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Water Resource Assessment

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ABSTRACT

The Finger Lakes National Forest (FLNF) Water Resource Assessment presents past and existing water resource conditions within the Forest, public values and expectations relating to water resources, water resource comments and concerns from public meetings/letters/phone calls, the FLNF Retrospective, the Caywood Point EA, the Oil and Gas EIS, and information needed for revision of the National Forest Land and Resource Management Plan (Forest Plan).

This assessment outlines the legal and administrative regulations and guidelines for water resource management. The discussion of regulations and guidelines deals with the 1972 Clean Water Act to the current FLNF Forest Plan direction, which is the foundation for the current management of the FLNF's water resources. The past disturbances, both natural and human-induced, that have affected the current land condition are summarized.

An analysis of the existing aquatic ecosystem on the FLNF is important to determine the overall condition of the water resources, to assess the need for future monitoring, and for comparison to the watershed conditions in the Finger Lakes Region of New York.

The assessment addresses in detail certain public issues and questions relating to water resources. The identification of restoration areas is a very important result from the water resource assessment. Over the last decade, many projects were implemented on the FLNF to improve water quality and riparian areas by eliminating erosion and sedimentation problems, and by revegetating and stabilizing bare soil areas.

The FLNF will continue to use state-of-the-art methods for aquatic resource protection and restoration within a framework that includes multiple management approaches and alternatives such as passive restoration (corridor protection and riparian revegetation) and active restoration (corridor protection and in-channel improvements).

Item A. Public Values/Expectations

Introduction

The purpose of Public Values/Expectations Section is to provide an overview of the public values related to water resources on the Finger Lakes National Forest (FLNF). These values can be gleaned from the Federal and New York State regulations/ guidelines, the recommendations of regional plans, a summary of the comments and concerns from: public meetings/letters/phone calls, the FLNF Retrospective, the Caywood Point EA, the Oil and Gas EIS, and the current FLNF Plan direction.

Federal and State laws, and regional plans reflect a range of public values regarding the role of the FLNF. These values are important because they are long-term perspectives that affect government laws and regional policy. The comments and concerns from FLNF's public meetings present what people value most about the national forest, and what management actions or conditions concern them.

Federal and FLNF Regulations and Guidelines

The 1972 Clean Water Act, as amended by the Water Quality Act of 1987, provides for the identification and protection of outstanding waters in every state, and is designed to restore and maintain the chemical, physical, and biological integrity of the nation's waters. To achieve this objective, it is the national goal to: eliminate the discharge of pollutants into navigable waters; provide water quality for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water, prohibit the discharge of toxic pollutants in toxic amounts; and develop and implement programs for the control of point and nonpoint sources of pollution. Waters of the United States protected by the Clean Water Act include rivers, streams, estuaries, territorial seas, and most ponds, lakes and wetlands. Wetlands include swamps, marshes, bogs, and similar areas (U.S. EPA, 1989).

Section 404 of the Clean Water Act regulates the discharge of dredged and fill material into waters of the United States, including federally classified wetlands. Activities that are regulated under this program include: filling water bodies for development, water resource projects, such as dams and levees, infrastructure development, such as highways and airports, and wetland conversion to uplands for farming and forestry (U.S. EPA, 1999). All the wetlands on the FLNF are federally classified wetlands, regardless of size. Executive Order 11990 (1977) protects federally classified wetlands by stating that "Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities."

The National Forest Management Act includes the management requirement (36CFR 219.27(a)(4) and (e)):

> "To protect streams, streambanks, shorelines, lakes and wetlands, and other bodies of water, special attention shall be given to land and vegetation for

> approximately 100 feet from the edges of all perennial streams, lakes and other bodies of water. This area shall correspond to at least the recognizable area dominated by riparian vegetation. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat" (Ilhardt and Parrott, 1990:28).

This management requirement is a standard and guideline (S&G) of the FLNF forest plan in Section 4.16 A3. The FLNF's standards and guidelines for soil and water resource protection are implemented and monitored for timber sales, snowmobile and horse trail construction/reconstruction projects, range management, pond construction/maintenance, and forest roads.

Stock ponds fall into two categories: open and closed system ponds. Open system ponds drain directly into a stream and closed system ponds do not drain directly into a stream. According to forest plan S&Gs, both types of ponds require fencing with a hardened surface for cattle access. The open system ponds also require fencing of the drainage channel into a stream to ensure soil and water resource protection.

<u>New York State Regulations/Guidelines</u>

In 1965, the Water Resources Commission was established to:

> "Provide the basis for wise management of our water resources through scientific planning and equitable regulatory activities.
>
> Establish comprehensive plans for multi-purpose development of the water and related land resources of each river basin and region of the state through regional and state-federal partnership efforts.
>
> Work as a partner with federal agencies in formulating comprehensive plans that adequately reflect New York's interests in interstate river basins.
>
> Fashion programs to implement regional plans for development of water resources as soon as they are established." (Genesee/Finger Lakes Regional Planning Council, 1999).

The Finger Lakes region consists of 11 glacially formed, freshwater lakes located in central New York State (Figure A-1, Finger Lakes Region) (Figure A-2, Genesee/Finger Lakes Basins). All of the lakes, except Honeoye Lake, are used for public water supplies. The Finger Lakes region includes 3 of the largest 10 lakes in New York State, which is a significant asset to the region.

Figure A-1: Finger Lakes region in New York State.

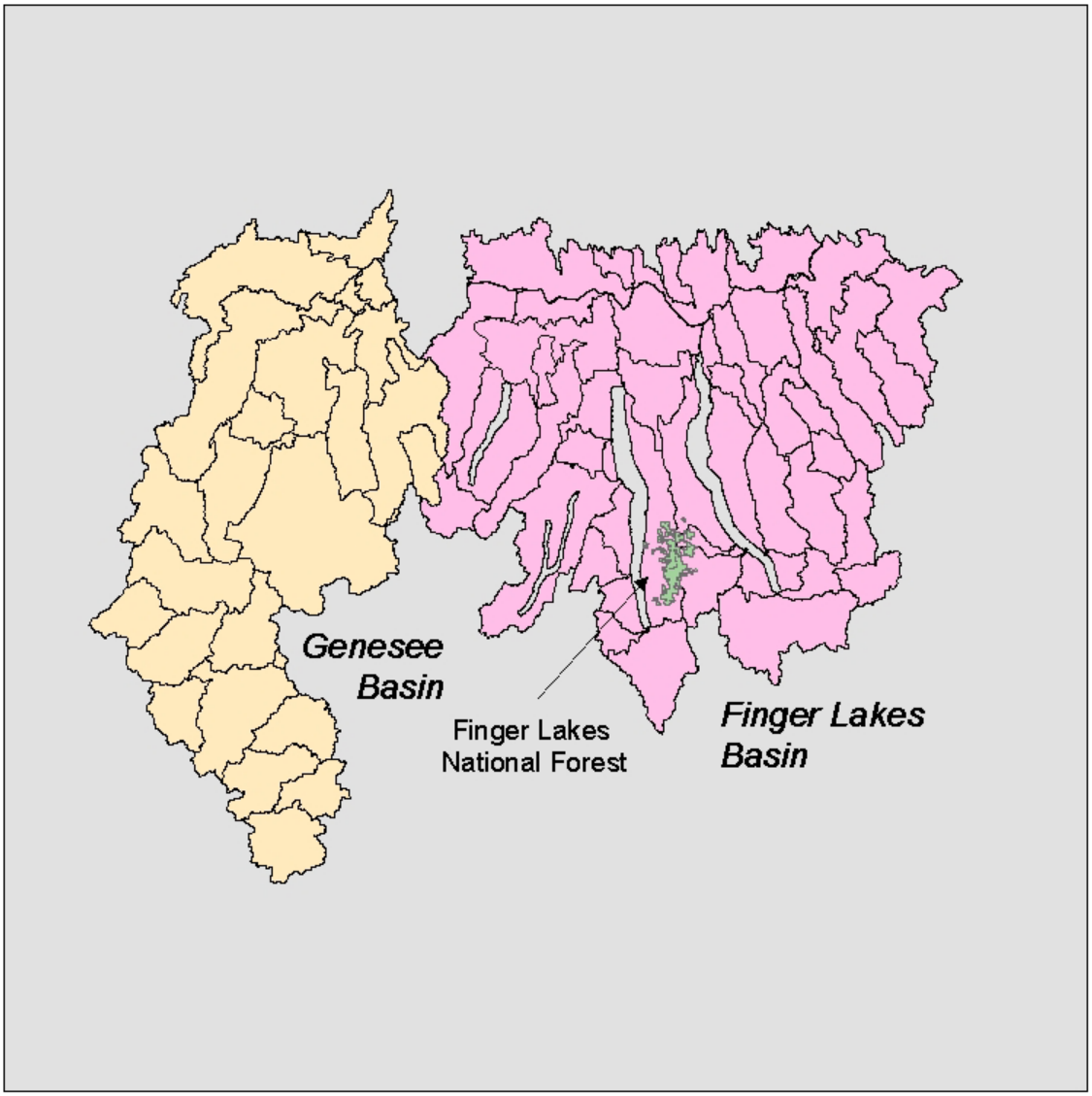

Figure A-2: Genesee and Finger Lakes Basin

The Yates, Ontario, and Wayne Counties published the 1973 Interboard Plan for the Finger Lakes-Oswego River Basin, which called for the control of point source pollution, stream reclassification, acquisition of public access points, and the coordinated operation of the Finger Lakes-Oswego River system, and the protection and purchase of wetlands. (Genesee/Finger Lakes Regional Planning Council, 1999).

The Federal Water Pollution Control Act Amendments of 1972 (PL92-500) requires annual water quality reports, and basinwide water quality planning. The New York State Department of Environmental Conservation (NYSDEC) conducted statewide assessments and composed, in January 1977, the Section 303 (b) Water Quality Management Plan for the Western Oswego River Basin.

Amendments to the Federal Clean Water Act, in 1977, require meeting fishable and swimmable water quality standards across the state. Priority Waterbody Lists (PWLs) were established on a county basis to identify stressed streams, targeted for implementation funding. There are water quality concerns in the Finger Lakes region, which are reflected by the fact that all 11 lakes are currently on the NYSDEC Priority Waterbodies List. The primary pollutant in Cayuga Lake are nutrients, and in Seneca Lake, salts. As part of a statewide Clean Lakes Program, the NYSDEC pledged to develop watershed management plans for the Finger Lakes. NYSDEC, in 1990, published the Watershed Planning Handbook for the control of non-point source pollution.

Regional Plans

Water quality planning, throughout the years, has been implemented in the Seneca Lake watershed for a variety of purposes, such as, commerce, flood control, water supply, environmental protection, and the inter-relationships between the water resource and the entire upland watershed. Seneca Lake is the drinking water source for over 70,000 people in central New York, therefore, water is one of the area's most precious natural resources.

The Seneca Lake Area Partners in Five Counties (SLAP-5) is a representative group from local, regional, state, and federal agencies. The SLAP-5 Oversight Committee developed the following goals:

- To develop a watershed management plan for Seneca Lake that will protect and improve water quality and is supported by the citizens and communities in the watershed.
- To provide representation of all important sectors in the Seneca Lake Watershed and to keep in contact with people in their areas of expertise to make sure that the watershed program reflects and responds to the people that they represent.

The goal of the Seneca Lake Watershed Management Plan is 'To protect and enhance Seneca Lake and its surrounding watershed through the encouragement of sound management practices and cooperation at the local level to develop a comprehensive approach for improving the quality of life and water in the Seneca Lake Watershed' (Genesee/Finger Lakes Regional Planning Council, and Southern Tier Central Regional Planning and Development Board, 1999).

"In 1992, the Seneca Lake Pure Waters Association made a clear case for protecting the Lake through land use laws (Genesee/Finger Lakes Regional Planning Council, and Southern Tier Central Regional Planning and Development Board, 1999:4-8):

- Being sensitive to conditions in three areas: 1) the littoral zone (zone related to the shore, extending to some shallow depth of water) along the shore, 2) the areas along the shore that drain directly into the lake, and 3) the areas along streams that flow into the lake.

- Seneca Lake has an unusually low proportion of its total water volume in its littoral zone, because of its steep shores and great depth. Therefore, its littoral zone needs to be protected from pollutants, shading structures, and activities that would disturb the plant and animal life.
- A major threat to Seneca Lake is silt, which discolors the water, covers spawning beds, and provides a rooting bed for weeds and other plant growth.
- Development in the direct drainage area will be limited, and protection against pollution and erosion will be provided for the entire watershed".

The suggested minimum municipal ordinances, which apply to lakeshore area/year round tributaries, for stormwater and erosion control, include:

NYSDEC regulations apply to any excavation within 100 ft. of a watercourse, and to slopes over 8%.

In 1998, land-use mapping determined that agriculture represented 33% of the land base for the Seneca Lake watershed. Approximately 60% of the FLNF is located in the Seneca Lake watershed, and of that, 20% is public grazing land.

Cayuga Lake is another valued and visible resource, which serves as a public water supply and a focal point for recreation. The water quality is generally very good, and the fish community is diverse and productive.

In 1998, the Cayuga Lake Watershed Restoration and Protection Plan (RPP) process began with the creation of the Cayuga Lake Intermunicipal Organization, whose focus was to identify priority issues and solutions on a watershed-wide basis. The cooperating municipalities share a number of common goals, including (Genesee/Finger Lakes Regional Planning Council, and Limnological Consultants Ecologic, LLC, 2001:1-7):

- "minimize nonpoint source pollution of both surface and groundwater in the watershed;
- the remediation of existing pollution and degradation;
- the preservation of open space and natural resources;
- the expansion of economic activities consistent with the watershed environment".

There are several water quality issues that threaten the resource as a water supply, for recreational use, and for aesthetic enjoyment, including:

- silt and sediment
- phosphorus
- fertilizers and pesticides

Agriculture is a dominant land-use in the Cayuga Lake watershed, with about one-third of the direct drainage being in active agricultural production. Approximately 57% of the agricultural lands in the watershed are used for livestock and products, and 42% are used for field crop production (Genesee/Finger Lakes Regional Planning Council, and

Limnological Consultants Ecologic, LLC, 2001). Approximately 40% of the FLNF is located in the Cayuga Lake watershed, and of that, 45% is public grazing land.

For the Seneca and Cayuga Lake Watersheds, the percent of the FLNF in each watershed is 2% and 1%, respectively (Table A-1) (Figure A-3).

Table A-1: Percent of FLNF in Seneca Lake Watersheds and Cayuga Lake Watersheds

Seneca Lake Watersheds

NAME	HUC 11	FLNF Acres	Watershed Acres	% of FLNF in Watershed
Seneca Lake	04140201060	9,943	157,015	6%
Kashong Creek	04140201050		19,657	
Glen Creek	04140201020		14,568	
Big Stream	04140201030		23,867	
Catherine Creek	04140201010		63,169	
Keuka Lake Outlet	04140201040		120,787	
total		9,943	399,062	2%

Cayuga Lake Watersheds

NAME	HUC 11	FLNF Acres	Watershed Acres	% of FLNF in Watershed
Trumansburg Creek	04140201130	1,506	8,659	17%
Taughannock Creek	04140201120	4,642	42,890	11%
Cayuga Lake	04140201150	347	160,357	0.2%
Virgil Creek	04140201090		25,978	
Tawger Creek	04140201140		15,950	
Seneca Lake to Cayuga Lake	04140201070		47,952	
Salmon Creek	04140201110		57,133	
Fall Creek	04140201100		56,374	
Cayuga Inlet	04140201080		100,976	
total		6,495	516,269	1%

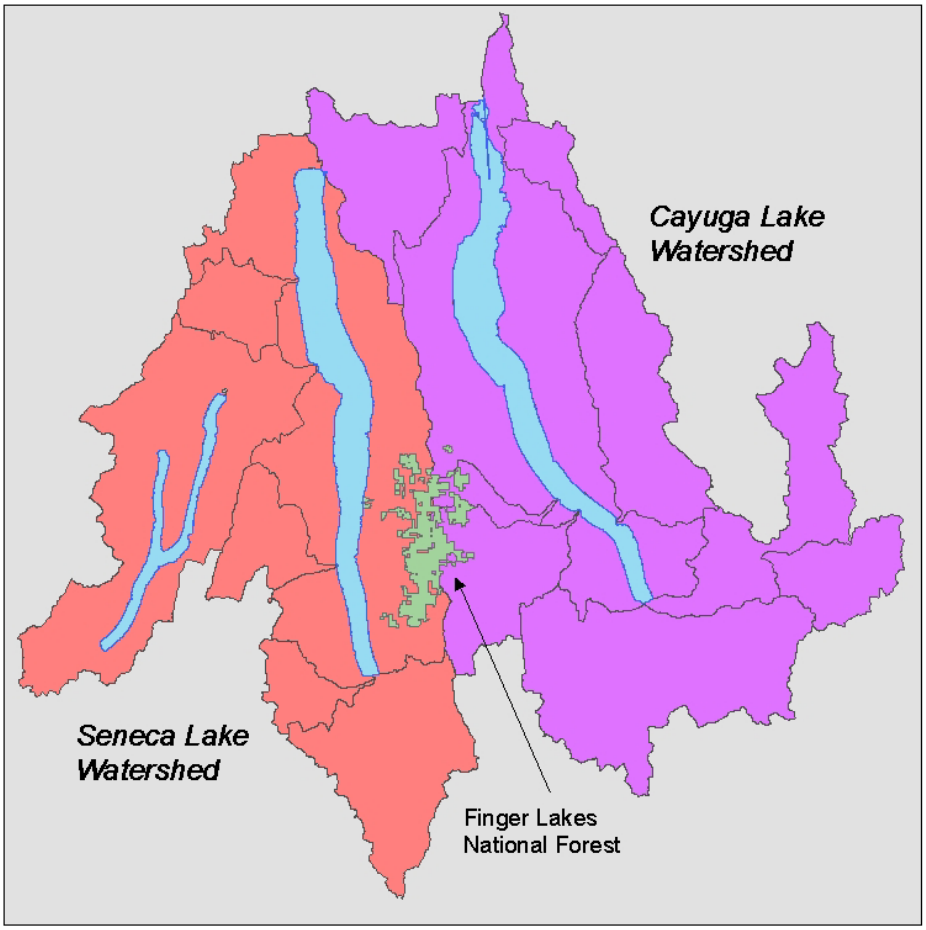

Figure A-3: Seneca Lake and Cayuga Lake Watersheds

Summary of Comments and Concerns from the Public

Between 1996 - 1998, and 2002 - 2004, the FLNF held a series of public meetings to gather comments and concerns from the public regarding management of the National Forest. Public comments and concerns also came from letters, phone calls, the FLNF Retrospective, the Caywood Point EA, and the Oil and Gas EIS.

The public concerns about aquatic resources and the role of water resource management on the FLNF were:

- bringing in people with water resource expertise to address topics that influence water quality.
- developing S&Gs, and Goals and Objectives for riparian areas and riparian area restoration.
- large woody debris and pool habitat.

- water quality threats to drinking water wells, public water supplies, and ponds and lakes due to oil and gas activities.

The public comment and management concerns over the issue of the FLNF providing fisheries habitat to sustain viable populations of species were:

- providing more opportunities for water development for increased fishing opportunities.
- managing aquatic habitat.

Current FLNF Forest Plan Direction

The goal of the FLNF, as stated in the Forest Plan, is to "protect the basic integrity of soil, air, and water resources so they can continue their life supporting functions in perpetuity, by such requirements as preventing erosion, meeting air quality standards, preventing contamination of surface and ground water" (Section IV.C., p. 4.04).

Riparian area S&Gs, from the Forest Plan include:

- A riparian area is the zone between seasonally dry land and perennial surface waters. The soils are wet and usually are saturated for a portion of the year. Vegetation is dominated by wet site species (Section A1, p. 4.16)
- Resources that depend on a riparian area will be given preferential consideration over other resources when there are conflicts between them (Section A2, p. 4.16)
- Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all streams, lakes, and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat (Section A3, p. 4.16)

Pond construction and maintenance S&Gs from the Forest Plan:

- Provide adequate spillway in pond dikes to prevent breach of the dike in overflow conditions (Section J1, p. 4.23)
- Fence existing and newly constructed livestock ponds to prevent trampling damage to the pond dike, and reduce pond siltation and eutrophication (Section J2, p. 4.23)

Fisheries S&Gs from the Forest Plan include:

- Fish management will emphasize warm water fish that can establish self-perpetuating populations, except where trout has been traditionally stocked (Section G2, p. 4.30)

Literature Cited:

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Item B. Reference Conditions

Introduction

The purpose of Reference Conditions Section is to provide a definition of reference condition, an overview of past disturbances, both natural and human-induced (anthropogenic), and the affects of past disturbances on the water resources.

Landforms at the surface of the earth reflect a delicate balance between forces acting to uplift the landscape and forces acting to wear down the landscape. Equilibrium conditions occur when the force of erosive agents, including water, wind or ice are balanced by the resistance of the land surface (Leopold et al, 1992). Geomorphic theory holds that landscape change and the evolution of landforms result during deviations from this state of equilibrium (Ritter et al, 1995). Human activity can contribute to such deviations through alteration of the land surface resistance to erosion. Agricultural and forestry practices, including removal of soil-stabilizing vegetation, road building, urban development and damming of waterways are just a few of the human activities that can affect the balance of landform shaping processes. Before the American War of Independence, the land in the Seneca and Cayuga Lakes basin was mostly covered with a closed canopy of mixed northern hardwood and softwood trees (NYS Museum, 1992). After 1779, following the removal of most of the Native Americans from the region, settlers from the east colonized the area and rapidly converted forests into agriculture land. By the second half of the 1800's, approximately 90% of the forest had been converted into pasture land. A trend of agricultural abandonment followed, which continues today. A majority of the cleared land, especially in the southern part of the basin, has reforested to a variety of successional stages (Genesee/Finger Lakes Regional Planning Council and Southern Tier Central Regional Planning and Development Board, 1999).

Definition

Reference condition is a natural area that has experienced the least impact from anthropogenic disturbances. Reference conditions can be used for establishing Desired Future Conditions (DFCs) and for comparison to current, disturbed conditions. Understanding the reference condition and realizing how past land-use has affected the current land condition is very important to land managers.

As Jan Albers states in her book, *Hands on the Land*:

> "A history of the landscape is the story of how different cultures saw fit to alter the earth to meet their needs, express their beliefs, and satisfy their whims. While geography, biology, and climate will all be major characters, the heart of a landscape history is how human cultures take physical form on the land." (Albers, 2000:14)

Natural Disturbances

Natural disturbances, such as forest fires and tropical storm remnants entering the region from the south, affected the landscape through removal of large numbers of trees. In the case of tropical storm remnants, the large amount of rainfall that occurs increases the rate of soil erosion and the number of trees entering a stream (large woody debris). The increase in soil erosion adds sediment into the streams which can be detrimental to fish habitat and aquatic species survival.

Forest fires remove understory vegetation, and can cause the soil surface to crust, preventing rainfall from soaking into the ground, and consequently increasing run-off into the streams. Floods resulting from forest fires and tropical storms have impacted the landscape of the Finger Lakes region.

The occurrence of severe to extreme drought conditions have affected the Finger Lakes' agriculture and recreation in the region. During a 100 yr. period, between 1895 and 1995, half of the Great Lakes Basin experienced a severe to extreme drought 17% of the time, and almost all of the basin experienced a severe to extreme drought 6% of the time (National Drought Mitigation Center, 2003). Drought conditions affect water and fish resources by concentrating water quality problems, where they already exist; by affecting aquatic habitat; and by causing fish mortality.

Human-induced Disturbances

In 1828, the first dam on Seneca Lake, with four sluice gates, was constructed at Waterloo. The present dam and navigation lock replaced the 1828 dam, in 1916. The Erie Canal was constructed in 1817 to ensure available water for commerce. The successor to the Erie Canal, the Barge Canal, was built in 1917 and was opened to boat traffic in 1918. "The Canal Corporation of the New York State Thruway Authority manages water levels of eight Finger Lakes, including Cayuga Lake," and Seneca Lake, "and connecting canals" (Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC, 2001:II-4).

Presently, the Seneca Lake outflow passes through control structures at Seneca Falls and Waterloo, which is a hydroelectric plant. A second hydroelectric plant is located along the Cayuga-Seneca Canal. In the winter months, Seneca Lake is drawn down to prevent ice and wind damage from occurring to shoreline structures, and to provide storage capacity for the spring runoff. During the summer months, the Seneca Lake water level is stabilized for boating activities (Genesee/Finger Lakes Regional Planning Council and Southern Tier Central Regional Planning and Development Board, 1999). Water levels on Cayuga Lake "are raised and lowered seasonally to protect recreational uses, increase storage capacity, and minimize the potential for flooding" (Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC, 2001:II-4).

Before the American War of Independence, the land in the Seneca and Cayuga Lake basins was covered mostly with a closed canopy of mixed northern hardwood and

softwood trees. By the late 1800's, most of the forest had been converted into pasture land. Today, most of the cleared land has reforested.

Sediment is "a significant water quality, habitat, and use impairment issue, particularly in the southern tributaries and southern Cayuga Lake. In the southern tributaries, the primary source of sediment appears to be streambank erosion…", a result of the streams being more unstable and flashy (Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC, 2001:C-2). The water is more turbid due to the presence of clay soils, which stay in suspension longer because of their small particle size.

In the early 1900's, an extensive wetland area in the southern part of Cayuga Lake was filled in and destroyed, which exacerbated the sediment problem with the removal of a natural filtration process that used to capture sediment before it entered the lake.

Agricultural activities, which is the land-use in almost half of the Seneca and Cayuga Lake watersheds, contributes nitrate-nitrogen, pesticides, and herbicides to the lake. Sources of phosphorus entering Cayuga Lake include two wastewater treatment plants discharging into the southern lake basin, runoff from residential and agricultural areas, and failed septic systems in the northern segment. The shallow areas at the northern and southern ends of Cayuga Lake have higher levels of phosphorus and algal growth production, which has resulted in New York State listing them as priority areas, with water quality concerns. Heavy metals are present in elevated concentrations in sediments of shore areas in the southern part of Cayuga Lake, "from industrial discharges, stormwater runoff, or atmospheric deposition" (Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC, 2001:C-2).

Other human-induced impacts:

- Due to its connections to the Great Lakes via the Seneca River, "Cayuga Lake is vulnerable to invasion by nonindigenous species of plants and animals", including the zebra and quagga mussel, zooplankton, and Eurasian milfoil (Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC, 2001:C-3).

- Expansion of urban areas near Cayuga Lake can be seen in the excellent example of the rapid establishment of the village of Lansing, which did not even exist 30 years ago. Due to increasing populations and growing economies, the changes in land-use in both watersheds occur quickly.

- Acid deposition is the input of acids that are in the atmosphere onto the earth's surface (Hubbard Brook, 2000). Because of the presence, in the north half of the watersheds, of lime-rich soils, limestone bedrock, and carbonate/bicarbonate ions in the water, any acid precipitation is probably neutralized before it impacts either Seneca or Cayuga Lake. The bottom half of the watersheds may be slightly impacted by acid deposition.

Reference Condition

The Genesee/Finger Lakes Regional Planning Council in the Seneca and Cayuga Lake Watersheds and the Southern Tier Central Regional Planning and Development Board in the Seneca Lake Watershed, have developed watershed assessment protocols to provide an overview of the general physical characteristics of each watershed. Areas in equilibrium (stable areas), under existing conditions, in each watershed will, in time, be identified.

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Item C. Existing Aquatic Ecosystem Condition

Introduction

The purpose of Existing Aquatic Ecosystem Condition Section is to provide an overview of the present situation of:

- water quality
- stream habitat condition
- riparian area condition
- habitat restoration/fish populations
- other human influences
- fluvial geomorphology

A complete look at the existing aquatic ecosystem on the FLNF is an important task for understanding the overall condition and for assessing the need for future monitoring. There are 46 stock ponds and 27 wildlife ponds on the FLNF, ranging in size from approximately 1/2 acre to 1 acre (USFS, 2001). Also, there are 49 confirmed or potential wetlands on the FLNF (USFS, 2001). There are approximately 21 intermittent streams on the FLNF, meaning that they do not flow year round. There are 6 perennial streams that originate on the FLNF (see Figure C-1).

Monitoring natural resources involves an inventory of present conditions, identifying the problem areas and determining the best method of monitoring to track changes over time for better management and decision-making in the future. Baseline data is the valuable result of monitoring an area for the first time. Future monitoring can then be compared to the baseline to analyze the dynamic processes occurring in a study area.

Water Quality

Our primary goal for water resources on the national forest is to provide clean water. In addition, we strive to "protect the basic integrity of the …water resources so they can continue their life supporting functions in perpetuity, by such requirements as preventing erosion …(and) preventing contamination of surface and ground water" (see Forest Plan, p.4.04, item 1, and p.4.07, item 1). In other words, we want to provide for healthy riparian areas on the national forest.

In 2002 we conducted our third year of monitoring several streams and ponds in FLNF grazing areas. The past three years of monitoring provides us information on the effects of grazing on water quality and riparian areas. It is also used to determine if our Standards and Guidelines (S&Gs) and forest plan goals for riparian areas are being met. The water monitoring is comprised of 15 test sites (3 ponds, 12 streams) located in or adjacent to FL grazing allotments. In most cases, lands upstream of the test sites are part of the national forest. From approximately May to July each year, water quality monitoring was conducted weekly. The parameters monitored included: dissolved

oxygen, pH, total nitrogen, phosphorus, temperature, turbidity, conductivity, total dissolved solids, flow, and E.coli (taken 3 times in the monitoring season).

The grazing area water monitoring results were compared to the State of N.Y. standards for Class D Waters (the lowest water quality class). In general, the parameters monitored met Class D standards approximately 85% of the time, except for turbidity, phosphorous and E.coli. Turbidity levels failed to meet the standard 50% of the time (due to sedimentation), phosphorus 83% of the time, and E.coli levels failed to meet the standard 67% of the time. These results indicate that water quality in our grazing areas, and some adjacent national forest lands, does not fully meet forest plan goals. In fact, Class D phosphorous and turbidity levels were exceeded 30-70% of the time at the 'control' stream and pond, where there has been no grazing or other agricultural activity for at least two decades.

Worth noting, water quality in two pastures was monitored as streams flowed into and out of the Forest Service pasture (termed the "entrance" and"exit" sample sites, respectively). Turbidity, phosphorous and E.coil monitoring results are shown in the following table:

Table C-1: Summary of Stream Data Collected from approximately May to July (one sample in late autumn) 2000 - 2003

Pasture	**Sample Location**	**Percent of Samples Exceeding Class D Standards**		
		Phosphorous	**Turbidity**	**E.coli**
Aman	Entrance	78%	7%	42%
	Exit	96%	20%	42%
North Cronk	Entrance	69%	8%	42%
	Exit	81%	9%	13%

This data shows that phosphorous and turbidity levels increased (in other words, water quality decreased) from entrance to exit. E.coil levels remained about the same in the Aman pasture from entrance to exit, and improved in the North Cronk pasture (possibly due to riparian area fencing, as discussed later).

Results from macroinvertebrate (organisms without a spine that live in the stream bed) monitoring showed that 58% of the streams are classified as severly impacted, and the remaining 42% are moderately impacted (classification system used by the State of NY, Dept. of Environmental Conservation). These results are probably due to the high turbidity levels, which adversely affect aquatic macroinvertebrate habitat.

In future years, additional monitoring on non-grazing lands is needed to better characterize water quality on the FLNF, and verify the sources of water quality problems. However, we suspect phosphorous levels are high due to high levels of phosphorous in the soil - a result of past agricultural uses. It is logical to assume the high turbidity levels are the result of erosion and stream bank instability in and near pastures, and high E.coli levels are due in part, to livestock use. Results show that E.coli levels are elevated

coming from private land onto FLNF land, and that the levels decrease in the Forest Service pastures where there is riparian area fencing along the streams. Additional monitoring and literature review is needed to compare nutrient and E.coli levels on the FLNF, to levels on adjacent private lands.

Working toward FLNF goals of providing healthy riparian areas and good quality water on the national forest, the FLNF fenced a riparian area in the North Cronk pasture in 2000. Fencing riparian areas is one practice used to improve water quality and stream bank stability. This riparian area had been frequented by cattle, had some eroding stream banks, and water quality problems. The monitoring results showed a slight improvement in water quality below this fenced area compared to previous years, and that bare soil areas next to the stream were starting to revegetate. The FLNF expects these improvements to increase in magnitude over the next 5-10 years, so more fencing is planned.

A study by Cornell University (Nagle and Fahey, 2002) quantifying the proportional contributions of stream bank and surface sources to fine sediment loads in streams in the southern Cayuga Lake watershed found that bank erosion contributed 60 to 82% of the sediment load. Though, this sediment load is not unusually high compared to the rest of the Northeast. The current problem of excessive sedimentation in Cayuga Lake is probably due to the destruction of the wetlands in the southern end of the basin and indicative of past channel management.

Stream Habitat Condition

Stream stability, erosion from road and stream banks, stream sedimentation and degradation of aquatic habitat continue in many watersheds to be concerns expressed by the general public and natural resource management agencies. A large portion of current channel and bank instability and stream sedimentation can be attributed to the removal of riparian vegetation for such land uses as roads, intensively used recreation sites, forest management and agricultural production. All these factors have been significant contributors to reductions in fish populations, loss of habitat, and channel instability.

Riparian Area Condition

Riparian forests include trees and other plants that live and grow near water on the banks of streams, rivers, ponds, and lakes. Prior to European human settlement, riparian vegetation along streams was probably healthier than it is today. Early settlements and land clearing, log drives associated with logging in the late 1800s to mid-1900s, and extensive in-river alterations had profound impacts on riparian vegetation, channel morphology and aquatic habitat. The degradation of riparian and stream habitats likely persisted for several decades until land use and cultural changes in watersheds throughout the Finger Lakes region occurred.

Most of the cleared land, especially in the southern part of the Seneca and Cayuga Lakes basin has reforested to a variety of succession stages (Genesee/Finger Lakes Regional

Planning Council and Southern Tier Central Regional Planning and Development Board, 1999). The majority of riparian lands currently lacking adequate riparian vegetation are generally where agricultural practices and road crossings are the predominant land uses.

Riparian forests on a small portion of the FLNF are generally younger forests. This situation allows the riparian area to function in numerous ways including serving as a buffer to filter sediment from entering streams and providing a canopy over streams to maintain desirable temperatures for native aquatic biota. Today, the natural process of recruitment of wood inputs into stream channels is starting to happen in small headwater streams. Encouraging the growth of large trees in riparian areas will ensure future recruitment of large woody debris into stream channels. Large dead and dying trees that are believed to have existed historically along streams are no longer there to function in the creation of diverse and complex stream habitats. There are some areas like the gorges where there are large trees that will eventually become part of the system as large woody debris.

A lack of large woody debris input has left stream habitat more homogenous and less complex than past periods when this function persisted. Scientific literature indicates large woody debris is responsible for in-channel storage of sediment and significant amounts of the total sediment yield of a watershed can be in storage behind large woody debris. Large woody debris also plays an important role in forming pools and accumulating gravel beds that can be used for spawning.

Habitat Restoration/Fish Populations

Wildlife Ponds

The wildlife ponds on the FLNF are man-made ponds with limitations due to their size, depth, submerged vegetation, and temperature. Pond inventories have been conducted to assess the physical and biological characteristics, including habitat conditions and a basic description of pond features and riparian vegetation. In these ponds, fish populations are also monitored and inventoried. To improve fish habitat, large trees and root wads have been placed in wildlife ponds to provide fish cover.

Dredging of the wildlife ponds are done periodically to remove silt and sediment in order to deepen the pond in an effort to lessen the winter kill. To counter the increases in aquatic vegetation growth due to nutrient loads, a select number of wildlife ponds are stocked with grass carp, which feed on submerged vegetation.

Foster, Ballard, and Potomac are put and take fishery ponds that are stocked with Rainbow and Brook trout. Several other wildlife ponds, such as Teeter, Sassafras, and Burdick ponds, are managed as warm water fisheries. These ponds are monitored every few years to determine if additional stocking is needed for sport fishing and to supplement winter kill.

Perennial Streams

Many of the streams on the FLNF are characterized as intermittent. However, the headwaters of several perennial streams are located on the FLNF. These include Mill, Breakneck, Hencoop, Sawmill, Bolter, and Hector Falls Creeks. To date, Mill and Hector Falls Creeks have been surveyed and found to contain non-game fish communities; although Hector Falls Creek does support a small, wild Brown trout population.

Other Human Influences

The presence of dams and diversion structures on streams can significantly adjust the hydrologic characteristics of the drainage basin. There are a variety of uses for dams and diversion structures, such as: hydropower, water supplies, flood control, recreation, and esthetics. In 1828, the first dam on Seneca Lake was constructed at Waterloo (see Section B, p. B-8).

Some benefits of dams include hydropower and recreation. Negative impacts of dams are due to the deposition of large amounts of sediment in the reservoir from essentially creating a settling pond (still water). Also, the deposition of sediment results in an increase in upstream bank erosion due to fluctuations in the water level, and erosion downstream due to decreased load and decreased peak discharges. This increase in sediment in the river bed adversely affects aquatic habitat.

There are no hydropower nor flood control dams located on the FLNF. There are several impoundment structures on the FLNF used primarily in pastures for supplying water for cattle grazing and a small number for recreation and wildlife. The FLNF has to periodically dredge the stock and wildlife ponds to remove the sediment, providing a sufficient supply of water for the cattle and deepening the pond in an effort to lessen the winter kill of fish.

Water-based recreational activities on the FLNF include fishing, and swimming in limited areas. Other recreational activities near water include camping, hiking, and wildlife and nature watching. The FLNF offers different types of water, such as streams, wildlife ponds, and stock ponds, whereas, the Finger Lakes Region offers a different recreational experience with its larger lakes. Both areas provide diversity and a valued experience for water-based recreational activities.

Fluvial Geomorphology

No geomorphic assessments have been done on the FLNF to the best of our knowledge.

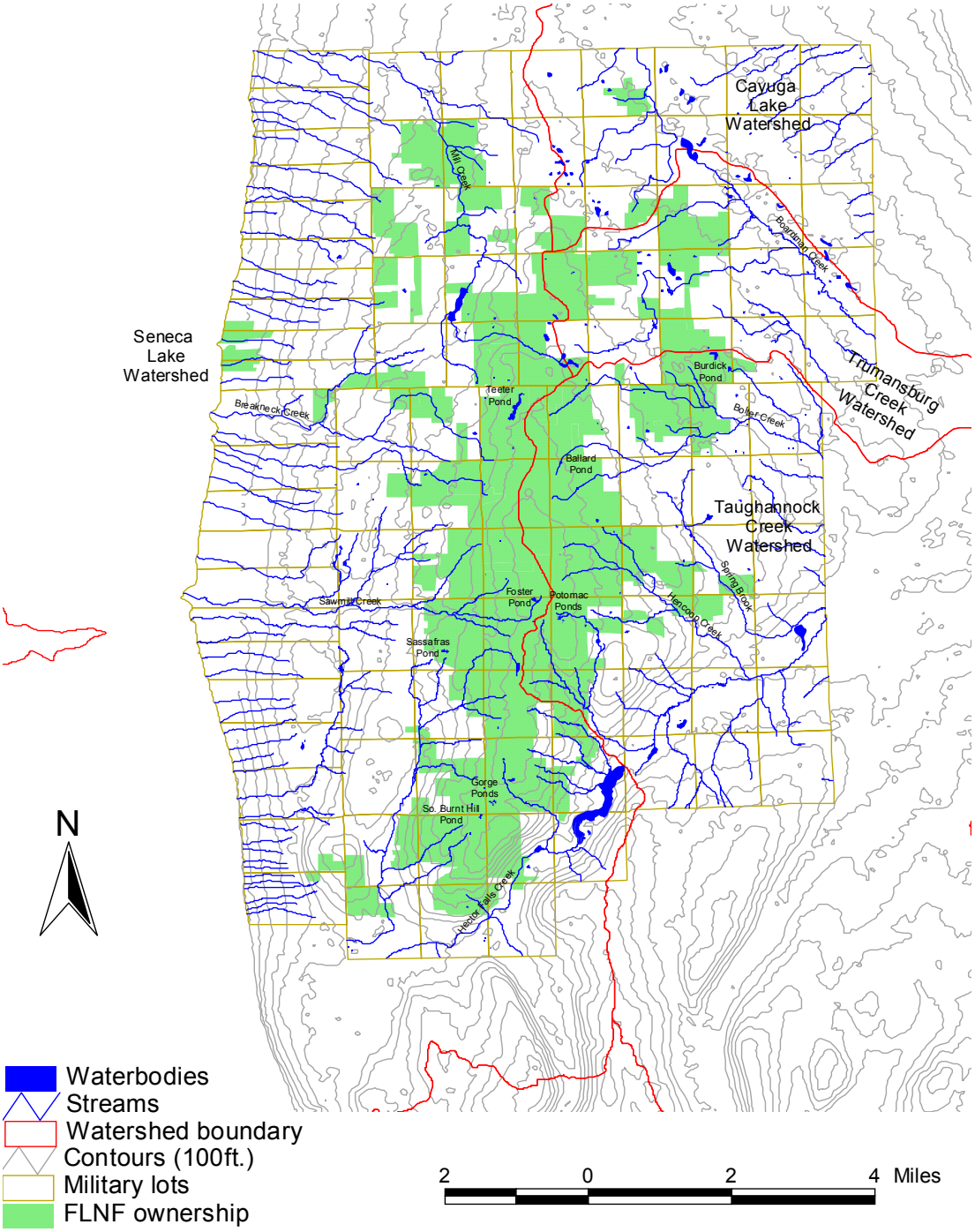

Figure C-1: Map of the waterbodies and streams on the FLNF

Literature Cited:

Genesee/Finger Lakes Regional Planning Council and Limnological Consultants Ecologic, LLC (2001) "Cayuga Lake Watershed Restoration and Protection Plan"

Genesee/Finger Lakes Regional Planning Council and Southern Tier Central Regional Planning and Development Board (1999) "Setting a Course for Seneca Lake"

Nagle, Greg and Fahey, Tim (2002) "Sediment Sources in the Finger Lakes Region and Western Catskills of New York," Cornell University, Dept. of Natural Resources.

USFS (2001) "FLNF Oil and Gas Leasing DEIS", U.S. Department of Agriculture, Forest Service

Item D. How the Finger Lakes National Forest Fits into the Finger Lakes Regional Context

Introduction

The purpose of this section is to provide an overview of the aquatic ecosystems and watershed conditions on the FLNF as they compare to those in the western part of New York State. This comparison required knowledge of the watershed conditions in the entire Finger Lakes region.

How do FLNF aquatic ecosystems/watershed conditions compare to those in western New York?

In general, some of the FLNF's geographical region is regaining a natural appearance, but it is not immune to the environmental stresses and perturbations affecting water quality in the western region of New York. Much of western New York has experienced increased levels of development to accommodate an increasing human population and changing land uses. Water quality issues of concern in the Finger Lakes region include water supply, swimming, and fish consumption issues, and pollutants of concern include nutrients, sediments, priority organics, pathogens, and salts (NYS DEC, 2001).

Between the early 1900s and the early 1970s, there was a marked decline in water clarity levels in most of the Finger Lakes probably due to an increase in phosphorus loading (NYS DEC, 2001). The trend from the early 1970s to the present has shown a general increase in water clarity in the larger Finger Lakes due to environmental management actions. The smaller lakes have remained static or moderately decreased in water clarity, in spite of the implementation of the same environmental management actions applied to the larger lakes. This difference is believed to be the result of a variation between the smaller and larger lakes in the amount of dissolved oxygen in the lower level of the lakes. A lower level of dissolved oxygen in the smaller lakes triggers a release of phosphorus from the lake bottom sediments. Therefore, this release of phosphorus negates realized reductions in phosphorus loading from the smaller lake watersheds. In certain years, however, the southern part of Cayuga Lake, a larger lake, has exceeded the State's total phosphorus guidance value.

The FLNF grazing area water monitoring results have shown elevated levels of phosphorus, as well as turbidity and E.coli in streams along grazing areas probably due to agricultural use, as previously discussed in Item C. Additional monitoring on non-grazing lands is needed to better characterize water quality on the FLNF, and to help verify the sources of water quality problems.

Is there anything special or unique about our aquatic ecosystems?

The FLNF is centered along a ridgeline between Seneca and Cayuga Lakes.
The Finger Lakes region is fortunate to have the FLNF protecting the forested headwaters of important streams and lakes. The protection assured to the FLNF lands means people

have opportunities to fully appreciate our natural resources. Small pond experiences, and the aquatic ecosystem, with opportunities for camping, fishing, wildlife watching, associated with a pond can be found in the FLNF.

Working toward FLNF goals of providing healthy riparian areas and good quality water, the FLNF is working on a project of fencing riparian areas along streams in grazing areas on the national forest to improve water quality and stream bank stability.

How do watershed conditions on the FLNF compare to reference conditions?

We do not know the watershed conditions on the FLNF compared to reference conditions. Reference conditions are areas with little impact from man-made disturbances. Since the FLNF has experienced a large amount of past man-made disturbance, an extensive literature review, consultation with subject experts, and monitoring, will be needed to determine the reference condition.

Potable water supplies and recreational activities provided by the FLNF

The only public water supplies on the FLNF watersheds are drilled wells with hand pumps at Blueberry Patch Campground and Potomac Group Campground. There is also one spring located off Picnic Area Road which is under special use permit to supply a residence.

Humans have the opportunity to recreate on a portion of the FLNF that is regaining a forested character. The FLNF provides a quiet, relaxing experience.

How do watershed conditions on the FLNF land compare to nearby private land?

Activities that occur within the FLNF are subject to considerable scrutiny. Environmental consequences of all actions must be considered and disclosed to the public, and monitoring and adherence to the FLNF S&Gs is required.

The stream and pond monitoring in FLNF grazing areas resulted in turbidity, phosphorus, and E.coli levels not meeting NYS Class D standards more than 50% of the time (see page C-15). These results, also, do not meet forest plan goals. At some monitoring sites, where the stream inlet into the grazing area flows from privately-owned land, turbidity, phosphorus and E.coli levels are high and not meeting Class D standards before they enter the FLNF grazing land. This indicates that neighboring private lands, also, are not in compliance. For the FLNF, we have to continue to work on not adding to these already high levels of turbidity, phosphorus and E.coli, as the stream flows through the grazing area on FLNF land. New York State Best Management Practices (BMPs), which are taken from the Natural Resource Conservation Service (NRCS) Conservation Practice Standard, electronic Field Office Technical Guide (NRCS, 2004) provides criteria for protection of water and fish resources near agricultural activities (other activities are included, but only those pertaining to the FLNF management are discussed):

- The Filter Strip – Strip Standard (Code 393s) is used to "remove sediment, organic matter and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization, thereby reducing pollution and protecting the environment" (NRCS, 2004:1). This practice applies to treating overland flow on pastures at the lower edges of fields, or on fields adjacent to streams, ponds, and lakes. The grass filter strip width is at least 20 ft. for slopes of less than 1% and increases 1.5 ft. for each percent of slope increase. The maximum effective grass filter strip width is 100 ft. Livestock is excluded from the grass filter strip, though, "occasional controlled grazing may be satisfactory when the grass filter area is dry and firm" (NRCS, 2004:2). Stubble height of grass in the grass filter area should be maintained at 3" to 5" high or more.
- The Riparian Forest Buffer Standard (Code NY391) is used to "reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow; provide protection against scour erosion within the floodplain; and restore natural riparian plant communities," (NRCS, 2004:1) to name a few. The riparian forest buffer width is a minimum of 15 ft., measured horizontally from the normal water line or from the top of bank. Livestock will be controlled or excluded as necessary to achieve and maintain the intended purpose. There are additional criteria to reduce excess amounts of sediment and nutrients in surface runoff. These include an additional 20 ft. of the riparian forest buffer width. In total, then, the buffer width would be 100 ft. or 30% of the flood plain whichever is less, but not less than 35 ft.
- The Pond Standard (Code NY378) is used to provide water for livestock. "If livestock are to water directly from the pond, an approach ramp shall be provided with a slope no steeper than four horizontal to one vertical. It shall be graveled, paved, or otherwise prepared to provide solid footing and shall be a minimum of 16 ft. wide" (NRCS, 2004:7). Fencing should be considered to control livestock access to the pond. Developing alternative watering facilities using water from the pond rather than allowing animals to drink directly from the pond should be considered.

In the case of silvicultural activities, the S&Gs and BMPs have very specific requirements that delineate erosion control practices and minimum buffer widths to protect water bodies. The NYS BMPs are consistent with the EPA-approved State Non-point Source Management Plan. "Erosion and sediment are the primary potential non-point source pollution problems associated with forest management activities, especially at stream crossings for forest roads and skid trails." (NYS Forestry, 2000:5) The FLNF adheres to the NYS forestry BMPs. Some of the NYS forestry BMPs guidelines include (NYS Forestry, 2000):

- During the planning stage, identify on a map areas to avoid (streams, wetlands, water bodies, steep slopes [30% or greater], unstable soils, and floodplains) and stream side management zones – areas next to streams, ponds, lakes, wetlands

and other water bodies where activities are modified to protect water quality, fish and other aquatic resources.

- Log decks and landings:
    - Use existing landings if possible. Close existing landings next to water bodies unless construction of new landings would cause greater harm to water quality than using existing landings.
    - If possible, construct new landings at least 200 ft. from water bodies.
    - If the landing must be closer than 200 ft. to a water body, use straw bales, silt fencing, or both, to minimize or prevent erosion.
- Locate forest roads away from streams, ponds, lakes, and wetlands whenever possible, and provide adequate filter strips (slope of land from 0 – 70%, filter strip width from 50 – 150 ft.)
- Keep skid trail grades less than 15%, where possible. Grades greater than 15% should not exceed 300 ft. in length.

Literature Cited:

Natural Resource Conservation Service (2004) "Conservation Practice Standard," electronic Field Office Technical Guide, http://efotg.nrcs.usda.gov

NYS DEC (2001) "Water Quality Study of the Finger Lakes"

NYS Forestry (2000) "Best Management Practices for Water Quality, BMP Field Guide"

Item E. Compliance with Water and Fish Resource Regulations

Areas not in Compliance

Water quality entering into and exiting from the FLNF grazing lands do not consistently meet the NYSDEC Class D requirements. This could be due in part to the lack of healthy riparian areas on all streams. A healthy riparian area allows for the unhindered functioning of important ecosystem processes and components, such as, a thriving macroinvertebrate community, stable stream banks, and riparian areas filtering incoming sediment and nutrients. Over the next 10 – 15 years the FLNF will fence off additional riparian areas thereby improving water quality.

Areas in Compliance

It is important to note, that even though the water quality monitoring results showed that the 'control' stream and pond exceeded the Class D standards for phosphorus and turbidity levels 30 – 70% of the time, the levels of exceedance where much lower at the control sites than at the other monitoring sites located in the pastures. The 'control' sites have not had agricultural activity for at least 20 years, therefore, the elevated phosphorus levels are due to past agricultural activity. Phosphorus is probably bound to soil particles and is released periodically in runoff. The turbidity levels found at the 'control' sites are probably due to the erosive characteristics of the soil, which is common in the region, and are relatively low compared to the turbidity levels at the other monitoring sites located in the pastures, which are probably due to the livestock activity on the banks of the streams and ponds.

Item F. Public Comments and Concerns

Introduction

The purpose of the Public Comments and Concerns section is to address concerns that were raised during public involvement meetings. Concerns were organized by similarities of subject-matter, and resulted in major topic questions that are answered below.

Are there aquatic indicator species to reflect overall ecosystem health?

During the forest plan revision process, the FLNF will evaluate the opportunities to use aquatic species and/or communities in the monitoring and evaluation program.

What are the impacts from recreation, agriculture, development and roads to stream banks and shorelines?

On the FLNF, riparian area impacts can result from recreational use and agriculture, water quality can be affected by agriculture, roads and development, and water body health can be affected by recreational use and agriculture, with resultant runoff, sediment delivery, and turbidity.

The FLNF continues to monitor water quality on non-grazing lands to better characterize water quality on the FLNF, and to verify the sources of water quality problems. The FLNF will meet S&Gs thereby maintaining and/or improving water quality.

Have the FLNF land management activities caused erosion?

Monitoring of the effects of management activities on soil and water resources was conducted on past timber sales, as well as other FLNF projects. Monitoring consisted of visually checking active sales to see if standards and guidelines (S&Gs) for soil and water protection were implemented and effective in minimizing soil erosion and stream sedimentation. Monitoring results showed that erosion and sedimentation on timber sales was minor.

The grazing area water monitoring results showed that turbidity levels exceeded the State of N.Y. standards for Class D Waters (the lowest water quality class) 50% of the time. It is logical to assume the high turbidity levels are the result of erosion and stream bank instability in and near pastures. Fencing riparian areas along some pastures has shown improvements in water quality and stream bank stability (see Item C, under Water Quality).

Have forest management activities caused positive and/or negative hydrological impacts?

No geological assessment has been done. Negative hydrologic impacts were discussed previously. Soil and water improvement projects and the implementation of some management activities on the FLNF have had a positive hydrologic impact on streams such as: stream bank stabilization, and stock pond and riparian area fencing. These activities reduce erosion, prevent impoundment structure failures, and improve infiltration rates in riparian areas.

What type of management activities do we need to increase attainment of the New York Water Quality Standards (NYWQS)?

The FLNF continues to monitor water quality to evaluate the overall aquatic health. The FLNF will evaluate project effectiveness in achieving resource protection, forest plan requirements, and Water Quality Standards. Riparian areas in grazing pastures will receive better protection through techniques such as fencing and revegetation of unstable streambanks. These actions will protect riparian areas, provide opportunities for large woody debris recruitment, and increase compliance with NYWQS.

What type/size of buffers are needed to protect surface waters and to provide suitable aquatic habitat?

A buffer strip adjacent to all streams and ponds of 50' to 100' is required under the current (1987) forest plan. The width of this buffer depends on the land slope, with steeper slopes having the widest buffer strips. In general, soil in the buffer strip should not be disturbed. The Forest Service must also comply with buffers prescribed in CFR 219.27(a)(4) for the protection of riparian areas (see p.A-1, last paragraph). During the forest plan revision process, the FLNF will evaluate the adequacy of the current buffer strip direction.

Item G. Restoration Opportunities

Problem Areas

A concern impacting the water quality on the FLNF is in the grazing areas and some adjacent national forest lands where we are not fully providing for healthy riparian areas on the national forest.

Successes

Over the last decade, many projects were implemented to improve water quality and riparian areas by eliminating erosion and sedimentation problems, and by revegetating and stabilizing bare soil areas. Some riparian areas have been fenced along cattle grazing pastures and several projects on trails and roads were implemented to correct erosion and sedimentation problems by installing water bars, culverts, and rehabilitating gullies.

The FLNF continues to monitor water quality on non-grazing lands to better characterize water quality on the FLNF, and to verify the sources of water quality problems. The FLNF will meet S&Gs thereby maintaining and/or improving water quality.

Recommendations

- Place more emphasis on fully implementing the S&Gs, legal mandates (see forest plan, Section A3, p. 4.16), and implementing water resource improvement projects to provide clean water and healthy riparian areas.

- Fence existing and newly constructed livestock ponds to prevent trampling damage to the pond dike, and reduce pond siltation and eutrophication (see forest plan, Section J2, p. 4.23; stock ponds monitored in 2002 had E.coli levels exceeding the Class D standard 75% of the time, indicative of runoff from manure in the pastures).