, comprise a sizable groundwater aquifer system and provide recharge to deeper bedrock aquifers.

2.2 LOCATION OF BLACK CREEK AND TRIBUTARIES

The Black Creek Watershed is approximately “L-shaped”, with a maximum east-west dimension of approximately 40 miles and an approximately north-south dimension of about 20 miles (Map 4, Complete Stream Network). The watershed occupies parts of Wyoming, Genesee, Orleans and Monroe counties including parts of the Towns of Middlebury in Wyoming County; Bethany, Stafford, Batavia, Elba, Byron, Bergen and LeRoy in Genesee County; Clarendon in Orleans County; and Sweden, Ogden, Riga, Chili and Wheatland in Monroe County. Its headwaters are in the Town of Middlebury; the main stream flows northerly to the Town of Byron, then turns east and flows to its junction with the Genesee River in the Town of Chili.

2.3 SIZE AND BOUNDARIES OF THE WATERSHED AND SUBWATERSHEDS

The Black Creek drainage area is about 202 square miles, and the main stream runs for over 46 miles (Map 5, Black Creek Watershed and Subwatersheds). Principal named tributaries from upstream to downstream include Bigelow Creek, Spring Creek, North Branch Black Creek, Robin’s Brook, Black Creek Tributary, Hotel Creek and Mill Creek. The Black Creek Watershed is part of the 2,500 square mile Genesee River Basin that drains to Lake Ontario.

2.4 FLOODPLAINS

Flood data are derived from the Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA). The FIRM is the basis for floodplain management, mitigation and insurance activities for the NFIP. In addition to the identification of Special Flood Hazard Areas (SFHAs), the risk zones shown on the FIRMs are the basis for the establishment of premium rates for flood insurance coverage offered through the NFIP.

Primary floodplain areas in the Black Creek Watershed flank the main channel along the lower portions of the stream channel (Map 6, FEMA Flood Hazard Zones). The largest flood zone is near the junction of Black Creek and the Genesee River and areas immediately upstream and downstream of the Bergen swamp. Smaller floodplain areas occur upstream of the Bergen Swamp and along the lower courses of principal tributaries.

FIRMs include 100-year and 500-year (1% and 0.2% annual chance) floodplain areas and zone designations. The risk data to identify floodplain areas are acquired through Flood Insurance Studies (FISs). FISs are hydrologic and hydraulic studies of flood risks developed by FEMA. The FIRM is the basis for floodplain management, mitigation and insurance activities of the NFIP. All communities in the Black Creek Watershed participate in NFIP.

2.5 FEDERAL AND STATE WETLANDS AND RIPARIAN ZONES

The Black Creek Watershed has about 14 per cent of the watershed included as wetlands based on USFWS mapping (Map 7, National Wetlands Inventory). Most federally recognized wetlands are in the Bergen Swamp and riparian land along streams. The NYSDEC regulated wetlands (Map 8, NYSDEC Wetlands) include over 10.5 per cent of the watershed. Also, wetlands are managed as part of various agricultural programs such as the Conservation Reserve Program, the Wildlife Habitat Improvement Program and the Wetland Reserve Program. Riparian corridors along the tributary streams and wetlands in the Black Creek Watershed are best illustrated by the National Wetlands Inventory Map, since the Federal definition of wetlands is less restrictive than the definition applied by NYSDEC.

The largest wetland area in the Black Creek Watershed is part of the Bergen Swamp in the Towns of Bergen and Byron. This unique wetland area is protected by conservation efforts of the Bergen Swamp Preservation Society. The Bergen Swamp is a large mature swamp that contains a number of distinct wetland community types and numerous native wetland species. Very few non-native plants have invaded this extensive wetland area.

2.6 SOILS

The Black Creek Watershed contains a large variety of soils and most of the soil types identified in the survey of Genesee, Monroe, Orleans and Wyoming Counties are located within the watershed boundaries (USDA, 1969, 1973, 1974. 1977).

Black Creek Watershed contains soil types which can be classified in the following groupings. 1) Areas of deep calcareous, high lime soils developed in glacial till that overlie limestone and dolostone bedrock that occur mostly north of the Onondaga escarpment. 2) Areas of deep calcareous, high lime soils developed in glacial till that overlie limestone and dolostone bedrock. Soil distribution is discontinuous and includes soil areas occasionally shallow to limestone bedrock that occur mostly south of the Onondaga escarpment. 3) Areas of medium lime soils developed in glacial till that overlie mostly Devonian shales. Soil areas include medium to fine textured subsoils developed in shaley tills that occur mostly south of the Onondaga escarpment in areas of the upper watershed near the southern drainage divide. 4) Areas of soils developed in glacial outwash terraces and kames occur in an outwash plain near Little Canada and East Bethany. 5) Areas of soils developed in glacial lake sediments occur mostly along the flanks of the Bergen Swamp and areas downstream. 6) Areas of deep organic soils occur mostly in the Bergen Swamp and smaller scattered wetland areas.

Limestone and dolostone bedrock is thought to be the source of much of the lime in the soils. The USDA Soil Survey identifies a majority of the soils in the watershed as being suited for agriculture. Only 15 percent of New York is covered with prime agricultural soils, and the Black Creek Watershed has a relatively high proportion. However, the prime agricultural soils are not evenly distributed throughout the watershed. Most of the areas classed as highly suitable farmland are located in the northern part of the watershed. Soils that are poor for crops but usable for pasture are scattered throughout the watershed. Soils poor for both crops and pasture are recommended for forest development. These soil types include the undifferentiated alluvial soils and steep land greater than 25 percent slope.

The soils of the Black Creek Watershed are mapped to the level of phases of soil series. This is the most precise delineation generally available. Within the watershed there are a total of 11,769 soil polygons, representing 200 separate classifications or mapping unit codes.

Each of the mapping unit codes, representing a unique type of soil, carries with it a large number of attributes. One of these attributes is Hydrologic Soil Group, a measure of runoff potential (Map 9, Soil Interpretation - Hydrologic Soil Groups) illustrates the interpretation of the soils data to show runoff potential. In this scheme, A indicates the lowest runoff potential and D represents the highest runoff potential. This is a very useful interpretation as it contributes to analysis of possible nonpoint source (runoff-generated) pollution.

The runoff potential is just one of numerous possible interpretations of the soils data. Among the other information that can be attached to each soil polygon includes:

- Particle size distribution;
- Soil reaction;
- Bulk density;
- Salinity;
- Available water capacity;
- Permeability;
- Organic matter content;
- Flooding characteristics;
- Depth to bedrock;
- Soil texture;
- Erodibility;
- Water table depth; and
- Soil subsidence.

Among the use and management data is information about suitability for:

- Sanitary facilities;
- Construction material;
- Building site development;
- Crops;
- Recreational development;
- Woodlands;
- Water management;
- Wildlife habitat; and
- Rangeland.

2.7 TOPOGRAPHY

Total relief in the Black Creek Watershed is almost 700 feet, with headwater elevations of about 1200 feet and a low water elevation of 512 feet at Black Creek's junction with the Genesee River (Map 10, Topographic Elevations). The Onondaga Escarpment, a regional east-west trending bluff area, crosses the watershed just south of Interstate 90 and bounds the Allegheny Plateaus to the south from the Lake Ontario Lowlands to the north.

Within the Black Creek Watershed many hills in the Lake Ontario Lowlands are oriented in a southwesterly direction, indicating a glacial origin as drumlins (Map 11, Topographic Aspects). Drumlins form as ice advances and deposits glacial till that is streamlined parallel to the ice flow direction. Topography of the Allegheny Plateaus are associated with stream dissection of dendritic patterns into relatively weak Devonian shales. Locally steep slopes occur on the flanks of drumlins and in the upper branches of dendritic tributaries in the upper part of the watershed (Map 12, Topographic Slopes).

2.8 AQUIFERS

Groundwater is water that infiltrates the soil from the land surface and fills spaces in porous unconsolidated sediments, such as gravel, sand, silt or clay, and pore spaces, cavities or fractures in bedrock. An aquifer is a regionally or locally connected zone of porous sediments and/or bedrock that easily allows the passage of water to springs or wells. The most typical means to access groundwater supplies within the Black Creek Watershed is through wells. Drilled wells reach the deepest water sources at depths of hundreds of feet below the land surface. Municipal, commercial and residential parties in the watershed utilize groundwater wells.

Bedrock aquifers occur in two general east-west trends across the Black Creek (Watershed Map 13, Bedrock Aquifers). The area mostly north of the Black Creek main channel consists of aquifers in Silurian carbonate rocks of the Lockport group. A smaller area trending from Stafford to north of Batavia consists mostly of aquifers in Devonian carbonate rocks of the Onondaga formation.

The majority of the Black Creek Watershed is geologically composed of bedrock that is covered by mostly thin (<25 feet) of an unsorted clay, sand and gravel mixture of glacial till. These materials generally do not prove plentiful sources of groundwater and have low well-yield capacities. However, local areas of shallow aquifers occur in glacial deposits and are used mostly for private water supply.

Water quality within aquifers varies by the aquifer source material, the amount of time the water has been in the aquifer and depth of the aquifer. Deeper aquifers generally have hard water and can contain natural gas and mineral salts, but there is less potential for surface contamination in these aquifers. Shallow aquifers generally have softer water, but they can be more easily contaminated by surface activities (Map 14, Surficial Aquifers).

2.9 LAND COVER

Land use patterns in the Black Creek Watershed indicate a predominant rural and agricultural use, with secondary residential and commercial uses. Wetland and forested areas make up most of the remaining uses (Map 15, USGS Land Use/Land Cover, 1970's/1980's).

Over 78 percent of the watershed is in agricultural use. Most of the active farm acreage is scattered through the watershed away from the population centers of Batavia on the western side of the watershed and the Town of Chili on the fringe of metropolitan Rochester. Agricultural vacant land, field and vegetable crops, dairy farming and livestock operations are the primary use activities. About 66.5 per cent of the watershed is included in various County Agricultural District Programs.

Single-family residential land uses are clustered in the Churchville-Chili area, around Batavia and in the villages of Bergen, Byron and Stafford. The residential land use category includes single- and multi-family residences, rural residential land and mobile homes.

Commercial land uses are clustered in and near population centers with most uses near Rochester, Batavia and along highway and railroad corridors. Municipal and community service facilities, such as cemeteries, libraries and schools, government buildings, health facilities and religious facilities are distributed through the watershed in a pattern that reflects the population distribution.

Monroe County Parks include Black Creek Park in Chili and Churchville Park in Riga. Genesee County Park and Forest is in the upper watershed in the Town of Bethany.

Forested lands cover over 8 percent of the total watershed area, and wetlands occupy slightly over 7 percent of the watershed area. A slow, general return to the original northeastern U.S. hemlock-hardwood forest characteristic of the region is evident in the plant succession. Transitions are dependent upon the time it is left undisturbed. Scattered throughout this background of upland hardwoods are pockets of hemlock-cedar bogs in slow draining, low areas supporting a numerous mixture of plant species. Stream banks support yet another group of riparian plants. Natural vegetation mosaics help to control water retention, moderates its movement across the landscape, and mitigates the effects of human-impacts on flooding, erosion and pollution.

Since the land use data is about 20 years old (Map 15, USGS Land Use/Land Cover 1970's/1980's), supplemental land use maps were developed to clarify land use analysis and document changes since the initial USGS map was compiled. The USGS also compiled land use/land cover data in 1992 based on remote sensing data (Map 16, USGS Land Use/Land Cover 1992). The SUNY Brockport Consultants also compiled a land use/land cover map of the watershed using 2002 Landsat imagery (Map 17, Land Use/Land Cover, 2002, Experimental). Although this map is up-to-date in its coverage, it has not been fully field checked nor are the land uses classified precisely to the original USGS map. Subsequent analysis in this report is primarily based on Map 15, but Maps 16 and 17 are used as supplements to provide the most up-to-date comparisons possible.

The broad agriculture/idle category (78 per cent of the watershed according to Map 15) can be broken down as follows according to preliminary analysis (Map 17):

Land Use	Percent of Total Watershed
■ Cropped land	36
■ Pasture or idle	21
■ Rural residential or farmsteads	6
■ Small woodlots, treelines, or fragmented forest	12
■ Agricultural converted to forest between 1970's and 2002	2
■ Agricultural converted to residential between 1970's and 2002	1

Additional land use and population data for subwatersheds is available on the BCWC web site at http://www.blackcreekwatershed.org.

2.10 NATURAL RESOURCES

Mineral resources are extracted from surface mine and quarry areas in scattered areas through the watershed. Paleozoic limestone and dolostone beds are quarried and crushed for construction aggregate. The largest cluster of crushed stone quarries is associated with the Onondaga group in the Stafford and Bethany areas. Sand, gravel and topsoil are also mined in scattered areas from glacial deposits for use as construction materials.

Historically, gypsum and evaporite salts are extracted by subsurface solution mining of bedrock from the Silurian Salina group in the Town of Wheatland. This activity is now abandoned in Black Creek Watershed, but both solution mining and room and pillar mining does occur regionally along the subsurface Salina trend.

This inventory produced three separate mappings of surface mine areas. The USGS topographic quadrangles show areas of mined or disturbed lands (Map 18, Mines or Quarries and Disturbed Lands). The NYSDEC lists all surface mines with State permits (Map 19, Mines, NYSDEC). The Federal listing of mined areas originally prepared by the former US Bureau of Mines is presently used by USEPA (Map 20, Mines, EPA). Differences in the lists of mined areas and the geographic distribution of mines result from inventory techniques and the various times when these lists were compiled. Mines and quarries located within 2 miles of the watershed boundary are included in the maps so the significance of adjacent mining activity can be assessed.

Natural gas wells are scattered through the Black Creek Watershed (Map 21, Oil and Gas Wells). There are a total of 633 oil and gas wells inside the Black Creek Watershed and within five miles of its boundary, 85 wells are inside the Black Creek Watershed, and 548 wells within 5 miles of the Black Creek Watershed boundary. Drilling has been in association with the northern edges of the regional Trenton-Black river gas trend. Drilling activity is more concentrated to the south in the Allegheny region of southwestern New York and northwestern Pennsylvania.

2.11 CLIMATE

The general climate of the Black Creek Watershed can be described as humid continental with warm, dry summers and cold, snowy winters. The area lies near the major west to east track of cyclonic storms driven by the jet stream and is characterized by frequent periods of stormy weather, particularly in the winter.

Summer days exceeding 90°F are rare, and the July average maximum temperature is 81EF. Winter days below 0°F are also rare, and the January average minimum temperature is 16EF. The freeze-free growing season averages 150 to 155 days per year, but ranges from 120 to 180 days. Annual average air temperature in the watershed is 47.2°F.

The average yearly precipitation is approximately 31.6 inches but varies from 31 to 37 inches across the watershed (Map 22, Annual Precipitation). Precipitation is nearly evenly distributed throughout all seasons. Winter precipitation occurs mostly as snowfall, partly driven by lake effect snows from both Lake Erie and Lake Ontario. On average the Black Creek Watershed receives 90 to 100 inches of snowfall each winter, and snowfall is rarely less than 70 inches in a given winter. Winter lake-effect snow belts produce the sharp precipitation gradient across the watershed and skews the watershed average. The eastern part of the watershed is more directly impacted by Lake Ontario snowfall than areas to the west.

2.12 DEMOGRAPHICS

Current population statistics from the 2000 Census indicate that population in the Black Creek Watershed is estimated from 35,030 to 46,081. Population data is depicted in Map 23, Percent of Watershed Population in Each Town, 2000 (change 1990 to 2000) and Map 24, Watershed Population in Each Town, 2000 (change 1990 to 2000). Most people live in Chili and Churchville in the southwestern portion of metropolitan Rochester. Other notable population clusters in the watershed are Bergen and Byron. The City of Batavia is located near the western watershed divide, but most of its population is outside the watershed boundary.

Population trends can be analyzed by comparison of the maps generated from the census data. Census data from 1990 and 2000 were collected and summarized by census blocks as they correlate to the watershed boundary (Map 25, Watershed Census Blocks). Census blocks, the smallest area for which population data are available from the U.S. Census Bureau, have socio-political boundaries that do not necessarily coincide with natural boundaries. Census blocks that straddle the boundary may only have part of their population residing within the watershed boundary.

Calculation of the population within the watershed is therefore not as straightforward as it might at first seem. If all census blocks with centroids within the watershed boundary are used to determine the population, using the 2000 census data, 35,030 people live within the Black Creek Watershed. If all census blocks that have any part within the watershed are used, 46,081 people live within the watershed. This range does take into account the broadest population estimate possible, but the maximum number also represents the population to most likely have an effect on, and be affected by, the watershed.

3.0 USES OF LAND AND WATER

3.1 LAND USES

Land uses in the Black Creek Watershed can be assessed from a combination of data sources. Compilation of land use/land cover data is discussed in Section 2.9 and provides a general view of trends over time, although compilation procedures and mapping source data vary for each map. The most widely available data (Map 15, USGS Land Use/Land Cover 1970's/1980's) provides an adequate general depiction of the Black Creek Watershed. Updated mapping (Map 16, USGS Land Use/Land Cover 1992; Map 17, Land Use/Land Cover, 2002, Experimental) provide supplements to the initial land use/land cover data.

Land use patterns in the Black Creek Watershed (Map 15, USGS Land Use/Land Cover 1970's/1980's) indicate a predominant agricultural use with secondary residential, commercial and industrial uses. Forested and wetland areas make up most of the remaining uses. Over 81 percent of the watershed area is Agricultural/Idle, Residential, Commercial and Industrial use categories.

	Land Use	Percent of Total
■	Agricultural/Idle	78.58
■	Residential	1.96
■	Commercial	0.78
■	Industrial	0.02

The remaining 18.66% of the watershed is Forest, Wetland, Transportation, Urban, Water and Strip Mines.

	Land Use	Percent of Total
■	Forest	8.66
■	Wetland	7.07
■	Transportation	1.17
■	Urban	1.11
■	Water	0.11
■	Strip Mines	0.54

3.1.1 Agricultural/Idle

Most of the active farm acreage is scattered though the watershed away from the population centers of Batavia on the western side of the watershed and in the Towns of Chili and Riga on the fringe of metropolitan Rochester. Vegetable crops, dairy farming and livestock operations are the primary use activities. It is a common agricultural practice to have areas temporarily used as fallow land, but the data collected in this inventory does not allow for the separation of idle land from currently active land uses. An attempt at differentiating the agricultural/idle category using 2002 LANDSAT data is discussed in Section 2.9. A substantial percent of the watershed acreage is included in the various County Agricultural District Programs (Map 26, Agricultural Districts).

3.1.2 Residential

Single-family residential land uses are clustered in the Churchville-Chili area, around Batavia and in the villages of Bergen, Byron and Stafford. The residential land use category includes single- and multi-family residences, rural residential land and mobile homes.

3.1.3 Commercial

Commercial land uses are clustered in and near population centers, with most uses in Chili, Batavia and along highway and railroad corridors. Municipal and community service facilities, such as cemeteries, libraries and schools, government buildings, health facilities and religious facilities are distributed through the watershed in a pattern that reflects the population distribution.

3.1.4 Industrial

The only classified industrial land use in the database is a light industrial park in Chili near the junction of Black Creek and the Genesee River. However, light and general industrial uses exist in the following areas of the watershed that were probably developed subsequent to the release of the land use database:

- Jetview Drive, Avion Drive, Traders Court and International Boulevard, which are located north and south of Paul Road between Marshall Road and Beahan Road;
- Between Chili Avenue and Paul Road, parallel to Jetview Drive;
- Scottsville Road (NY-383) from Ballantyne Bridge to the City of Rochester;
- Both sides of Union Street (NY-259) between I-490 and NY-33; and
- The north side of Beaver Road between Scottsville-Chili Road (NY-386) and Archer Road.

3.1.5 Power Generation Facilities

No land is classified as power generating facilities in the Black Creek Watershed. A privately owned hydroelectric power generating facility exists in the eastern part of the watershed at a small earthen dam on a tributary to Black Creek.

3.1.6 Mines

There are a total of 25 mines or quarries and disturbed areas in the Black Creek Watershed based on USGS topographic maps (Map 18, Mines or Quarries and Disturbed Areas). The disturbed areas are significantly larger in size than the mines or quarries. There are 10 mines or quarries and 15 disturbed areas.

There are 31 mines inside the Black Creek Watershed and within two miles of the watershed according to NYSDEC permits (Map 19, Mines, NYSDEC). Fourteen are within the watershed, 17 are within 2 miles. There is 1 clay mine, 2 for limestone, 1 for marl and 27 are stone and gravel.

There are 29 mines in the Black Creek Watershed and within two miles of the watershed according to the EPA BASINS data set (Map 20, Mines, EPA). There are 11 surface mines, 6 wells and 12 underground mines. Differences in the inventories of these agencies probably arise from differences in definition and classification of mining activities.

3.1.7 Active and inactive waste sites

There are a total of 356 Resource Conservation Recovery Facilities inside the Black Creek Watershed and within two miles of its border. Only 70 sites are inside the Black Creek Watershed, but an additional 286 are within two miles of its border (Map 27, RCRA Facilities).

Resource Conservation Recovery Facilities are regulated by the Resource Conservation Recovery Act (RCRA) which was enacted by Congress in 1976. RCRA regulates the management of solid waste (e.g., garbage), hazardous waste and underground storage tanks holding petroleum products or certain chemicals.

A RCRA site designation implies that a location may be a point source of pollution from spills, leaks or dumping of hazardous materials, petroleum products or other chemicals. Inactive sites are listed to alert people to the presence of risk associated with the past use of a parcel of land. Documented waste spills in the Black Creek Watershed since the establishment of RCRA are identified (Map 28, Recorded Spills).

Hazardous wastes are wastes that exhibit certain characteristics that may be regulated by RCRA. A waste may be considered hazardous if it is ignitable (i.e., burns readily), corrosive or reactive (e.g., explosive). Waste may also be considered hazardous if it contains certain amounts of toxic chemicals. In addition to these characteristic wastes, USEPA has also developed a list of over 500 specific hazardous wastes.

Hazardous waste takes many physical forms and may be solid, semisolid or even liquid. According to the USEPA regulations, solid waste means any garbage or refuse; sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, agricultural operations and community activities.

3.1.8 Public facilities

There are numerous public facilities in the Black Creek Watershed performing services related to education, religion, health care, and government. The watershed is served by 15 unified school districts that provide ample opportunity for K-12 public education (Map 29, School Districts). There are 52 public schools within the school districts serving the watershed. Higher education is accessible at Genesee Community College in Batavia, which is part of the State University of New York, and Roberts Wesleyan College in Chili, a private institution. The Rochester Institute of Technology sits just outside the watershed at its east boundary. Additional public and private institutions are nearby in the Rochester and Buffalo metropolitan areas. The watershed is served by 4 public libraries in Chili, Riga, Bergen and Byron (Map 30, Public Libraries). Other library facilities are affiliated with educational institutions.

There are 24 places of worship in the Black Creek Watershed. Places of worship are clustered in and around population centers. The mapped distribution of places of worship include those in the Federal Geographic Names Information System and/or those with public advertisement in the Yellow Pages of the telephone book (Map 31, Places of Worship). Any omissions are accidental and unintentional.

Healthcare facilities are associated with the watershed’s population centers. The following healthcare facilities are within two miles of the Black Creek Watershed (Map 32, Healthcare Facilities). None are strictly within the watershed. Hospitals include the VA Hospital and the United Memorial Medical Center, both in Batavia. Residential care facilities include the Batavia Nursing Home, Genesee County Nursing Home, St. Luke Manor of Batavia, Western NYS Veterans Home, all in Batavia; plus the LeRoy Village Green Residential Health Care Facility and Heritage Manor in LeRoy, the Westwood Commons in Chili and the Westgate Nursing Home in Rochester.

Each of the 14 towns in the watershed have local governmental facilities. Town Halls are located in each town and serve as places for public meeting and governance (Map 33, Town Halls).

3.1.9 Airports

There are four commercial airports in close proximity to the Black Creek Watershed (Map 34, Airports). Greater Rochester International Airport is the largest facility, linking the region to national and international air travel hubs. Also, Buffalo International Airport to the west (not mapped) is less than an hour's drive by automobile from anywhere in the Black Creek Watershed. Genesee County Airport near Batavia is the next largest and only airport within the watershed boundary, providing smaller aircraft a local service connection to the watershed. Local airports serve the watershed near LeRoy and Brockport, respectively. Presently, the Black Creek Watershed has adequate airport facilities to suit the needs of commercial passengers, cargo transport and private aircraft.

3.1.10 Cemeteries

The inventory process identified the known cemeteries in the Black Creek Watershed (Map 35, Cemeteries). The mapping was based on known cemeteries identified on standard 7.5-minute topographic quadrangles. Cemeteries are scattered throughout the watershed in a pattern that reflects the historic population patterns and density.

3.1.11 Waterbodies and wetlands

Wetlands occupy slightly over 7 percent of the watershed. Wetlands are predominantly forested with small scattered marsh areas. Wetlands are mostly associated with the more significant riparian corridors and areas of deep glacial scour (Map 7, National Wetlands Inventory; Map 8, NYSDEC Wetlands). Lakes and ponds are small in total area, comprising less that 0.1 percent of the watershed. The distribution of waterbodies and wetlands in the Black Creek Watershed was compiled by merging data from the National Wetlands Inventory, NYSDEC Wetlands, areas of open water, and hydric soils distribution from the soils database into a single map (Map 36, Waterbodies and Wetlands).

Waterbodies and wetlands support aquatic mammals such as beaver, muskrat, mink and river otter as well as freshwater fish such as bass, pike, sunfish and common carp. Various amphibians and bivalves are also present. Stocking of streams and conducting biological population surveys by NYSDEC is a management strategy that helps to support sustainable aquatic populations in the Black Creek Watershed.

3.1.12 Forests and silviculture

Forested lands cover over 8 percent of the total watershed (Map 37, Forests and Silviculture). Most forest lands have low productivity as agricultural lands due to low soil fertility, thin soils with shallow rock layers, and steep slopes. Forested lands are scattered throughout the basin with a slightly greater density near the southern watershed divide in Genesee County. Wildlife such as whitetailed deer, wild turkeys and coyotes are known to currently live in and travel through the forested lands of the watershed.

3.1.13 Parks and recreation

There are three county parks in the Black Creek Watershed (Map 38, County Parks). Monroe County Parks operates the 1505-acre Black Creek Park in Chili and the 742-acre Churchville Park in Riga. Genesee County operates the 440-acre Genesee County Park and Forest in the upper watershed in the Town of Bethany. Additional public parks are operated by various towns and villages in the watershed. Parks provide a variety of opportunities for both summer and winter outdoor recreation. Picnicing, hiking, fishing and horseback riding are popular summer activities, and skiing, skating and snowmobiling are popular winter activities.

3.1.14 Nature preserves

The Bergen Swamp Preservation Society functions as an educational institution that holds and preserves the lands of the Bergen Swamp (Map 39, Nature Preserves). The Bergen Swamp is also designated by the National Park Service as a National Natural Landmark. The Bergen Swamp Preservation Society is responsible for stewardship of the Bergen Swamp, and The Society has a comprehensive plan for managing the Bergen Swamp as a natural area.

Map 39 also shows areas designated as important areas by the New York Natural Heritage Program or protected by the Genesee Land Trust. Wetland areas in the Black Creek Park are protected as both Federal and State wetlands. Being part of a County Park, these wetlands are available for public recreational use.

3.2 LAND TRANSPORTATION

The Black Creek Watershed is crossed by a systematic network of Federal, State and County roads (Map 40, Land Transportation). Interstate 90 and US 20 cross the watershed in an east-west direction to provide relatively easy regional access. Interstate 490 provides a direct connection to downtown Rochester, and the junction of Interstates 90 and 490 is directly south of Bergen. Several additional east-west state highways connect more remote parts of the watershed; the most notable are Routes 5, 33, 33A, 63, and 262. North-south state highways are almost evenly spaced across the watershed and provide convenient access to points both inside and outside the watershed; the most notable are Routes 19, 36, 98, 237, 259, and 386. Route 383 generally parallels the Genesee River Valley and crosses Black Creek near the creek's confluence with the Genesee River.

Additional county and town roads link these principal arteries to individual parcels of public and private land. Numerous bridges cross the waters of Black Creek and its tributaries, providing points of public access to the stream and also producing sources of nonpoint pollution.

A CSX railroad line crosses the watershed, running from Rochester to Batavia, passing through Churchville and Bergen. The Rochester and Southern Railroad line crosses the Black Creek Watershed as it trends to the south following the Genesee River valley. These railroads are part of the regional rail system and allow commercial and industrial access to the watershed.

3.3 SCENIC VIEWSHEDS

Members of the BCWC offered the following locations as those with scenic views:

- Genesee County Park - panorama of the watershed divide;
- Genesee Community College - view of the Clarendon-Linden fault;
- North of Batavia airport - landscapes north of the Batavia Moraine;
- Torpy Hill - view of the Bergen Swamp;
- Stuart Road Bridge - view of Black Creek, Chili Mills dam, raceway and mill;
- Stottle Road Bridge - view of Black Creek channel in Chili;
- Cobblestone Bridge - historic bridge on Pfrengle property at confluence of Black and Mill Creeks; and
- Double arched culvert - historic crossing over Black Creek on the Genesee Valley Greenway.

3.4 LAND USE TRENDS

The population of the Black Creek Watershed increased by 8 per cent between 1990 and 2000. Land use conversions in the Black Creek Watershed are concentrated in suburban areas southwest of Rochester, especially the Towns of Chili and Riga. Rural towns are declining in population due to apparent population redistribution. Increases in suburbanization are disproportionate with watershed population growth. Agricultural land is in decline as farmlands are being abandoned in favor of suburban style land uses.

Population trends over time indicate that changes in population density over the past few decades have been modest without significant rapid growth in the Black Creek Watershed. An exception is in the southwestern part of Monroe County (especially Chili, but also Riga and Ogden), an area impacted by post WW II suburban development of the Rochester metropolitan area.

Growth in the Town and Village of Bergen is probably due to its convenient access to the junction of I-490 and I-90 and to its proximity to Rochester. The existing land use for the junction of I-490 and I-90 is mostly agriculture and woodland mixed in with some commercial, residential and industrial uses. The future land use is classified by the Town of Bergen as Interchange Development. A zoning district has been created that presently allows light industrial, commercial and retail uses by special use permit.

Growth in and around Batavia has occurred in part from its central location between Rochester and Buffalo, and in part as a result of the New York State Thruway (I-90) and the major State roads that cross the area.

3.5 GOVERNMENTAL POLICIES AND REGULATIONS FOR LAND USE

Towns within the Black Creek Watershed use comprehensive planning and community zoning regulations to guide local land use decision making. Projects with potentially significant impacts are reviewed through SEQR. Site plans are reviewed and permitted with the intent to promote compatible land uses and minimize environmental impacts from development. Protection of sensitive environmental areas, avoidance of recognized natural hazard areas and continued use of prime agricultural lands are commonly applied regulatory strategies.

State permits to discharge waste into surfaces waters (SPDES permits) do provide a framework for managing pollution sources that can impact water quality. However, town and county governments have broad authority to develop and implement zoning regulations and to make site plan decisions such as setbacks from sensitive areas, septic system requirements and other activities. A comparison and contrast of town codes should be coordinated by the BCWC to assist towns in establishing consistent policies across the Black Creek Watershed. The BCWC can assess topics relevant to its water quality and water quantity goals, review town codes across the watershed, identify existing relevant coordination efforts outside the watershed, prepare model ordinances and share findings with local municipalities in the watershed.

3.6 CONSUMPTIVE WATER USES

Surface and groundwater resources in the Black Creek Watershed are used for various consumptive purposes. The primary agricultural uses are for irrigation and water for livestock. Drinking water for people is extracted primarily from groundwater sources and consist of private and public supply wells. Industries do not consume significant quantities of water except for water obtained from municipal sources.

3.7 RECREATIONAL OPPORTUNITIES

Freshwater fishing is popular in Black Creek and its major tributaries. Seasonal game hunting popular in the Black Creek Watershed includes deer, wild turkey, waterfowl and small game. Both seasonal fishing and hunting are regulated by NYSDEC and permits are required for legal capture of fish and game.

Canoeing is popular on the lower course of Black Creek, especially in the reach including the Bergen Swamp to the Churchville Dam. Hiking trails are used by the public in the county parks and along the abandoned railroad grade through the Bergen Swamp.

The Genesee Valley Greenway follows the path of the abandoned Genesee Valley Canal and Pennsylvania Railroad across the lower Black Creek Watershed. The Greenway is primarily used for biking, hiking, horseback riding, birdwatching, cache hunts and snowmobiling. The trail has a historic double-arched stone culvert over Black Creek.

3.8 EDUCATIONAL OPPORTUNITIES

Educational opportunities for public environmental awareness have been available in the Black Creek Watershed, and the BCWC has made public outreach one of its primary goals. Conservation efforts of the Bergen Swamp Preservation Society are focused on public environmental education. The BCWC has initiated public field trips to look at waterways, wetlands, and geologic features in the Black Creek Watershed. SUNY Brockport, Department of the Earth Sciences, has developed faculty-student collaborations directed towards training future scientists and teachers in areas of surface and groundwater management, geologic mapping and landform analysis, and wetlands science. The BCWC contacted the Byron-Bergen, Churchville-Chili and Gates-Chili High Schools Science Departments and is working with the respective faculties to incorporate watershed activities into their curriculum.

4.0 WATER QUALITY

4.1 CHARACTERISTICS

Water quality standards are the foundation of the water quality-based control program mandated by the Clean Water Act. A water quality standard consists of four basic elements:

- Designated uses of the water body, such as recreation, water supply, aquatic life and agriculture.
- Water quality criteria to protect designated uses based on measured pollutant concentrations and narrative regulatory requirements.
- An antidegradation policy designed to maintain and protect existing uses and high quality waters.
- General policies that address implementation issues such as low flows, variances and mixing zones.

Water quality management strategies for the Black Creek Watershed should be based on an understanding of physical characteristics, chemical water quality data and biological water quality indicators. Various water quality data collected by monitoring activities of the USGS, USEPA, NYSDEC and Monroe County Department of Health provide the basis for the following preliminary water quality assessment.

A number of water quality standards exist that can be applied to the Black Creek Watershed. Water quality standards define goals by designating a stream's uses, setting criteria to protect those uses and establishing provisions to protect water quality from pollution. Guidelines exist to aid in the determination of applicable standards. The USEPA defines water quality standards, and NYSDEC uses Federal guidelines in establishing stream classification categories. The NYSDEC maintains the following classification system for surface waters:

- All waters of the state are provided a class and standard designation based on existing or expected best usage of each water or waterway segment.
- The classification AA or A is assigned to waters used as a source of drinking water.
- Classification B indicates a best usage for swimming and other contact recreation, but not for drinking water.
- Classification C is for waters supporting fisheries and suitable for non-contact activities.

Waters with classifications A, B and C may also have a standard of (T), indicating that it may support a trout population, or (TS), indicating that it may support trout spawning (TS). Special requirements apply to sustain these waters that support these valuable and sensitive fisheries resources.

Black Creek is currently designated as a Class A stream by the NYSDEC. Under this classification Black Creek may be considered as a source of drinking water. A goal has been established to have "waterways in the Black Creek Watershed meet the best use classification goals set for them by the NYSDEC". Given these criteria, drinking water standards have been used in this report as a benchmark for comparison use only. This does not imply that these standards are enforceable at this time.

4.1.1 Physical characteristics

Temperature of water is a very important factor for aquatic life. It controls the rate of metabolic and reproductive activities. Most aquatic organisms are cold-blooded, which means they cannot control their own body temperatures. Their body temperatures become the temperature of the water around them. Cold-blooded organisms are adapted to a specific temperature range. If water temperatures vary too much, metabolic activities can malfunction. Temperature also affects the concentration of dissolved oxygen and can influence the activity of bacteria in a water body. Water temperature in Black Creek was found to range from 0 to 28EC with a mean value of 9.8EC.

Total solids refers to matter suspended or dissolved in water or wastewater, and is related to both specific conductance and turbidity. Total solids (also referred to as residual solids) is the term used for material left in a container after evaporation and drying of a water sample. Total solids includes both total suspended solids, the portion of total solids retained by a filter, and total dissolved solids, the portion that passes through a filter. Total solids has been found to vary from 217 to 1240 mg/L in Black Creek samples.

Total suspended solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material such as silt, decaying plant and animal matter, industrial wastes and sewage. High concentrations of suspended solids can cause many problems for stream health and aquatic life. Suspended solids measurements were only recorded once during the time frame of the USGS data set. No conclusions should be drawn from this data.

Turbidity is a measure of the cloudiness of water; the cloudier the water, the greater the turbidity. Turbidity in water is caused by suspended matter such as clay, silt and organic matter and by plankton and other microscopic organisms that interfere with the passage of light through the water. Turbidity is closely related to TSS but also includes plankton and other organisms. Turbidity itself is not a major health concern, but high turbidity can interfere with disinfection and provide a medium for microbial growth. It also may indicate the presence of microbes.

The USEPA Surface Water Treatment Rule requires systems using surface water or groundwater under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that at no time can turbidity go above 5 nephelometric turbidity units (NTUs). Systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95 per cent of the daily samples in any month.

Turbidity values for Black Creek have been reported using three different methods and units. Samples collected from April, 1998 onward use the NTU unit, and were found to range from 0.8 to 180 NTU with a mean of 6.6 NTU. Other methods of reporting turbidity were used prior to 1974, but only a small number of samples were analyzed.

4.1.2 Chemical water quality data

Chemical water quality data for the Black Creek watershed has been recorded and tabulated by the USGS from 1954 through 2001. Over this time 614 samples have been collected, but sampling is not evenly distributed over the time period. This data is available at a USGS web site.

http://waterdata.usgs.gov/ny/nwis/qwdata/?site_no=04231000&agency_cd=USGS

A wide range of water quality parameters have been measured over this time frame, but most sampling dates have a limited subset of parameters. Further complicating the data are the repetition of parameters analyzed or reported using different methods or units.

Sampling within the watershed has been limited to the Churchville area and down stream. The lack of water quality samples in the western portion of the watershed limits the analysis of impacts to only the region sampled. The Bergen Swamp may act as a buffer, filtering and improving the quality of water that moves through it. Individual water quality parameters shed light on the natural and anthropogenic factors that influence the quality of water in Black Creek. Although some parameter values exceed drinking water standards, the overall water quality is good.

Specific conductance (SpC) is a measure of how well water can conduct an electrical current. Conductivity increases with increasing amount of dissolved ions. These ions, which come from the breakdown of compounds, conduct electricity because they are negatively or positively charged when dissolved in water. Therefore, SpC is an indirect measure of the presence of dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium and iron, and can be used as an indicator of water pollution.

The term total solids refers to matter suspended or dissolved in water or wastewater and is related to both specific conductance and turbidity. Total solids (also referred to as residual solids) is the term used for material left in a container after evaporation and drying of a water sample. Total solids includes both total suspended solids, the portion of total solids retained by a filter and total dissolved solids, the portion that passes through a filter.

Total dissolved solids (TDS) are solids in water that can pass through a filter (usually with a pore size of 0.45 micrometers). TDS is a measure of the amount of material dissolved in water. This material can include carbonate, bicarbonate, chloride, sulfate, phosphate, nitrate, calcium, magnesium, sodium, organic ions, and other ions. A certain level of these ions in water is necessary for aquatic life. Similar to TSS, high concentrations of TDS may also reduce water clarity, contribute to a decrease in photosynthesis, combine with toxic compounds and heavy metals, and lead to an increase in water temperature. TDS is used to estimate the quality of drinking water, because it represents the amount of ions in the water.

The USEPA sets a secondary standard of 500 mg/L TDS in drinking water. Secondary standards are unenforceable, but recommended, guidelines for contaminants that may cause cosmetic or aesthetic effects in drinking water. High TDS concentrations can produce water hardness, laxative effects, and can give an unpleasant mineral taste to water. TDS was found to range from 197 to 1040 mg/L. Mean and median values were found to be 656.8 and 669.5 mg/L, respectively. This shows that TDS exceeds the secondary standard value in over half of the samples tested.

SpC has been determined regularly over the entire time period of the data set. This parameter is easily measured in the field and is a function of the dissolved constituents in the water. As such, specific conductance may be used to estimate the total dissolved load of the stream. Figure 4.1 shows a graph of SpC versus TDS, where TDS is reported as the sum of dissolved constituents. A strong linear correlation confirms the relationship between specific conductance and TDS.

In the USGS data report, dissolved solids are reported several ways. Evaluation of these different data sets shows that they are comparable. A plot of specific conductance versus residual solids (Figure 4.2) shows a similar slope to that shown in Figure 4.1. Therefore, SpC may be used as a substitute for laboratory determination of total dissolved solids. Over the time period monitored, SpC was found to range 339 to 1650 uS/cm with mean and median values of 1002.2 and 1010 uS/cm, respectively.

Hardness is measure of polyvalent cations (ions with a charge greater than +1) in water. Hardness generally represents the concentration of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions, because these are the most common polyvalent cations. Other ions, such as iron (Fe^{2+}) and manganese (Mn^{2+}), may also contribute to the hardness of water, but are generally present in much lower concentrations. Waters with high hardness values are referred to as hard, while those with low hardness values are soft.

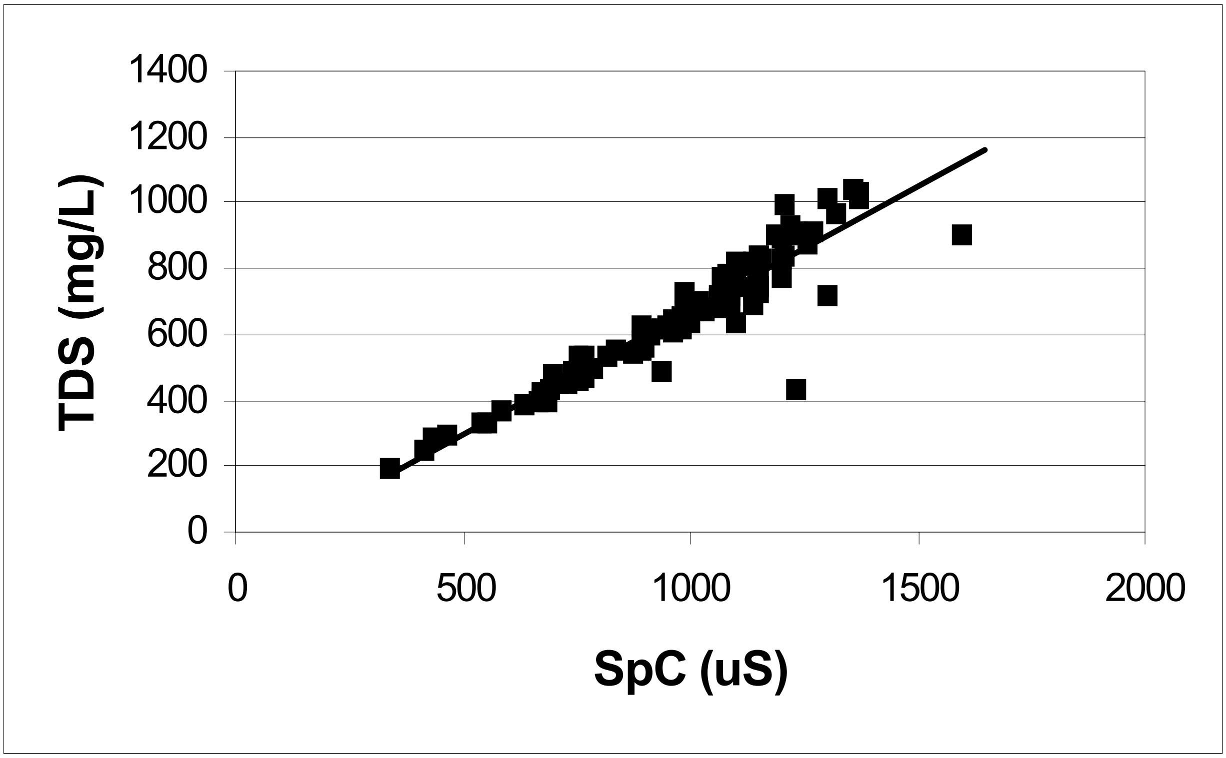

Figure 4.1. Specific conductance (SpC) versus total dissolved solids (TDS). SpC measured in microsiemens correlates well with measured values of TDS in stream water. SpC is easily measured in the field, not requiring laboratory analysis.

Hardness affects the amount of soap that is needed to produce foam or lather. Hard water requires more soap, because the calcium and magnesium ions form complexes with soap, preventing the soap from sudsing. Hard water can also leave a film on hair, fabrics and glassware. Hardness of the water is very important in industrial uses, because it forms scale in heat exchange equipment, boilers and pipe lines. Some hardness is needed in plumbing systems to prevent corrosion of pipes.

Hardness mitigates metals toxicity, because Ca^{2+} and Mg^{2+} help keep fish from absorbing metals such as lead, arsenic and cadmium into their bloodstream through their gills. The greater the hardness, the harder it is for fish to absorb toxic metals through their gills.

Because hardness varies greatly due to differences in geology, there are not general standards for hardness. The hardness of water can naturally range from zero to hundreds of milligrams per liter (or parts per million). Waters with a total hardness in the range of 0 to 60 mg/L are termed soft; from 60 to 120 mg/L moderately hard; from 120 to 180 mg/L hard; and above 180 mg/L very hard. Hardness values determined in Black Creek were found to range from 140 to 850 mg/L. Mean and median values were calculated to be 521.5 and 530 mg/L, respectively. In all cases, water samples are classified as hard to very hard.

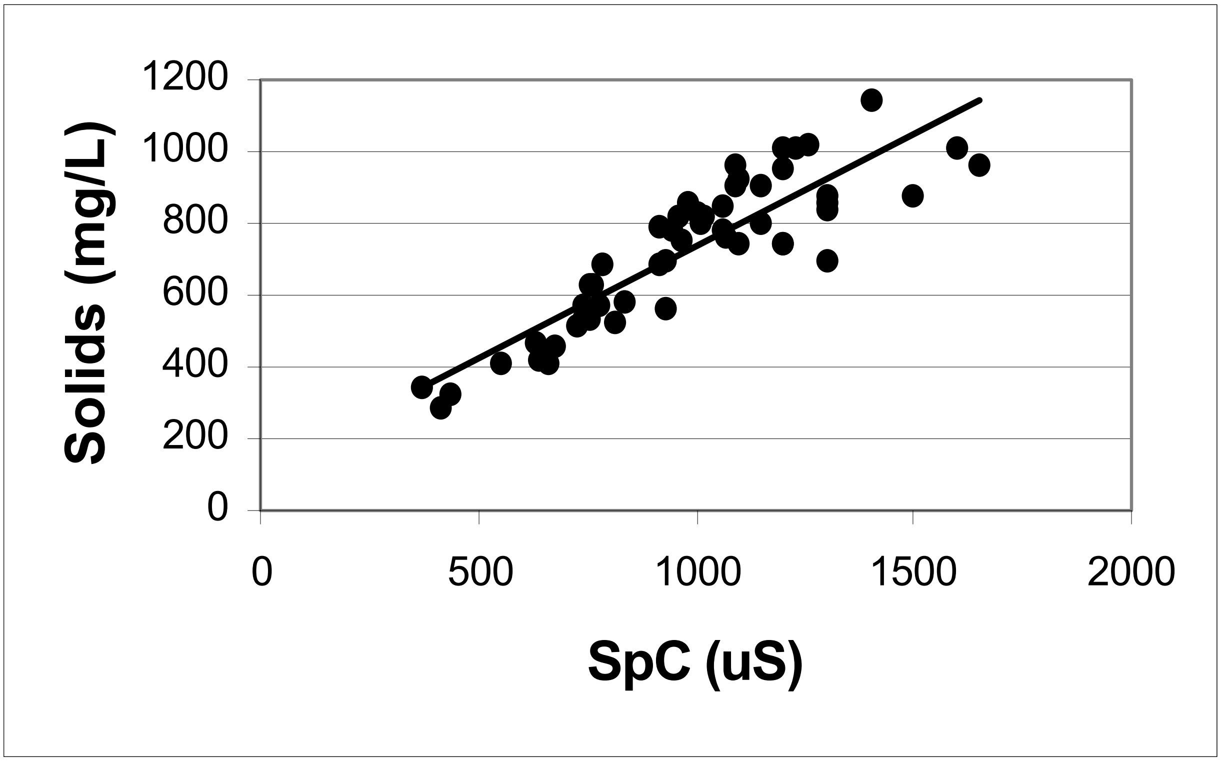

Figure 4.2. Specific conductance (SpC) versus residual solids. SpC, measured in microsiemens, correlates well with measured values of total solids in stream water. SpC is easily measured in the field, not requiring laboratory analysis.

Calcium (Ca) and magnesium (Mg) contribute the bulk of the hardness in Black Creek samples. Iron (Fe) and manganese (Mn) contribute less to the total hardness of the water. Dissolved calcium concentrations were found to range from 44 to 264 mg/L with a mean of 155.9 mg/L. Dissolved magnesium concentrations were found to range from 8.4 to 68 mg/L with a mean of 34.1 mg/L. The high concentrations Ca^{+2} and Mg^{+2} in Black Creek water samples is indicative of the interaction of the stream water with the limestone ($CaCO_3$) and dolostone ($CaMg(CO_3)_2$) bedrock, either directly or by the discharge of groundwater into the stream channel. Figure 4.3 shows a strong correlation between Ca^{+2} and Mg^{+2} suggesting they originate from the same bedrock source. An additional source of Ca may be from the interaction of groundwater with gypsum ($CaSO_4$C2H2O) bearing sediments that occur regionally. Figure 4.4 shows the relationship between Ca^{+2} and SO_4^{-2}. Values for Fe and Mn are reported as both dissolved and total. Total would include both dissolved ions and Fe and Mn included in suspended solids. Total values were reported more often and found to range from 0 to 0.98 mg/L for Fe, and 0 to 0.12 mg/L for Mn.

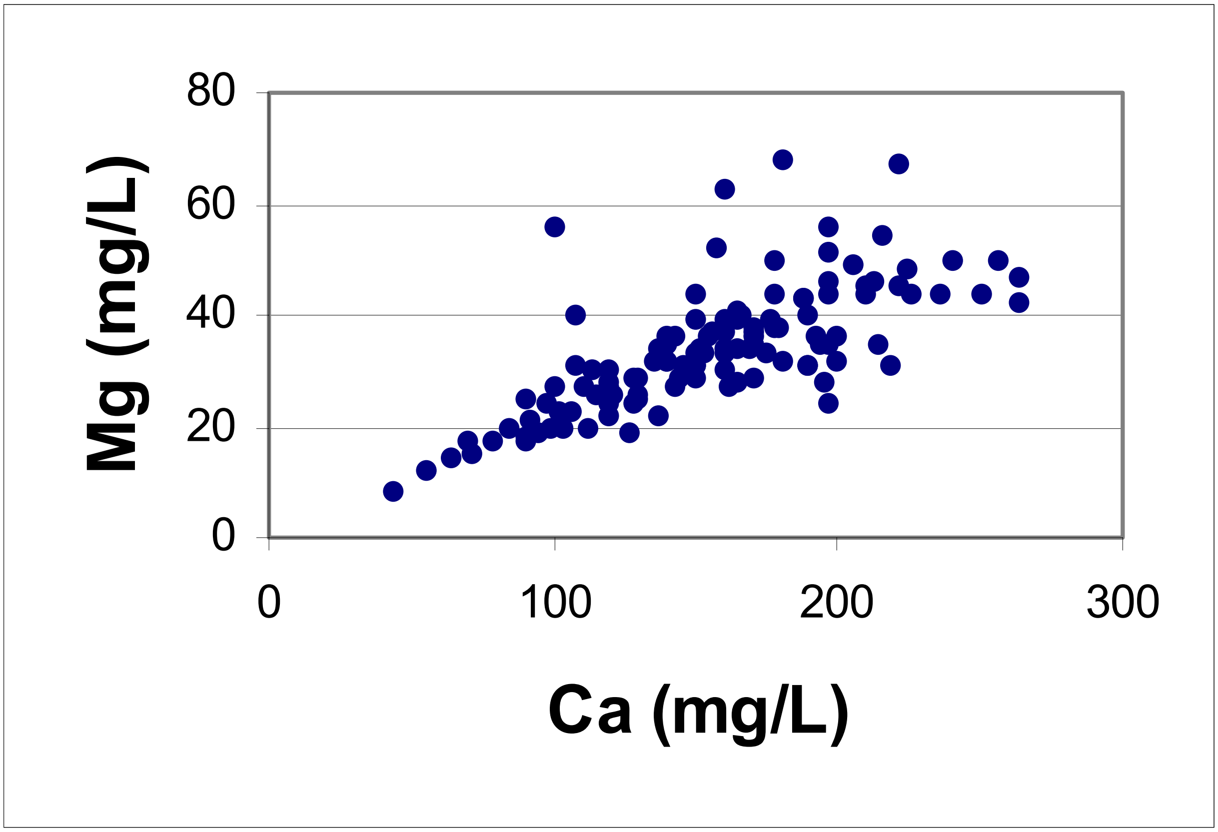

Figure 4.3. Relationship between Ca^{+2} and Mg^{+2}. The dissolved cation calcium (Ca) and magnesium (Mg) found in water samples are the result of mineral dissolution. The strong relationship between these two cations suggests dissolution of limestone and dolostone bedrock found in the region.

Nitrogen is required by all organisms for the basic processes of life to make proteins, to grow, and to reproduce. Nitrogen is very common and found in many forms in the environment. Inorganic forms include nitrate (NO_3), nitrite (NO_2), ammonia (NH_3), and nitrogen gas (N_2). Organic nitrogen is found in the cells of all living things and is a component of proteins, peptides, and amino acids. Nitrogen is most abundant in Earth's environment as N_2 gas, which makes up about 78 percent of the air we breathe.

Nitrate (NO_3) is highly soluble (dissolves easily) in water and is stable over a wide range of environmental conditions. It is easily transported in streams and groundwater. Nitrates feed plankton, aquatic plants and algae, which are then eaten by fish. Nitrite (NO_2) is relatively short-lived in water because it is quickly converted to nitrate by bacteria. Excessive concentrations of nitrate and/or nitrite can be harmful to humans and wildlife.

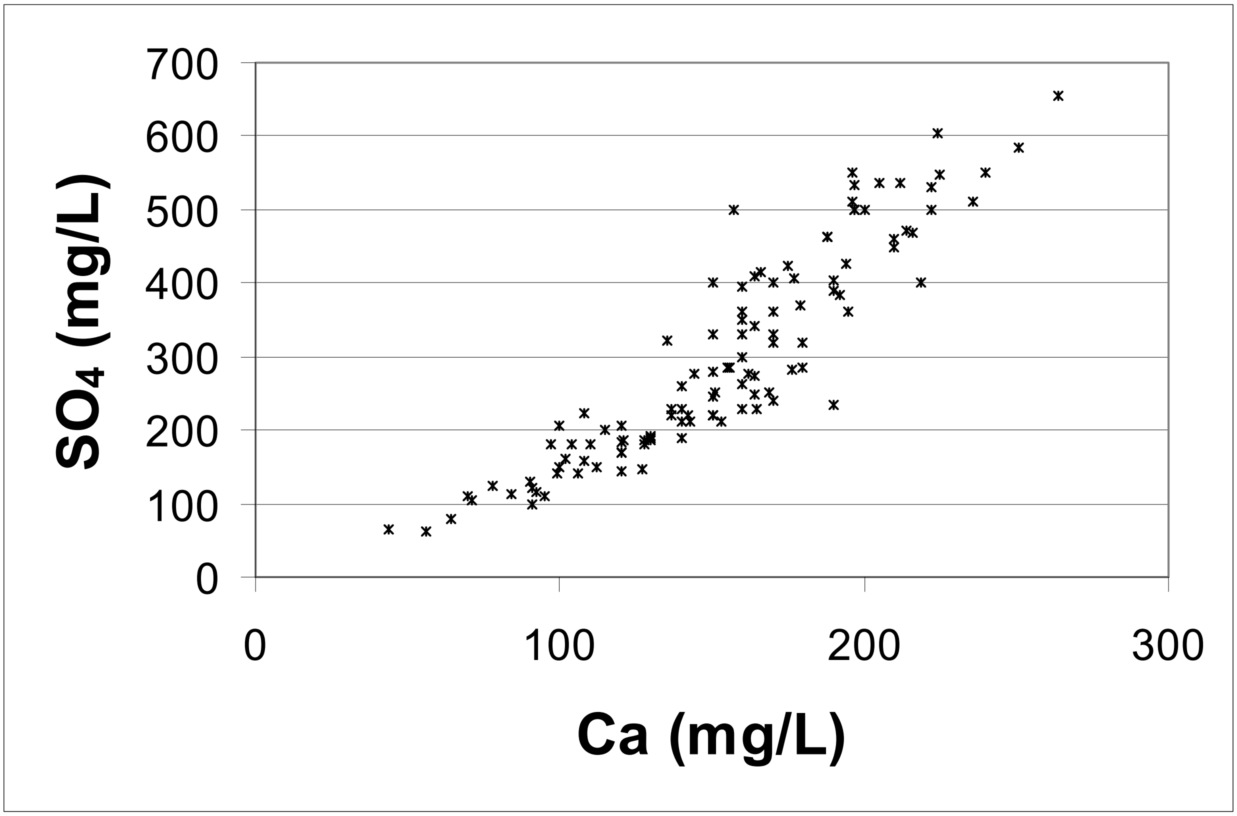

Figure 4.4. Relationship between Ca^{+2} and SO_4^{-2}. The dissolved ions calcium (Ca) and sulfate (SO_4) found in water samples may result from the dissolution of the mineral gypsum. The strong relationship between these two ions suggests dissolution of gypsum bedrock found in the region by groundwater with subsequent discharge into the stream.

Ammonia, another inorganic form of nitrogen, is the least stable form of nitrogen in water. Ammonia is easily transformed to nitrate in waters that contain oxygen and can be transformed to nitrogen gas in waters that are low in oxygen. Ammonia is found in water in two forms; the ammonium ion (NH_4^+), and dissolved ammonia gas (NH_3). When the pH is below 8.75, NH_4^+ predominates. Toxic concentrations of ammonia in humans may cause loss of equilibrium, convulsions, coma and death. Ammonia concentrations can affect hatching and growth rates of fish by causing changes in tissues of gills, liver and kidneys during structural development.

The USEPA has established a maximum contaminant level (MCL) of 10 milligram per liter (mg/L) for nitrate as nitrogen (NO_3-N) and a MCL of 1 mg/L for nitrite as nitrogen (NO_2-N) in drinking water. Total N reported as nitrate was found to range from 2.1 to 14 mg/L with a mean of 7.1 mg/L. Dissolved nitrate and nitrite values were found to range from 0.3 to 13 mg/L with a mean of 4.2 mg/L for nitrate, and from 0 to 0.82 mg/L with a mean of 0.1 mg/L for nitrite. Dissolved ammonia was found to range 0 to 1.24 with a mean of 0.2 mg/L. The low values of nitrite and ammonia suggest that the stream water contains sufficient oxygen for the oxidation of these compounds to nitrate. Nitrate values occasionally exceeded the USEPA limit for drinking water.

Phosphorus (P) is a nutrient required by all organisms for the basic processes of life. Phosphorus is a natural element found in rocks, soils and organic material. Phosphorus clings tightly to soil particles and is used by plants, so its concentration in clean waters is generally very low. However, phosphorus is used extensively in fertilizer and other chemicals, so it can be found in higher concentrations in areas of human activity. Many seemingly harmless activities added together can cause phosphorus overloads.

Phosphorus exists in water in either a particulate phase or a dissolved phase. Particulate matter includes living and dead plankton, precipitates of phosphorus, phosphorus adsorbed to particulates and amorphous phosphorus. The dissolved phase includes inorganic phosphorus and organic phosphorus. Phosphorus in natural waters is usually found in the form of phosphates (PO_4^{-3}). Phosphates can be in inorganic form (including orthophosphates and polyphosphates) or organic form (organically-bound phosphates).

Organic phosphate is phosphate that is bound to plant or animal tissue. Organic phosphates are formed primarily by biological processes. They are contributed to sewage by body waste and food residues, and also may be formed from orthophosphates in biological treatment processes or by receiving water biota. Organic phosphates may occur as a result of the breakdown of organic pesticides which contain phosphates. They may exist in solution, as loose fragments or in the bodies of aquatic organisms.

Inorganic phosphate is phosphate that is not associated with organic material. Types of inorganic phosphate include orthophosphate and polyphosphates. Orthophosphate is sometimes referred to as soluble reactive phosphorus (SRP). Orthophosphate is the most stable kind of phosphate, and is the form used by plants. Orthophosphate is produced by natural processes and is found in sewage. Polyphosphates (also known as metaphosphates or condensed phosphates) are strong complexing agents for some metal ions.

Phosphates are not toxic to people or animals unless they are present in very high levels. Digestive problems could occur from extremely high levels of phosphate.

In freshwater lakes and rivers, phosphorus is often found to be the growth-limiting nutrient, because it occurs in the least amount relative to the needs of plants. If excessive amounts of phosphorus and nitrogen are added to the water, algae and aquatic plants can be produced in large quantities. When these algae die, bacteria decompose them and use up oxygen. This process is called eutrophication.

No national criteria have been established for concentrations of phosphorus compounds in water. However, to control eutrophication, the USEPA recommendations that total phosphate should not exceed 0.05 mg/L (as phosphorus) in a stream at a point where it enters a lake or reservoir, and should not exceed 0.1 mg/L in streams that do not discharge directly into lakes or reservoirs. Total P was found to range from 0.06 to 0.73 mg/L as PO_4^{-3} with mean and median values of 0.2 and 0.14 mg/L, respectively. This suggests that P exceeds USEPA recommendations in over one half the samples tested.

The hydrogen concentration in water (pH) is given on a scale from 0 to 14 with each unit representing a factor of 10 change in the hydrogen ion concentration. A solution with a pH value of 7 is neutral; a solution with a pH value less than 7 is acidic; a solution with a pH value greater than 7 is basic. Natural waters usually have a pH between 5 and 9.

The USEPA sets a secondary standard for pH levels in drinking water; the water should be between pH 6.5 and 8.5. Secondary standards are unenforceable, but recommended, guidelines. Values of pH in Black Creek have been determined to range from 6.7 (near neutral) to 8.5 (mildly alkaline). These values reflect the influence of limestone and dolostone bedrock in the area.

Alkalinity is a measure of the buffering capacity of water, or the capacity of bases to neutralize acids. Measuring alkalinity is important in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater. Alkalinity does not refer to pH, but instead refers to the ability of water to resist change in pH. The presence of buffering materials help neutralize acids as they are added to the water. These buffering materials are primarily the bases bicarbonate (HCO_3^-), carbonate (CO_3^{2-}), occasionally hydroxide (OH^-), borates, silicates, phosphates, ammonium, sulfides and organic ligands.

Waters with low alkalinity are very susceptible to changes in pH. Waters with high alkalinity are able to resist major shifts in pH. As increasing amounts of acid are added to a water body, the pH of the water decreases, and the buffering capacity of the water is consumed. If natural buffering materials are present, pH will drop slowly to around 6, then a rapid pH drop occurs as the bicarbonate buffering capacity (CO_3^{2-} and HCO_3^-) is used up. At pH 5.5, only very weak buffering ability remains, and the pH drops further with additional acid. A solution having a pH below 4.5 contains no alkalinity, because there are no CO_3^{2-} or HCO_3^- ions left. Alkalinity not only helps regulate the pH of a water body, but also the metal content. Bicarbonate and carbonate ions in water can remove toxic metals (such as lead, arsenic, and cadmium) by precipitating the metals out of solution.

Alkalinity levels of 20-200 mg/L are typical of fresh water. A total alkalinity level of 100-200 mg/L will stabilize the pH level in a stream. Levels below 10 mg/L indicate that the system is poorly buffered, and is very susceptible to changes in pH from natural and human-caused sources. Alkalinity, or acid neutralization capacity (ANC), for Black Creek samples was found to range from 86 to 294 with a mean value of 192.8 mg/L as $CaCO_3$. Black Creek is typical of fresh water systems, and has sufficient buffering capacity to resist changes in pH.

Dissolved oxygen (DO) is the amount of oxygen dissolved in the water. DO is a very important indicator of a water body's ability to support aquatic life. Oxygen enters the water by absorption directly from the atmosphere or by aquatic plant and algae photosynthesis. Oxygen is removed from the water by respiration and decomposition of organic matter. The amount of DO in water depends on several factors, including temperature (the colder the water, the more oxygen can be dissolved), the volume and velocity of water flowing in the water body, and the amount of organisms using oxygen for respiration. The amount of oxygen dissolved in water is expressed as a concentration, in milligrams per liter (mg/l) of water.

Dissolved oxygen levels should be above 3 mg/L for healthy aquatic life. Values DO for Black Creek range from 7.2 to 14.2 mg/L indicating ample dissolved oxygen for aquatic life in the stream.

4.1.3 Biological water quality indicators

Fecal coliform bacteria are present in the feces and intestinal tracts of humans and other warm-blooded animals, and can enter water bodies from human and animal waste. Within the watershed, several sources are present including on site septic systems, wastewater treatment systems and CAFO. Biological monitoring stations in the Black Creek Watershed are designed to identify impacts to water quality (Map 41, Biological Monitoring Stations and Protected Streams).

If a large number of fecal coliform bacteria (over 200 colonies/100 ml of water sample) are found in water, it is possible that pathogenic (disease- or illness-causing) organisms are also present in the water. Pathogens are typically present in such small amounts it is impractical to monitor them directly. Fecal coliform values for Black Creek samples were found to range from 4 to 36,000 colonies/100ml of water with a median value of 550 colonies /100 ml of water. This indicates a significant impact to water quality, but it should be noted that these samples were taken during the time period of June 1971 to August 1974. More recent data is not available.

Total organic carbon (TOC) is a measure of the role that organic matter plays in aquatic systems. It affects biogeochemical processes, nutrient cycling, biological availability, chemical transport and interactions. It also has direct implications in the planning of wastewater treatment and drinking water treatment. Organic matter content is typically measured as total organic carbon and dissolved organic carbon, which are essential components of the carbon cycle. Total organic carbon values were found to range from 4.2 to 9.7 mg/L with a mean of 6.5 mg/L. Dissolved organic carbon was not reported.

Community Water Watch programs engage local citizens groups in monitoring stream water quality. These groups use basic observations and simple field tests for basic water quality parameters to monitor steam health. Observations of stream macroinvertebrates and algae growth are also conducted. These biological components of a stream are often used as indicators of gross changes in steam water quality. Two locations in the Black Creek Watershed, in the Village of Churchville and near the intersection of Black Creek with Route 386, are monitored by Community Water Watch groups. Data indicated no observed detrimental impacts to water quality over the past 5 years.

Other indicators besides TOC and fecal coliform are commonly accepted biological indicators. Diverse populations of macroinvertebrates, fish and aquatic mammal populations are common indicators of good water quality. Thirty-one river otters were released in Black Creek in the fall of 1998 in an effort to populate waters of western New York. Additional information can be found at www.nyotter.org.

4.2 WATER DISCHARGE MANAGEMENT

4.2.1 Industrial and sanitary discharges

Numerous types of discharges fall into the category of industrial and sanitary. For the purpose of this report, industrial and sanitary discharges include SPDES permitted facilities, chemical bulk storage facilities, landfills, salt storage facilities and toxic release inventory registered facilities.

SPDES permitted facilities are the most numerous sources of discharge in the watershed. For the Black Creek Watershed, SPDES facilities include industrial and manufacturing facilities, sewage treatment plants, restaurants, mobile home parks and individual residences. Thirty-six facilities are permitted in the watershed (Map 42, SPDES Facilities).

Although not strictly industrial processing facilities, salt storage and chemical bulk storage facilities may represent potential impacts to the watershed. Five salt storage facilities exist and are operated by the NY State Department of Transportation or local municipalities. Two chemical bulk storage facilities exist in the watershed.

Four landfills are present in the watershed. All of the landfills are municipal solid waste landfills, regulated by the NYSDEC. Landfills are known to leak, but included in the operation of a permitted facility are detailed requirements for monitoring and reporting leaks.

Toxic release inventory facilities are regulated under the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. EPCRA's primary purpose is to inform communities and citizens of chemical hazards in their areas. Businesses are required to report the locations and quantities of chemicals stored on-site in order to help communities prepare to respond to chemical spills and similar emergencies. Three sites within the watershed are required to report under EPCRA.

4.2.2 Agricultural discharges

Agricultural discharges may be grouped as point source and non-point source discharges in the same way other discharges are classified. Non-point source discharges would include transport by runoff or groundwater of excess nutrients and pesticides that are broadly applied to agricultural lands. Point source discharges would include agricultural operations that occur in small or confined areas. Given currently available data, it is not possible to determine the impact, if any, from non-point source agricultural discharges. Similarly, most point source type discharges are not possible to determine if the specific operation is not regulated in some way.

A CAFO is any farm that houses a significant number of animals for at least 45 days in a year. These farms are placed into categories defined by the number and type of animals present. A medium-size CAFO is defined as an operation possessing 300 to 999 animal units, and a large CAFO is an operation with 1000 or greater animal units. An animal unit equates the amount of waste produced by various farm animals with beef cows being equal to 1 unit and dairy cows being equal to 1.4 units. Farms regulated as CAFOs must also discharge into navigable waters either through a man-made ditch, flushing system or other similar man-made device, or directly into surface waters of the state. New York currently has 137 large CAFOs and 500 medium-sized CAFOs.

Presently, there are 6 farms with active CAFOs in the Black Creek Watershed (Offhaus, Eastview, Lor-Rob, Totten, Dan Bridge, and Zuber). All are dairies, 4 are large CAFOs, and 2 are medium CAFOs.

CAFOs are permitted by the NYSDEC under the USEPA Clean Water Act. Farms permitted as CAFOs are required to develop Comprehensive Nutrient Management Plans and Agricultural Waste Management Plans. These plans are designed so that a farm is operated such that there is zero discharge except in the event of a storm resulting in greater than the local 25-year 24-hour rainfall. The permitting process for CAFOs is described in detail by the NYSDEC at http://www.dec.state.ny.us/website/dow/cafohome.html.

Recent changes to the CAFO permits have provided an extension for permitting of medium sized CAFOs until June 30, 2004. Large CAFOs have until 2006 to complete the permitting process under recent USEPA directives. Currently operating CAFOs in the Black Creek Watershed are included in miscellaneous storage facilities (Map 43, Various Storage Facilities; CAFO; Pesticide Applications).

4.2.3 Stormwater runoff management

Stormwater is water from rain or snow melt that runs off into surface waters. Surface water runoff may come from any ground surface or other features that rain or snow contact including rooftops, paved areas, bare soil and lawns. Stormwater runoff will collect and transport both suspended solids and dissolved constituents including eroded soil, animal waste, salt, pesticides, fertilizers, oil and grease, debris and other potential pollutants. The quality of runoff waters is affected by the path of the flow the runoff follows before it reaches a stream channel. Any potential pollutants in the runoff waters have the potential to impact the overall water quality of a stream.

The USEPA and the NYSDEC regulate the discharge of stormwater. Stormwater Phase II requires permits for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas and for construction activities disturbing one or more acres. These regulations are currently in the process of being implemented. Some of the urban areas within the watershed may be effected.

The Town of Bergen adopted the NYSDEC model stormwater and erosion and sediment control ordinance several years ago. They are the only town in Genesee County to do so, but the ordinance did not include the Village of Bergen. The Village of Bergen has a storm sewer system that drains to a tributary of Black Creek.

Stormwater runoff management issues affecting the Black Creek Watershed include non-permitted discharge of grey water and septic system waste into stormwater pipes, sanitary sewer overflow into Black Creek from infiltration and inflow, performance problems with sewers due to age, high groundwater tables and poorly drained soil areas.

5.0 WATER QUANTITY

5.1 FLOW DATA

Streamflow is the component of the hydrologic cycle by which water input to the watershed is conveyed through the Black Creek drainage network to the watershed outlet at the confluence with the Genesee River and then to Lake Ontario. It is affected by the volume of water supplied in the form of rain or snow, the operation of other hydrologic processes (infiltration, evaporation, etc.) and changes in volume of storage (ponds, snowpack, soil moisture, etc.) in the watershed.

The flow rate in Black Creek has been monitored continuously since October, 1945. The streamflow gage is located on Black Creek at the east end of Carrol Street in Churchville, NY. It is 100 feet downstream from the mainline tracks of Penn Central Transportation Co., and 0.3 mile downstream from Black Creek Dam. At this point the upstream contributing watershed is approximately 130 square miles.

The gage at Churchville provides the only systematic measurement data on water levels in the Black Creek Watershed. Bergmann Associates (1992) produced additional calculations of discharge using models to estimate peak flows at the Interstate highway bridges crossing Black Creek. Peak flow estimates are based on mathematical models that use hydrologic stage-discharge data from the Churchville gage and general watershed terrain characteristics. Floodplain Information Reports prepared by the USACE for Riga and Chili in 1969 and the Genesee River Basin Study in 1988 also provide additional background information on Black Creek water discharge.

The largest flow ever recorded was 4,880 ft^3/sec, which occurred on March 31, 1960. The water level reached 9.44 feet above the gage datum, or 3.44 feet above flood stage. This can be compared with the recent flood of March 19, 2003, during which a stage height of 6.72 feet (0.72 feet above flood stage) was reached.

Statistical analysis of the entire data record (56 years) suggests that the 100-year return period flow rate (that flow rate that can be expected, on the average, once every 100 years) is approximately 4,538 ft^3/sec. The event of March 31, 1960 slightly exceeded this, so that event can be judged to be a greater than 100-year storm. The 500-year return period flow rate is estimated to be 5,848 ft^3/sec, representing a stage of approximately 10.8 feet (4.8 feet above flood stage). The estimates of 100-year and 500-year flow rates are made by fitting the annual peak flow rate to the Pearson Type III, Log Pearson Type III and Gumbel Extremal distributions and extrapolating. The period of record is sufficient for the 100-year estimate, but somewhat short to have good confidence in estimates of longer recurrence interval.

The largest daily average flow was also achieved on March 31, 1960, when the average flow rate for the entire day was measured to be 4,120 ft^3/sec. These high flow rates are a sharp contrast to the very low flow rates that also occur in Black Creek. The lowest daily average flow occurred on August 12, 2001, when the flow rate was 0.17 ft^3/sec. There have also been numerous other extreme low flow intervals when the daily average flow rate did not exceed 1 ft^3/sec. The following low flow intervals occurred from 1950 to the present:

- 9/30/50 to 10/7/50
- 8/3/59 to 8/9/59
- 9/10/59 to 9/16/59
- 7/12/63 to 7/14/63
- 10/8/63 to 10/9/63
- 7/31/64 to 8/2/64
- 8/8/64 to 8/11/64
- 9/15/64 to 9/16/64
- 9/18/64 to 9/19/64
- 7/29/65 to 7/30/65
- 8/17/65 to 8/18/65
- 8/13/70 to 8/15/70
- 8/21/85 to 8/24/85
- 8/23/95 to 8/28/95
- 8/8/01 to 8/13/01
- 8/16/01 to 8/18/01
- 9/11/01 to 9/12/01

These low flow regimes occur during the months July, August and September. These are the low flow months in Black Creek. Average monthly flow rates in ft^3/sec are as follows:

Month	Discharge, ft^3/sec
January	130
February	186
March	329
April	252
May	125
June	63.1
July	27.1
August	21.8
September	25.5
October	40.7
November	76.8
December	123

The wettest month on record was March, 1971, when the average flow rate was 664 ft^3/sec. The driest month was September, 1959, when the average flow rate was 1.66 ft^3/sec. The seasonal variation of flows in the creek is also demonstrated by a graph of the average flow rate for each day of the year (Figure 5.1).

One percent of the time, the flow rate was less than or equal to 1.9 ft^3/sec, and one percent of the time the flow rate exceeded 982 ft^3/sec. This range of flow rates is large compared with other streams studied by the consultant. It is surprising that this variability exists, even with the expected moderating influence of a large wetlands area of the Bergen Swamp a modest distance upstream.

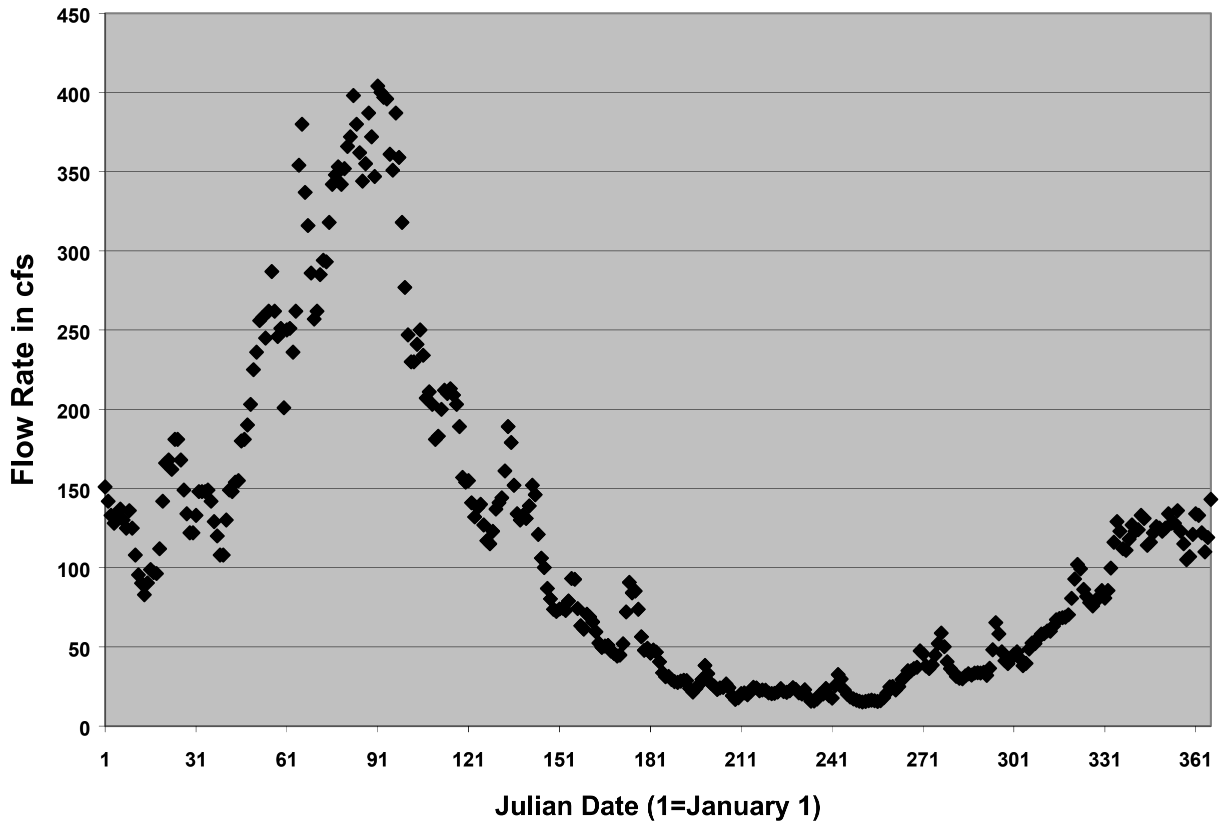

Figure 5.1. Variation of the average flow rate in Black Creek for each day of the year

5.2 DRAINAGE INFRASTRUCTURE

5.2.1 Dams

There are 21 constructed dams in the Black Creek Watershed (Map 44, Dams). Properties and functions of the dams vary according to location and type. Principal uses of dams are for recreation, irrigation, water supply for fire control and hydroelectric power generation.

5.2.2 Storm and sanitary sewers

Storm sewers are designed to move surface runoff quickly from developed areas to receiving surface waters. Their function and use is generally designed on a case by case basis, and they are recommended in places where population density is high or drainage is poor. Storm sewers generally move water so rapidly to receiving waters that flood potential is not mitigated, groundwater recharge is diminished, and water quality is not improved.

Sanitary sewer districts and treatment plants exist in Churchville, Bergen, North Byron, Byron, and South Byron (Map 45, Sewer Districts and Treatment Plants). The treatment plant at Churchville is scheduled to be abandoned and taken off line in 2004. A sewer line is being constructed between the Riga Landfill and the Gates-Chili-Ogden Sewer District. The Village of Churchville wastewater treatment plant will be closed when it is incorporated into the sewer expansion.

Substantial areas of the Black Creek Watershed are not served by sanitary sewer systems. Private septic systems are the primary waste disposal method used in rural areas. Aging septic systems built prior to the establishment of modern construction codes can pose a risk to surface and groundwater quality. No comprehensive inventory data exists on the distribution and age of septic systems in the watershed.

5.2.3 Other stormwater runoff management

In Monroe County water quantity control is required for stormwater runoff. Ways to manage water quantity from stormwater runoff include 1) protecting and preserving wetlands and floodplains and 2) building detention facilities. A dry basin exists in Churchville, and Monroe County encourages using stormwater wetlands for water quality treatment. Farmers use tiles and ditches to improve drainage from their lands, but these practices can contribute to downstream flooding. The USDA helps farmers reclaim their wetlands to mitigate stormwater runoff effects on agricultural land.

6.0 SUMMARY OF PROBLEMS AND RISKS

The State of the Basin environmental inventory of the Black Creek Watershed provides a basis for the analysis of possible problems and the risks current practices pose for watershed management planning. A summary of problems and risks are provided relative to BCWC water quantity and quantity goals and objectives, identified citizen concerns and the limits of available data.

6.1 WATER QUALITY RISKS

Black Creek has multiple risks to its water quality. Industrial point sources, agricultural nonpoint sources, and nonpoint sources from developed areas appear to provide the highest risks. Stormwater management practices and stream bank erosion processes also contribute to the overall water quality risk.

6.1.1 Point sources

Industrial discharges are primarily point sources where quantities and types of pollution are known and regulated. Toxic Release Inventory data (Map 46, Toxic Release Inventory) reflect a relatively sparse distribution of discharge sites. However, commercial activities in the watershed handle chemicals and hazardous materials, process and recover metals, process and package foods and generate wastes.

Resource Conservation Recovery Facilities are regulated by RCRA which was enacted by Congress in 1976. RCRA regulates the management of solid waste (e.g., garbage), hazardous waste and underground storage tanks holding petroleum products or certain chemicals. There are 70 RCRA facilities inside the Black Creek Watershed, and another 356 facilities within two miles of the watershed border (Map 27, RCRA Facilities). RCRA sites are clustered in and near areas of higher population density. There were 242 spills recorded in the Black Creek Watershed by the NYSDEC. Known spill sites are clustered in and near populated areas and suggest there is a greater pollution risk in the lower reaches of the watershed (Map 28, Recorded Spill Sites).

6.1.2 Agricultural sources

Agricultural discharges of pollution are primarily associated with the production of animal waste and application of fertilizers, pesticides, and herbicides to farm fields. Most discharges are nonpoint and dependent on the interaction of farm management practices and rainfall/runoff events. Water quality can be maximized by the use of recognized BMP for farm activities that are targeted towards the minimization of pollution risks. Cost-effective BMP development can be specifically designed and implemented in the Black Creek Watershed.

6.1.3 Nonpoint sources

Additional nonpoint pollution discharges emanate from developed areas such as villages, subdivisions, shopping malls and other commercial properties. Stormwater runoff management strategies historically have concentrated on water quantity issues, however comprehensive stormwater management plans can also include water quality management. Nonpoint pollution management can be incorporated into site planning and design of new developments with a goal of no net impact to downstream hydrology. Presently developed areas have limits on what pollution reduction benefits can be attained without redesign or redevelopment of stormwater systems. Conversion of existing dry detention ponds to stormwater wetlands may be a way to attain water quality benefits from existing stormwater management facilities.

Besides the typical pollutants that runoff from rooftops, parking lots and other impervious surfaces, just about all developed areas in western New York receive a seasonal nonpoint load of salt used for winter de-icing. Potentially detrimental effects to terrestrial and aquatic environments are generally known, but there is no specific data that addresses the potential problems in the Black Creek Watershed.

Sanitary sewer systems are associated with higher population density areas. In rural areas and areas of single-family residential sites on multi-acre parcels, septic systems are typically used for home waste disposal. Town codes and county health regulations are designed to eliminate private homes as a source of nonpoint pollution. Although regulations are generally adequate, strict adherence to proper septic siting, construction and maintenance are necessary to eliminate water quality impacts. Aging septic systems that do not comply to modern codes can pose a significant pollution risk.

Streambank erosion contributes to both water quantity and water quality risks. The primary water quality issue from accelerated erosion is to increase stream turbidity. Channel migration and associated streambank erosion is a natural process, however future development should attempt to minimize acceleration of channel erosion.

6.1.4 Public water quality concerns

The overall water quality in the Black Creek Watershed is good, based on the use of drinking water standards as a benchmark. This conclusion is based on the available data which is minimal in describing gross characteristics of the stream water. Recent studies by faculty and students at SUNY College at Brockport and Roberts Wesleyan College have found conflicting results that raise significant questions regarding the type and amount of data available for assessment.

While the overall water chemistry was found to be comparable to previous reports, levels of nitrate and total nitrogen were found to be above MCLs in several portions of the watershed. It should be noted that these studies were limited in scope, but revealed a systematic problem in previous investigations.

Previous reports provide a limited spatial and temporal data set. Samples have been collected since 1954, and during this time monthly sampling was common. Over the past 5 years sampling frequency has been higher at times, but the number of parameters tested are limited. Presently tested parameters provide information on general water quality conditions. They do not test for a wide range of constituents that might be degrading water quality. Additionally, sampling has often been limited to a single location in the watershed.

To better understand the current water quality conditions of the Black Creek Watershed and to design management plans that will protect the resource, a comprehensive investigation is needed. This investigation should include at a minimum the following criteria:

- Identify constituents of concern for the watershed based on current potential sources of impact.
- Design and complete a multi-year study that monitors water quality as a response to changing environmental conditions. This should include 1) seasonal variations in water flow, 2) variations in water quality between base flow and storm flow events, 3) variations in water quality as a function of land use, and 4) dissolved versus suspended transport of constituents.
- Conduct a comprehensive basin-wide study that identifies key monitoring locations so as to determine the water quality in both the main channel and important sub-watersheds.

Public involvement in the BCWC planning process has also identified the following concerns affecting water quality in the Black Creek Watershed:

- The Village of Churchville wastewater treatment plant should be closed.
- The Town and Country mobile home park on Route 33A in Riga uses septic systems that are aging. Closure of the septic system at this location is scheduled and alternative waste disposal facilities should be designed to minimize water quality impacts.
- There used to be pike and smallmouth bass throughout Black Creek, but these fish species seem to be limited in the stream today.
- Water quality surveys such as a trace metals study could provide a benchmark for future water quality comparisons.
- Streambank erosion is a problem in some areas, but not everywhere.
- Regular maintenance cleaning of garbage and debris from the streambed is needed.
- The BCWC should be involved in public outreach that helps citizens and landowners understand the value of stream corridor maintenance.

6.2 WATER QUANTITY RISKS

Black Creek experiences significant fluctuations in stage and discharge. Excess quantities of water produce the flooding that is typical in the lower part of the watershed. Extreme low flows have caused the channel to dry up in some segments of the channel and its major tributaries.

6.2.1 Flooding

The most significant flooding occurs in the lower Black Creek Watershed in the Towns of Riga and Chili with lesser flooding in Bergen and Byron. Construction of the Mt. Morris Dam upstream of the confluence of Black Creek and the Genesee River has significantly alleviated backwater flooding along Black Creek. Coordination of discharges at the Mt. Morris Dam with the downstream Court Street Dam is necessary to prevent backwater events during periods of high discharge in the Genesee River. Headwater flooding of Black Creek and its principal tributaries from heavy rains and/or rapid snow melt remains a risk. Different land uses contribute to the overall flood risk, and the locations of specific land uses within the Black Creek Watershed affect the level of risk.

Flooding of wetlands is not usually a problem since flooding is a normal and a necessary wetland function. Forested lands do not typically experience significant damage from flooding, but flood events could create an interruption of activities in the uses of forested lands. When agricultural lands flood, damage can occur to buildings and equipment. Crop damage can occur, but detrimental effects on pastures is negligible. Significant pollution is possible if areas that generate animal waste are flooded. Proper siting of agricultural activities minimizes the impacts of flooding on both farm practices and the surrounding environment. Flooding can produce significant damage for commercial and residential areas. The risk can become severe where permanent structures are built at levels below expected flood elevations.

The best flood management strategies are those that allow flexible land use practices but minimize the location of permanent, damagable structures and their contents in flood zones. State and Federal programs can help landowners to apply BMP through assistance and advisement programs. County and town governments can uniformly regulate land use standards for flood prone areas.

6.2.2 Base flow

Low flow periods occasionally occur in dry late summer and early fall seasons. During these times Black Creek may be almost totally dependent on groundwater discharge to provide flow. Local segments of Black Creek have been known to barely flow at these times.

6.2.3 Public water quantity concerns

Public involvement in the BCWC planning process has identified the following concerns over flooding in the Black Creek Watershed:

- Cleaning the Black Creek channel does not provide benefits if the entire main channel is not cleaned. An area-wide watershed maintenance policy could keep the channel cleaned, free of debris and minimize obstacle effects on flooding.
- Under the Genesee Valley Greenway bridge near Scottsville Road, where Black Creek flows into the Genesee River, culverts are sometimes clogged with sediment, and flooding has been reported because water cannot flow to the Genesee River.
- Black Creek has been impassable by canoe through the Bergen Swamp from West Sweden Road to State Route 19 since the 1991 ice storm. Cleaning the debris from this reach could improve recreational access and possibly reduce backwater flooding.

6.3 RECOMMENDATIONS

In addition to Section 1.4 Goals and Objectives, some specific recommendations are as follows. The following recommendations are related to public policy, technical investigations and public outreach and education:

- Municipal outreach needs to continue while a Watershed Plan is being developed and implemented. Renew and update the IMA existing between Monroe, Genesee and Orleans Counties to include towns and villages.
- Develop watershed protection policies commensurate with BCWC stormwater quality and quantity management goals, stream corridor protection plans, etc.
- During development of a Watershed Management Plan, evaluate commercial activities to assess business pollution prevention activities.
- Assess town zoning ordinances as they relate to flood zones, riparian zones, agriculture and special overlay districts. Compare and contrast zoning ordinances in towns and suggest model ordinances for riparian buffers, floodplains, etc.
- Develop a BCWC Drainage Subcommittee that includes agencies, towns and citizens to develop an integrated drainage plan and serve as a liaison between local governments.
- Develop a Black Creek flood prevention and mitigation plan.
- Develop a BCWC Technical Subcommittee to develop and implement systematic water quality monitoring to gather improved base line data and assess potential human impacts on water quality.
- Perform hydrologic analysis and water quality modeling to define the behavior of the watershed and its relationships between land use and water quality.
- Additional gaging stations, especially upstream, are needed to improve understanding of surface water hydrology.

- Conduct an aquatic survey of fish populations in the Black Creek Watershed.
- Inventory storm sewers and surface runoff management facilities
- Inventory smaller local parks and recreational facilities.
- Bridge culverts have been described as inadequate and may cause backwater effects in the Black Creek Watershed. A survey of the adequacy of drainage culverts would provide systematic information on the magnitude of this possible problem.
- Develop additional public access points to Black Creek in addition to existing locations at public parks. Additional public access points would enhance Black Creek's recreational potential for canoeing and fishing.
- Develop a debris removal plan for Black Creek and tributaries. Encourage each community to clean out Black Creek and its tributaries. Towns may differ in their approach depending on the stream classification in their town. Debris removal would increase navigability along some reaches of the channel and may help to alleviate local backwater flooding.
- Conduct a visual survey of Black Creek and its tributaries for debris and erosion problems and for other signs of environmental degradation. Photographs of bridge culverts during high water may serve to document potential problems associated with obstacles to flow.