



**Department of
Environmental
Conservation**

Fisheries Management Plan for the Impounded Portion of the Upper Hudson River

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Prepared by:

James Pinheiro
Rob Fiorentino
Kyle Jones

Bureau of Fisheries
Division of Fish and Wildlife
New York State Department of Environmental Conservation

Approved by

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**Stephen S. Hurst, Chief
Bureau of Fisheries**

PURPOSE

The Upper Hudson River is a large, freshwater riverine system that constitutes a northern 161-mile stretch of the Hudson River. It runs through several major population centers in upstate New York. The Upper Hudson River provides drinking water supply for several communities throughout its watershed and serves as a wastewater discharge location for others. Many locations along the Upper Hudson River offer convenient public access via state and municipal sites, and 37 miles of the Upper Hudson River serves as the primary navigation channel for the Lake Champlain Canal, operated by the NYS Canal Corporation (NYSCC). There are numerous hydropower facilities throughout the 15 impoundments on the Upper Hudson River which generate an immense supply of renewable hydroelectric energy and provide water supply for various industrial water withdrawals.

Additionally, historical industrial impacts to the Upper Hudson River have been well documented through the legacy polychlorinated biphenyls (PCB) contamination and the subsequent remediation efforts. Such contamination led to a prohibition on recreational fishing from 1976 through 1995. Through extensive environmental remediation efforts and rigorous biological monitoring, portions of the Upper Hudson River are now re-opened to catch and release recreational fishing.

It is the intent of the New York State Department of Environmental Conservation (DEC) to not only maintain, but improve recreational fishing, public access opportunities and ecological restoration throughout the Upper Hudson River through fisheries resource management and ecological restoration efforts. These efforts serve as the focus of this Plan.

SCOPE & SCALE

This Plan will focus specifically on the impounded portion of the Upper Hudson River (Impounded Portion) which extends from the confluence of the Sacandaga River 67 miles downstream to the Federal Dam at Troy (Figure 1). This area of river encapsulates 15 individual impoundments, which significantly inhibit volitional movement of fish. Many of these dams are operated as hydroelectric generating projects that are regulated and licensed by the Federal Energy Regulatory Commission (FERC). This Plan also takes into consideration all tributaries within this reach up to the first impassable barrier to fish. The timeline for this plan will be from 2024 to 2044.

For management purposes the Upper Hudson River will be split into two distinct management zones. A divide has been designated at Bakers Falls due to its status as a historic significant natural fish barrier (NMFS.NOAA.gov). The 26.7 miles upstream of Bakers Falls will be managed for resident sportfish populations. The 40.3 miles of river downstream of Bakers Falls will be managed primarily for the restoration of American eel.

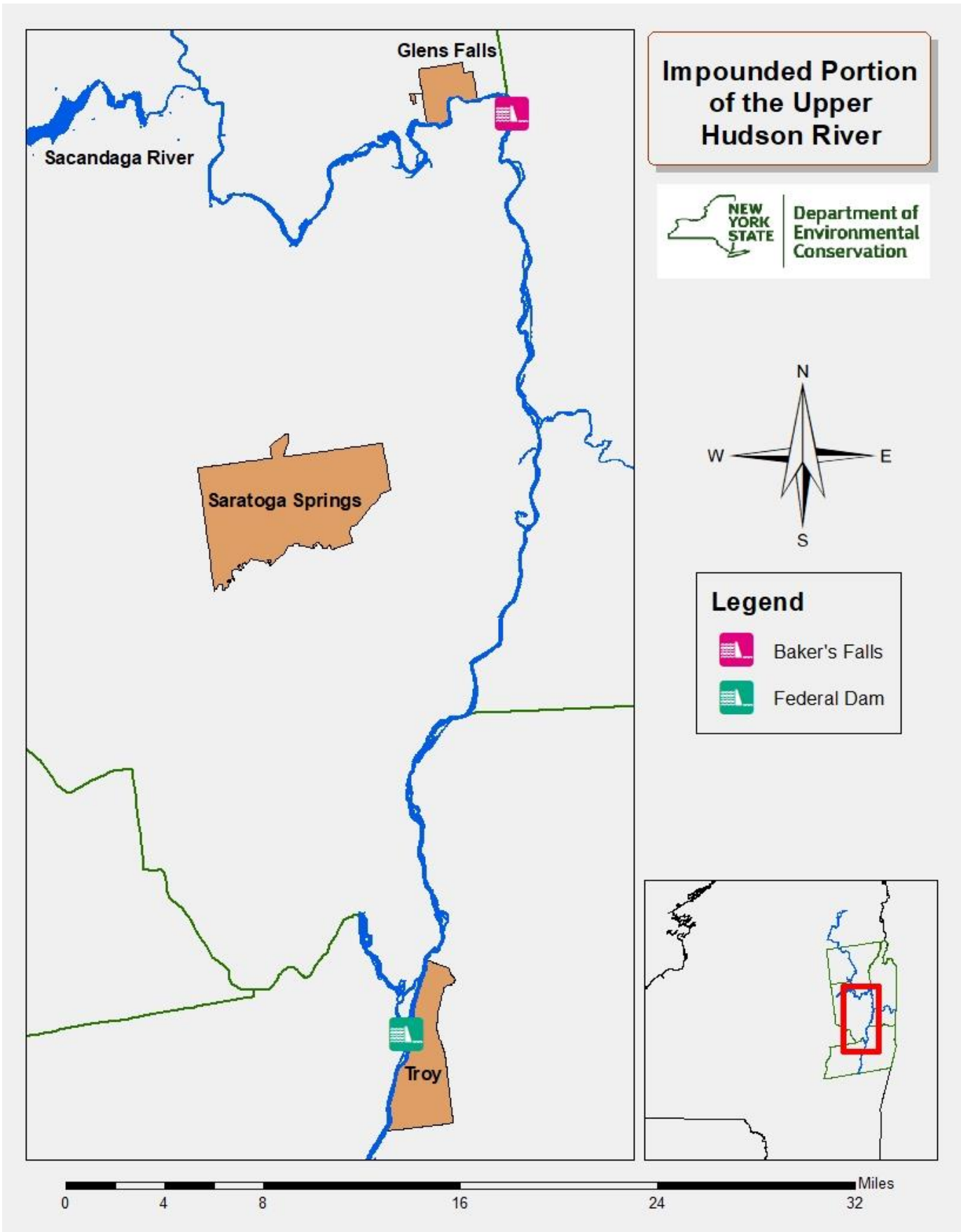


Figure 1. Impounded Portion.

RISKS AND CHALLENGES

The Impounded Portion has a long history of anthropogenic impacts and associated environmental degradation. These impacts range from industrial uses that included log drives, industrial discharges, and hazardous waste contamination, to physical alterations for navigational dredging, channel manipulation, and flow regulation and attenuation for downstream flood protection and hydropower generation. These operations have had profound physical and ecological impacts on this stretch of the Hudson River. The degraded conditions present a challenge for fisheries management actions and functional ecological restoration.

The fisheries management challenges facing the Impounded Portion begin with the river flow manipulations originating upstream on the Sacandaga River. Collaboration among multiple New York State agencies, public corporations, federal partners, and others to reduce the fisheries impacts from flow manipulations through FERC relicensing proceedings will be needed throughout this plan's timeline.

In addition, the NYSCC operates the Champlain Canal through six navigational locks below Bakers Falls. This navigational operation creates fish passage challenges that can both allow for or inhibit fish movement between impoundments. This challenge is exemplified by the recently established population of the invasive round goby (*Neogobius melanostomus*) below Champlain Canal Lock C1, that emigrated from Lake Ontario via the Erie Canal system. This invasive fish species will require long-term monitoring and range spread mitigation efforts, already underway through the Round Goby Rapid Response Task Force.

CURRENT STATE

Habitats

This 67-mile stretch of river contains 15 impoundments. Habitat characteristics within this stretch of river are unique between these impoundments. While most of this section is characteristic of a deep slow-moving river, there are some reaches that contain faster flowing water in a riffle environment. River flows are not natural. Flows are manipulated for flood control, power generation, water supply, and canal operation. Flow manipulations result in daily and seasonal fluctuations of water levels and interrupt natural sediment transport processes. These oscillations negatively impact the habitat available for different life stages of various species of fish. A map and detailed description of each impoundment is included in Appendix A.

Fish community

The Impounded Portion is now dominated by cool and warmwater fish species (Table 1). Historically, American eel traversed this entire section of the Hudson River. However, recent survey efforts indicate that this species may now only be present in the lowest four impoundments. Additionally, various species of anadromous fish are present in limited numbers downstream of Bakers Falls (Table 2). A list of fish species present in each impoundment can be found in Appendix B.

Table 1. Sportfish species commonly found in the Impounded Portion.

Common name	Scientific name
Smallmouth bass	<i>Micropterus dolomieu</i>
Walleye	<i>Sander vitreus</i>
Northern pike	<i>Esox lucius</i>
Largemouth bass	<i>Micropterus salmoides</i>
Chain pickerel	<i>Esox niger</i>
Channel catfish	<i>Ictalurus punctatus</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Bluegill	<i>Lepomis macrochirus</i>
White perch	<i>Morone americana</i>
Yellow perch	<i>Perca flavescens</i>

Table 2. Diadromous fish species that occupy the Impounded Portion.

Common name	Scientific name
Blueback herring	<i>Alosa pseudoharengus</i>
Alewife	<i>Alosa aestivalis</i>
American shad	<i>Alosa sapidissima</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
American eel	<i>Anguilla rostrata</i>
Striped bass	<i>Morone saxatilis</i>
Sea lamprey	<i>Petromyzon marinus</i>

Fishery

Figure 2 represents the managed fish species as a heat map showing their relative abundance per pool. All of these species are self-sustaining, not supplemented with stocking. Due to contamination in sediments, fish harvest is limited above Bakers Falls and prohibited below that point. Fishing is a mixture of shore and boat angling depending on the access to a pool and the species present. DEC's 2017 Statewide Angler Survey found that the entire Upper Hudson River received more than 120,000 angler days per year. Although, specific location data does not exist, a significant portion of this effort is directed towards the Impounded Portion and these species of fish. This fishery is also of significant local importance and provides outdoor recreational opportunities to multiple disadvantaged communities.

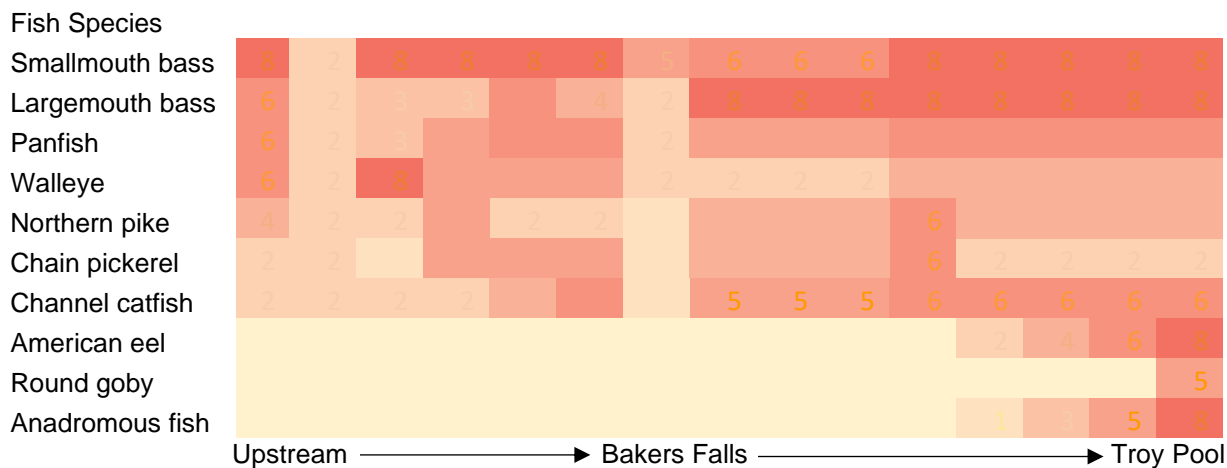


Figure 2. Current State Heat Map from Luzerne Pool to Troy Pool

Public Access

Fishing access is limited by the impounded nature of the system, requiring individual boating access sites within each pool. Currently six of the 15 impoundments lack a public trailered boat launching site. Shoreline angling access is sporadic and limited to publicly accessible lands but has improved post PCB remediation efforts with many local communities showcasing public parks and recreational opportunities.

Contamination

The Impounded Portion has extensive chemical contamination originating from prior industrial uses. The most prevalent contaminate is PCBs from the General Electric (GE) plants in South Glens Falls. The fishery is managed downstream of South Glens Falls the Impounded Portion and its tributaries up to the first impassable barrier are managed under strict catch and release only angling due to the bioaccumulation of contaminants. Harvest of fish is allowable upstream of the falls.

20 YEAR PLAN

Management of fisheries within the Impounded Portion poses unique challenges. Most fisheries management plans focus on either angler effort and catch rates, or quantity of harvest; however, a majority of the Impounded Portion is catch and release fishing only, limiting management actions. The fact that these fisheries are now open to public recreational catch and release fishing is an environmental stewardship milestone to be proud of. It took over 30 years for PCB remediation efforts to be completed, with many local riverside communities now encouraging public recreation on the river. Achieving this milestone demands further investment for future management and stewardship of these river fisheries.

Continuing threats to the aquatic ecology of the river from invasive species such as the round goby will challenge resource managers moving forward. Management decisions will need to balance navigational boating access through the Champlain Canal system while mitigating the threat of aquatic invasive species spread and stabilizing daily river flows through the many hydropower facilities. Restoration and protection of catadromous American eel will be implemented, where feasible, and require continual biological monitoring. The DEC and its many partners, through regulatory reform, management actions, improved public access, enhanced recreational fishing, and ecological restoration initiatives will develop and execute the next phases of management for the Impounded Portion over the next two decades.

The vision for the Impounded Portion is to:

- Maintain and enhance the status of current fish community for ecological sustainability and recreational fisheries,
- Restore American eel in the Impounded Portion of the Upper Hudson River and its tributaries from Federal Dam to Bakers Falls,
- Prevent and monitor the spread of invasive species of fish,
- Monitor contaminant loads in fish for public awareness,
- Improve and expand recreational fishing access.

Figure 3 represents the desired state of Impounded Portions fisheries. Sportfish populations will be robust while invasive fish species will be held below lock C-1. American eel will be provided passage and protection up to Bakers Falls.

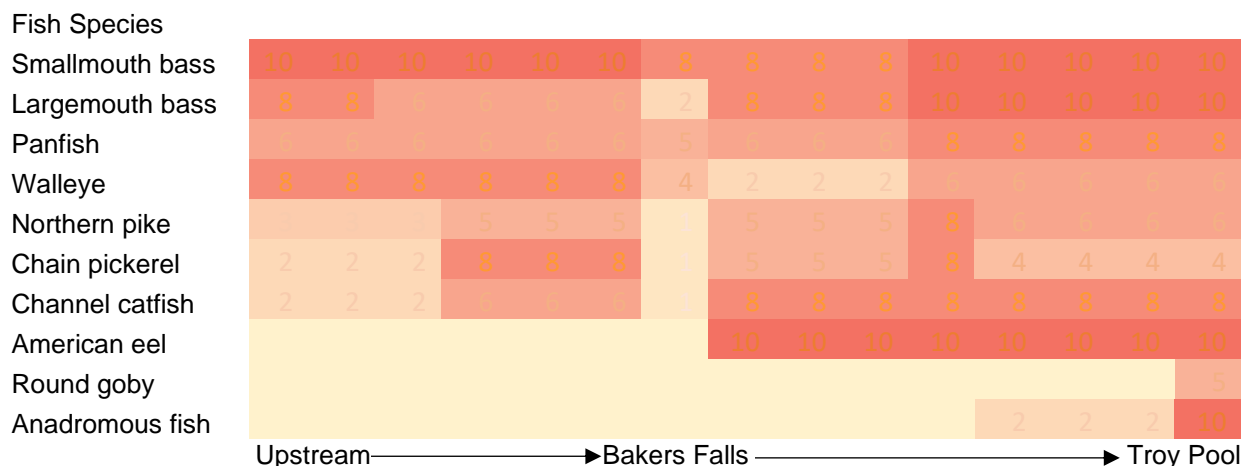


Figure 3. Desired State Heat Map from Luzerne Pool to Troy Pool.

Goal: Maintain and enhance the status of current fish community for ecological sustainability and recreational fisheries.

<i>Objectives</i>	<i>Actions</i>
Detect changes in fish communities for adaptive management.	1. Perform biological sampling to detect changes in the sportfish community and the fish community in general on a 10-year rotation by pool.
Maintain and enhance successful fish spawning and recruitment.	1. Maintain and improve pass by flows through by-passed reaches to provide walleye spawning habitat below the Sherman Island facility thru the FERC compliance and re-licensing process. 2. Moderate pulsing flows from the Conklingville & Stewarts Bridge Reservoir Dams on the Sacandaga River.

Goal: Restore American eel in the Impounded Portion and its tributaries from Federal Dam to Bakers Falls.

<i>Objectives</i>	<i>Actions</i>
Restore aquatic connectivity in the 40 miles of the Impounded Portion and its tributaries from Bakers Falls to Federal Dam watersheds focusing on passage of American eel.	1. Secure upstream American eel passage structures at all hydropower and or canal lock structures (see Appendix C for detailed requirements). 2. Work with NYSCC to conduct an American eel siting study at Lock C1. 3. Work with partners to develop aquatic organism passage restoration projects through both the FERC relicensing process and other NYS regulatory permitting and grant initiative programs.

Obtain ≥ 90% downstream passage survival of American eel from Bakers Falls to Federal Dam.	<ol style="list-style-type: none"> 1. Require 98% downstream passage of American eel at each hydropower facility as per accepted USFWS Protection, Mitigation & Enhancement measures (see Appendix C for detailed requirements). 2. Require downstream fish passage effectiveness studies at all hydropower facilities to determine if survival objectives are being achieved.
Document current extent of American eel populations in the Impounded Portion and tributaries.	<ol style="list-style-type: none"> 1. Require FERC relicensing pre-application studies to determine baseline indexes of relative abundance of American eel thru the FERC licensing process. 2. Require post-licensing American eel assessment surveys within FERC project licensed specific impoundments below Bakers Falls 3. Conduct American eel assessment surveys in tributaries and impoundments where no licensed hydropower facilities exist.

Goal: Prevent and monitor the spread of invasive species of fish.

<i>Objectives</i>	<i>Actions</i>
Prevent the spread of aquatic invasive species.	<ol style="list-style-type: none"> 1. DEC and partners in NYCC and Army Corps of Engineers will continue to assess mitigation measures within the Champlain Canal Lock system to prevent expansion of invasive species but continue to allow vessel passage.
Monitor the distribution of invasive fish species throughout the Impounded Portion.	<ol style="list-style-type: none"> 1. DEC and partners in Aquatic Invasive Species Rapid Response Taskforce will continue to monitor the distribution of round goby using traditional survey methods, and eDNA sampling techniques. 2. DEC will assist and inform NYSCC with the implementation of the ROUND GOBY INTERIM RAPID RESPONSE PLAN FOR THE CHAMPLAIN CANAL SYSTEM IN NEW YORK STATE.
Increase public awareness of invasive fish impacts on native fish communities and habitats.	<ol style="list-style-type: none"> 1. DEC and the Lake Champlain Basin Program will continue efforts to increase public awareness of round goby and the possible negative impacts through public outreach. 2. Provide signage at public access locations where the presence of round goby is confirmed.

Goal: Monitor contaminant loads in fish for public safety and awareness.

<i>Objectives</i>	<i>Actions</i>
Keep fish consumption advisories current with information on contaminants in fish.	<ol style="list-style-type: none"> 1. Continue sampling sportfish species through DEC's Toxic Substance Monitoring Program (TSMP) for the New York State Department of Health.
Increase public awareness of fish consumption health advisories.	<ol style="list-style-type: none"> 1. Update consumption specific signage at public access points throughout the Impounded Portion 2. Distribute current fish health advisory information at local angler education events.

Goal: Improve and expand recreational fishing access.

Objectives	Actions
Improve and expand existing public angling access sites.	<ol style="list-style-type: none">1. Make improvements to existing DEC-owned access sites, including ADA accessibility improvements where feasible.2. Require public access improvements thru the FERC licensing process on facilities owned and maintained by the licensed facility operator.3. Partner with NYSCC to identify and implement expanded lock operating hours or public access facility improvements at NYSCC facilities.
Expand public access in pools where no public access exists.	<ol style="list-style-type: none">1. Collaborate with NYS partners to identifying priority locations for targeted public access expansion on the Fort Miller, Northumberland, Upper Mechanicville, Mechanicville pools.2. Develop access facilities at identified priority locations.
Provide public access at the Southern extent of Stillwater pool.	<ol style="list-style-type: none">1. Identify suitable locations for potential development of trailered boat launching sites.2. Acquire and develop 1 additional public access facility.

Acknowledgements

This plan would not have been developed without the efforts from numerous DEC Fish & Wildlife staff, both current and retired, who helped collect all the biological data included in this plan. Partners in these management efforts have included representatives of the United States Fish & Wildlife Service and United States Geological Survey. Many thanks to the DEC staff who assisted with the assembly of the plan contents. This includes Meagan Beckwith, Razia Syed, Jeff Loukmas, Scott Jamieson, Tom Shanahan (retired), Scott Wells and others.

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Appendix A

Upper Hudson River Map

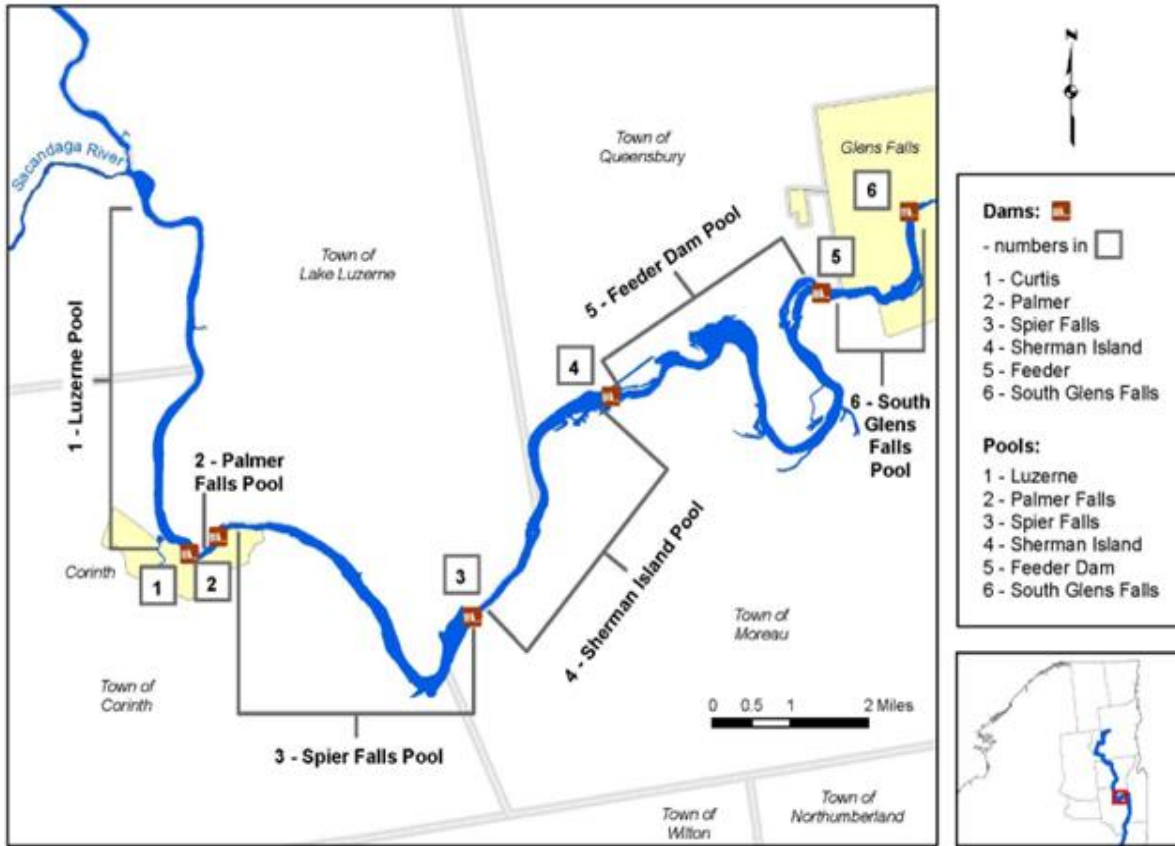


Figure 1. Confluence of Sacandaga River to Glens Falls.

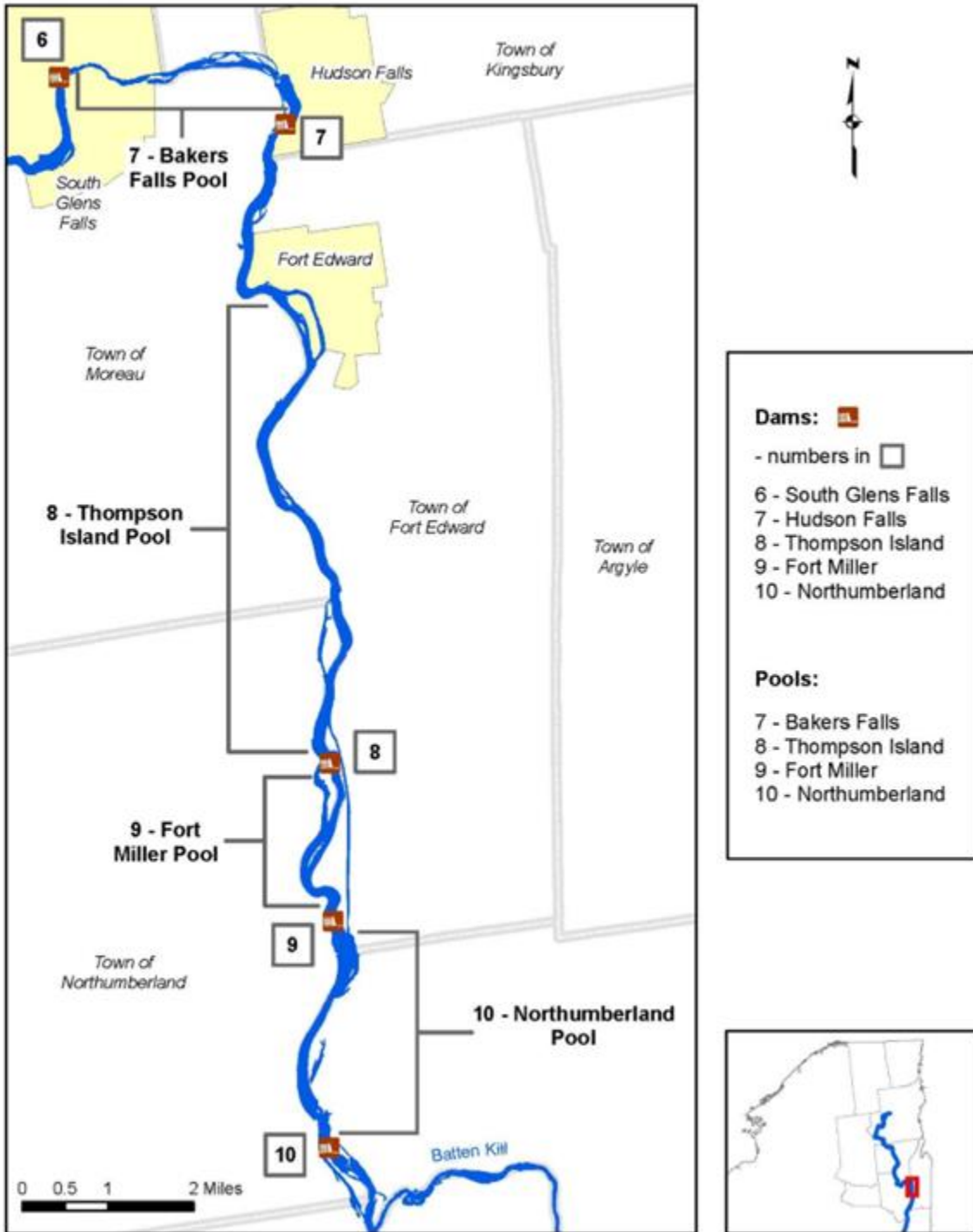


Figure 2. Glens Falls to confluence of Batten Kill.

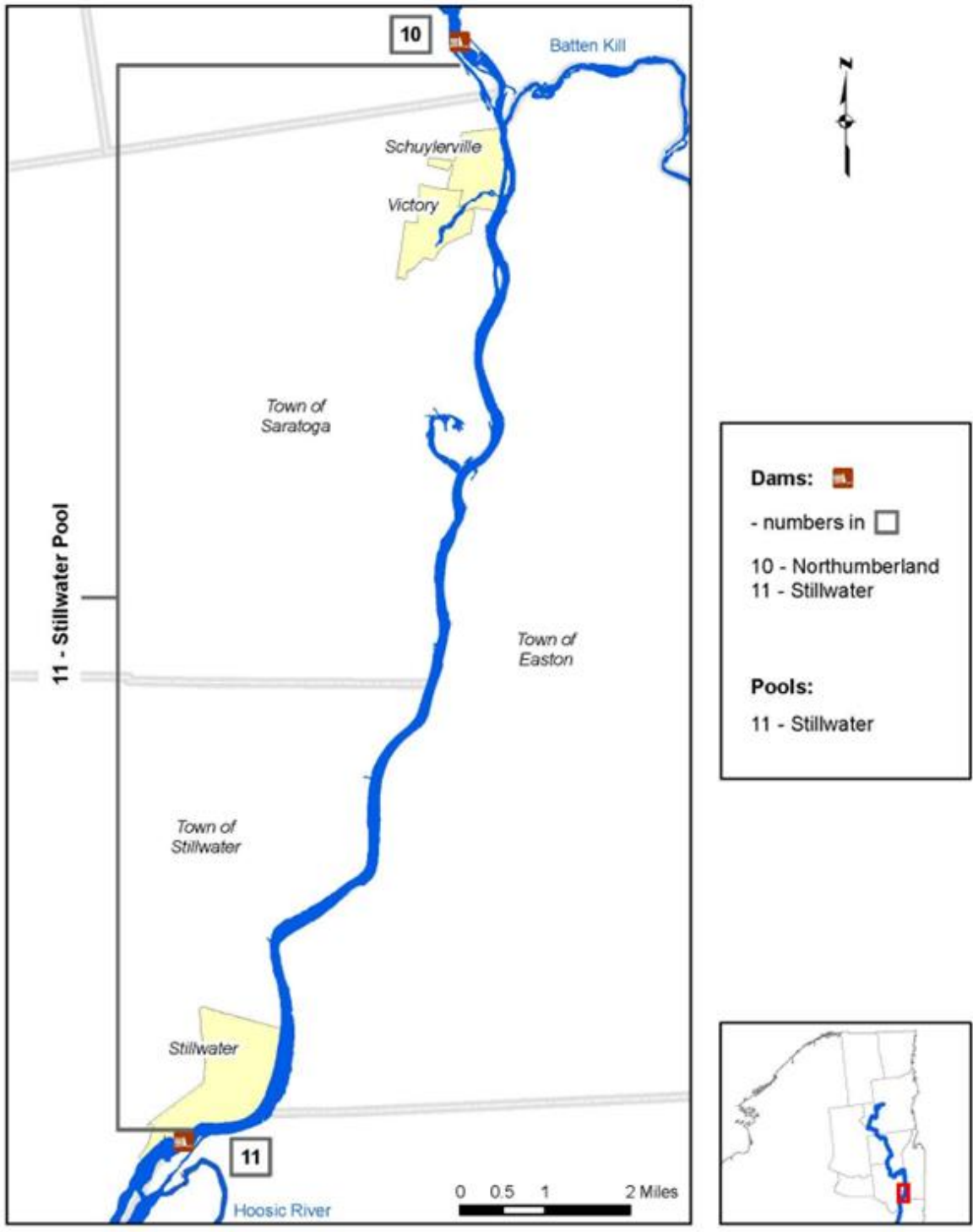


Figure 3. Confluence of Batten Kill to Confluence of Hoosic River.

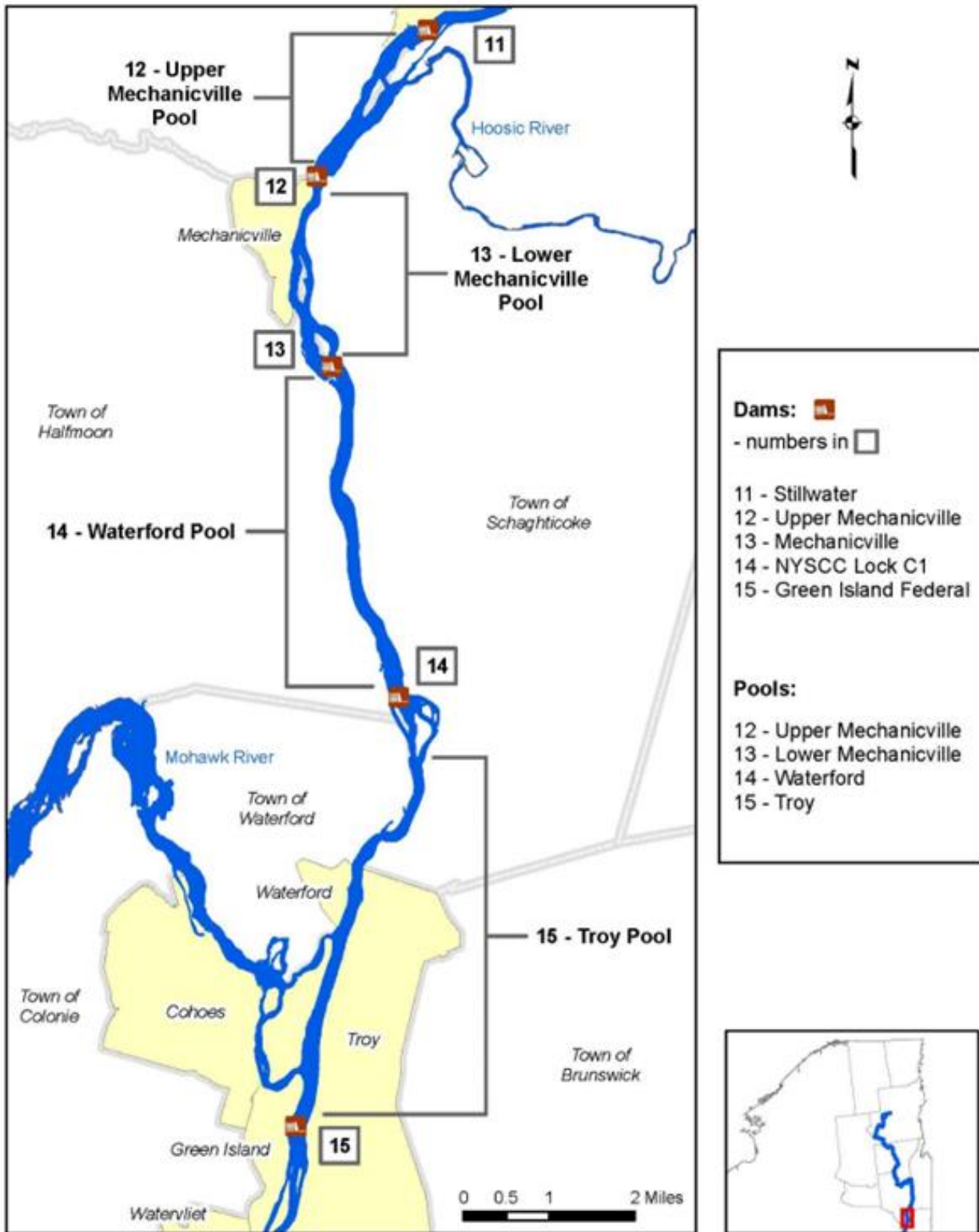


Figure 4. Confluence of Hoosic River to Federal Dam.

Table 1. Dams and Impoundment names

Facility name	River Section	Length (miles)
Curtis Dam (FERC #2609)	Luzerne Pool	5.25
Palmer Dam (FERC #2609)	Palmer Falls Pool	0.50
Spier Falls (FERC #2482)	Spier Falls Pool	4.8
Sherman Island (FERC #2482)	Sherman Island Pool	3.75
Feeder Dam (FERC #2554)	Feeder Dam Pool	6.9
South Glens Falls (FERC #5461)	South Glens Falls Pool	2.2
Hudson Falls Dam (FERC #5276)	Bakers Falls Pool	3.3
Thompson Island Dam	Thompson Island Pool	6.0
Fort Miller Dam (FERC #4226)	Fort Miller Pool	2.3
Northumberland Dam	Northumberland Pool	3.0
Stillwater Dam (FERC #4684)	Stillwater Pool	15.0
Upper Mechanicville (FERC #2934)	Upper Mechanicville Pool	2.0
Mechanicville (FERC #6032)	Lower Mechanicville Pool	3.0
NYSCC Lock C1	Waterford Pool	4.0
Green Island Federal Dam (FERC #P-13)	Troy Pool	5.0

Impoundment Descriptions

Lake Luzerne Pool

The most upstream impoundment of the Hudson River starts with the Lake Luzerne pool which is formed by the Curtis Dam (FERC #2609) in Corinth. This impoundment has a mix of warm & coolwater species see Table 1 (Appendix B).

Palmer Falls Pool

The next impoundment downstream is the very small Palmer Falls pool formed by the Palmer Dam (FERC #2609) also in Corinth. No known fish passage exists at both the upstream & downstream facilities of this impoundment and there is no recent (<20 years old) fisheries data for this impoundment as access is very limited.

Spier Falls Pool

The Spier Falls pool, formed by the Spier Falls Dam (FERC #2482) is a long narrow impoundment with one small gravel boat launch for limited public access, maintained and operated by Moreau State Park. A boat electrofishing Toxic Substance Monitoring Program (TSMP) fish collection was conducted on this impoundment in 2015 and the catch included one chain pickerel, 36 smallmouth bass and six walleyes.

Sherman Island Pool

Further downstream the Sherman Island pool and associated Sherman Island Dam (FERC #2482) forms a large impoundment with an additional gravel boat launch owned & operated by Moreau State Park. This pool has a similar fishery as pools above. Table 2 (Appendix B) has fishery data from multiple surveys.

Feeder Dam Pool

Feeder Dam pool is the largest pool in the resident reach. The pool formed by the Feeder Dam (FERC #2554) includes the Sherman Island bypassed reach and is the portion of the river that flows

under the I-87 Northway to the intake for the Feeder Canal where seasonal diversion flows help supplement the Lake Champlain Canal system. This impoundment, also known as Big Boom, is the site of the former log boom infrastructure for the Glen Falls lumber and paper mills. The town of Queensbury operates a town park with an improved boat launch on the impoundment just downstream of the Northway accessible off Big Boom Road. This impoundment includes the largest area of backwater shallow wetlands and small tributaries above Bakers Falls. Making this impoundment very productive for warmwater species such as black bass, esocids and common carp (Appendix B, Table 3).

South Glen Falls Pool

The South Glens Falls pool includes a diversity of habitats such as a deepwater channels and shallow wetland shoals. The dam forming the impoundment known as the South Glens Falls Hydroelectric Project has two different hydropower operators, with a powerhouse on each end of the dam. The facility on the north side of the river is operated by Brookfield Renewable (FERC #2385). The facility on the southside of the dam is operated by Boralex (FERC #5461). This pool supports a host of different sportfish species from large walleye, black bass and channel catfish (Appendix B, Table 4). Although this is not a particularly large pool or dam, it does have good public access given its proximity to highly developed urban centers, accessible from Sandbar Beach and a boat ramp operated by the town of Moreau within the village of South Glens Falls.

Bakers Falls Pool

Below the South Glens Falls Dam a significant portion of the river is diverted into the Finch Paper LLC mill with remaining flows going over the spillways into the much faster Bakers Falls pool. This run of the river is very different from the rest of the Impounded Portion. River flows are much quicker and closely resemble a lotic river system. The flows subside as they pass through old industrial logging infrastructure which is spread throughout the river above Hudson Falls Dam (FERC #5276). No current fisheries data is available for this impoundment however data may become available in the future due to current litigation efforts by DEC regarding the PCB remediation efforts. The Hudson Falls Dam atop the natural Bakers Falls is the furthest upstream DEC will seek passage for American eel. Passage of American eel above the Hudson Falls Dam may cause a net population sink thru fish passage induced mortality given their complex life cycle. Also, significant infrastructure improvements will be needed at the facilities to provide effective upstream fish passage other than a trap and transfer program.

Thompson Island Pool

Immediately below Bakers Falls the river has a hardened shoreline and long riffle run sections through the site of the former Fort Edward Dam, removed in 1973. This was the reach for the first phases of PCB remediation efforts on the Hudson River in 1978. This reach of river includes Roger's Island and Lake Champlain Canal Lock No. 7. The lock provides access to the land cut canal that continues through Washington County toward its namesake, Lake Champlain.

Downstream of Champlain Lock No. 7, the river slows significantly, and lock by lock starts its remaining 119-foot descent to sea level at the base of Federal Dam. Seven miles downstream the river reaches Lock No. 6 at the Thompson Island Dam. This large impoundment has endured significant dredging that may have altered the habitat and subsequently the fish community. Electrofishing survey data from 2007 & 2008 (Appendix B, Table 5) show an increase in overall fisheries diversity below the natural fish barrier of Bakers Falls when compared to the upstream pools.

Fort Miller Pool

While recreational boaters traverse Champlain Lock No. 6, many do not realize they are bypassing a 2.3-mile portion of the Upper Hudson River. The Fort Miller Pool, also referred to as the “landlocked section” is not accessible to trailered motorboats. At the southern end of the pool is the Fort Miller Dam and hydroelectric facility (FERC # 4226). This facility provides fishing & cartop boat access and portage. There is currently no fisheries survey information available for this impoundment, likely due to the inaccessibility to motorized vessels.

Northumberland Pool

Below the Fort Miller Dam the river enters a brief riffle before slowing into the Northumberland pool for another 2.7 miles. The Northumberland dam forms the top end of Champlain Lock No. 5 and previously supplied water diversion for industrial plants along the Thomson shoreline on the eastern bank of the river. No recent fisheries survey information is available for this pool, as the only survey on record is from the 1932 original biological survey.

Approximately 1,600 feet downstream of the Northumberland Dam is a large set of rapids that Champlain Lock No. 5 diverts boat traffic around. This set of rapids is the proposed location for the Thomson Hydroelectric project (FERC #12741). This project has a preliminary FERC permit to investigate the feasibility for building a new dam and associated generating station across the Hudson River. This project would dramatically change the Northumberland pool as it is currently configured and should be followed closely as it has the possibility of severely altering the riverine habitats and the associated aquatic communities.

Stillwater Pool

Immediately below the proposed project site, the Batten Kill joins the Hudson River from the east. This confluence is at the upper portion of the longest pool on the Hudson River covered under this plan. The Stillwater pool covering over 1,300 acres, extends for 15 miles downstream, and hosts the largest expanse of resident fish population habitats, large wetland complexes, and over 800 miles of tributaries. The Kayaderosseras Creek and Batten Kill watersheds, portions of which are above natural fish barriers provide a large input of high-quality water.

The diversity of fish species present includes many minnow and sunfish species along with a handful of sportfish signify the diversity of habitat available in this impoundment. Table 6 (Appendix B) displays the diversity of species captured in recent DEC fisheries seining and electrofishing surveys of this pool.

Just below the confluence with the Batten Kill, the Town of Schuylerville has an improved motorboat launch, which provides access to the upstream portion of this impoundment. From here the river slowly meanders past the confluence with Fish Creek, the outlet of Saratoga Lake, and towards The Cove. This large backwater area of the river has a significant wetland complex and small private marina with a fee boat launch. It is another nine miles down the river until you reach the Stillwater Dam (FERC #4684) and the upper portion of Champlain Canal Lock No. 4.

Upper Mechanicville Pool

Just below Lock No. 4 the Hoosic River empties into the Hudson River. This impoundment although small has a very diverse fish community (Appendix B, Table 7.). This impoundment is the furthest upstream anadromous migratory fish, such as striped bass, have been documented in DEC fisheries surveys. However, recent fisheries surveys by private consultants under the Upper Mechanicville FERC re-licensing process captured anadromous & catadromous species, blueback herring and American eel (HDR 2018). This survey data shows that limited fish passage for these migratory species is taking place thru the canal locks up to the Stillwater Dam.

The Upper Mechanicville pool has no public motorboat launch and is limited to access through the locks and shoreline from NYSCC property. The Upper Mechanicville hydropower operation along the western shoreline of the dam was issued a new FERC license in March of 2021 for a term of 50 years through a settlement agreement. The license requires a seasonally installed American eel ladder for upstream passage and downstream fish protection and passage measures, along with upstream fish passage to be installed immediately after such fish passage is constructed at the downstream Mechanicville Dam. Most of the protection, mitigation and enhancement requirements within the settlement agreement are consistent with the management recommendations of this fisheries management plan.

Lower Mechanicville Pool

For the next three miles the Hudson River flows past the village of Mechanicville. The pool includes the confluence of the Anthony Kill and is formed by the Mechanicville Dam (FERC #6032) and NYS Champlain Canal Lock No. 2. This is a large hydropower facility that is currently operated by Albany Engineering. This lock facility is located on an island in the middle of the river with the Hydro plant on one side and the auxiliary dam spillway on the other.

Fish survey work was recently conducted in this pool as part of the Upper Mechanicville FERC re-licensing process. These fisheries surveys show the seasonal presence of anadromous and catadromous migratory species. Prior DEC fisheries survey results are listed in Appendix B, Table 8.

The Mechanicville facility has a provision in its FERC license for re-evaluating upstream fish passage and protection if passage conditions change. Providing safe, effective, and timely fish passage & protection both upstream & downstream at this facility for fish species, specifically American eel is a priority of this plan.

Waterford Pool

Four miles downriver thru the Waterford Pool is the next dam, NYS Champlain Canal Lock No. 1. There is no hydropower facility at this dam. Electrofishing survey data indicates the highest abundance of American eel of any impoundment in this pool along with numerous sportfish species, see Table 9 (Appendix B). NYSCC does offer a small public boat launch providing access for motorboat operators to the river. This dam has a 14.3-foot drop thru the locks and is currently the furthest upstream barrier to migratory fish species. All efforts should be made by DEC to work with the NYSCC and other agencies to provide safe, effective and timely upstream and downstream American Eel passage thru this facility while monitoring the presence and mitigating potential upstream spread of the invasive round goby.

Troy Pool

Once the Hudson River reaches the Troy pool below Champlain Canal Lock No. 1, vessel traffic increases along with fishing opportunity. This pool is the confluence of the Mohawk and Hudson Rivers, combining into a delta of small islands and channels surrounding Peebles Island State Park, Van Schaick Island and the town of Waterford. This is also where the Erie Canal starts its voyage away from the Hudson River and thru the flight of locks to continue westward up the Mohawk River. The convergence of these two major river and canal systems brings a plethora of recreational boating and fishing opportunities to the general public. Often overlooked as an angling destination, this short portion of the river hosts a variety of shoreline fishing and car top boat launching facilities. The diverse number of fish species is higher in this pool than any other impoundment on the Hudson River, (Appendix B, Table 10). The presence of round goby was confirmed in this section of the river in 2022. A total of 204 specimens were captured from the mouth of the Mohawk River at Peebles Island, upstream to just below Champlain Canal Lock No.1., (USGS 2023). The U.S. Geological Survey with the assistance of NYSDEC has conducted extensive environmental DNA sampling to

update the known occurrence of round goby within the Upper Hudson River. At this time, round goby has not been documented upstream of Champlain Canal Lock No. 1.

Federal Dam and the Green Island hydroelectric facility (FERC # P-13) is the last barrier on the Hudson River to the Atlantic Ocean. The Green Island hydroelectric facility has a requirement within its FERC license to provide upstream and downstream fish passage and protection structures, portions of which are operational or currently under development.

Appendix B

The following tables include all fish species documented and the number captured during NYSDEC fisheries surveys in each impoundment starting at the upstream extent of the Impounded Portion and working downstream.

Table 1. Boat Electrofishing Fisheries Survey # 508006 Sites 1,2&3. June 2008, Upper Hudson River, Luzerne Pool.

Species	Number captured
emerald shiner	1
spottail shiner	12
bluntnose minnow	1
fallfish	7
white sucker	8
brown bullhead	3
rock bass	35
redbreast sunfish	4
pumpkinseed	1
smallmouth bass	13
yellow perch	8
logperch	1

Table 2. Fisheries Surveys #508914 (seine netting) & #515010 (electrofishing) from 2008 & 2015, Upper Hudson River, Sherman Island Pool.

Species	Number caught
northern pike	5
chain pickerel	8
mimic shiner	100
bluntnose minnow	27
fallfish	143
white sucker	4
brown bullhead	2
channel catfish	1
banded killifish	25
rock bass	43
redbreast sunfish	11
pumpkinseed	27
bluegill	2
smallmouth bass	73
largemouth bass	1
tessellated darter	5
yellow perch	102
logperch	2
walleye	26

Table 3. Fisheries electrofishing Surveys #508006 & #514060 from 2006 and 2014, Upper Hudson River, Feeder Dam Pool.

Species	Number caught
sunfish spp.	1
chain pickerel	3
common carp	1
golden shiner	1
spottail shiner	1
fallfish	2
brown bullhead	6
rock bass	10
redbreast sunfish	12
pumpkinseed	7
smallmouth bass	13
largemouth bass	6
yellow perch	40

Table 4. Fisheries electrofishing surveys #515059 & #508006 Upper Hudson River, South Glens Falls Pool.

Species	Number caught
chain pickerel	1
common carp	4
spottail shiner	8
bluntnose minnow	1
white sucker	1
brown bullhead	2
rock bass	6
redbreast sunfish	21
pumpkinseed	10
bluegill	1
smallmouth bass	7
largemouth bass	1
yellow perch	52

Table 5. Fisheries Seining Surveys #507915 & #508914, Upper Hudson River, Thompson Island Pool.

Species	Number caught
northern pike	3
chain pickerel	3
eastern silvery minnow	6
golden shiner	4
satinfish shiner	2
spottail shiner	1
rosyface shiner	4
spotfin shiner	30
bluntnose minnow	6
fallfish	151
white sucker	4
banded killifish	1
rock bass	3
redbreast sunfish	6
pumpkinseed	2
smallmouth bass	2
largemouth bass	11
tessellated darter	33
yellow perch	8
logperch	2

Table 6. Fisheries Surveys #507019, #507915 & #508914 (multiple gear types deployed), Upper Hudson River, Stillwater pool.

Species	Number caught
chain pickerel	1
eastern silvery minnow	11
golden shiner	16
satinfish shiner	2
common shiner	1
spottail shiner	293
rosyface shiner	32
spotfin shiner	54
mimic shiner	42
bluntnose minnow	100
fathead minnow	71
creek chub	1
fallfish	56
white sucker	5
northern hog sucker	1
yellow bullhead	1
banded killifish	8
brook silverside	23
rock bass	9
redbreast sunfish	38
pumpkinseed	46
bluegill	7
smallmouth bass	21
largemouth bass	16
black crappie	3
tessellated darter	80
yellow perch	13
logperch	35

Table 7. Fisheries Survey #508914 (multiple gear types deployed), Upper Hudson River, Upper Mechanicville Pool.

Name	Number caught
common carp	2
eastern silvery minnow	11
golden shiner	14
common shiner	1
spottail shiner	393
rosyface shiner	23
spotfin shiner	116
mimic shiner	26
bluntnose minnow	74
fallfish	43
white sucker	10
brown bullhead	1
channel catfish	1
banded killifish	20
brook silverside	28
white perch	1
striped bass	1
rock bass	109
redbreast sunfish	32
pumpkinseed	126
bluegill	14
smallmouth bass	107
largemouth bass	39
black crappie	18
tessellated darter	41
yellow perch	38
logperch	38

Table 8. Fisheries Survey #508914 (multiple gear types deployed), Upper Hudson River, Mechanicville Pool.

Name	Number caught
redfin pickerel	1
cutlip minnow	4
spottail shiner	160
rosyface shiner	330
spotfin shiner	55
mimic shiner	2
bluntnose minnow	5
fathead minnow	50
eastern blacknose dace	2
fallfish	250
white sucker	65
northern hog sucker	2
pumpkinseed	1
bluegill	2
smallmouth bass	2
largemouth bass	50
tessellated darter	4

Table 9. Fisheries Electrofishing Survey #517059, Upper Hudson River, Waterford Pool.

Name	Number caught
bowfin	5
American eel	33
gizzard shad	1
northern pike	5
chain pickerel	1
goldfish	1
common carp	55
golden shiner	2
spottail shiner	206
spotfin shiner	58
fallfish	6
white sucker	3
brown bullhead	3
channel catfish	44
trout-perch	1
banded killifish	2
white perch	4
redbreast sunfish	1
green sunfish	3
pumpkinseed	43
bluegill	65
smallmouth bass	16
largemouth bass	18
black crappie	2
yellow perch	36
logperch	4
walleye	2
freshwater drum	4

Table 10. Fisheries Surveys #508914, #416028 & #413004 (multiple gear types deployed), Upper Hudson River, Troy Pool.

Name	Number Caught
American eel	12
blueback herring	55
alewife	241
American shad	15
gizzard shad	40
northern pike	1
common carp	20
eastern silvery minnow	1
common shiner	1
spottail shiner	187
spotfin shiner	102
mimic shiner	26
bluntnose minnow	10
fallfish	7
channel catfish	2
banded killifish	2
brook silverside	5
white perch	1
striped bass	1
rock bass	3
bluegill	7
smallmouth bass	55
black crappie	1
tessellated darter	5
yellow perch	12
logperch	3
freshwater drum	1

Appendix C

Downstream fish passage and protection

Dams are barrier to fish movement and/or migration. Fish moving downstream are subjected to potential mortality from impingement and entrainment. Fish passage Protection, Mitigation and Enhancement (PM&E) measures will need to be evaluated at all FERC licensed facilities. New FERC licenses issued for projects must incorporate ≤ 1 " clear space angled trash racks as per the USFWS 2019 Fish Passage Engineering Design Criteria to physically exclude most juvenile & adult fish from the turbines. For protection of American eel no more than $\frac{3}{4}$ " of spacing will be permitted. Alternate downstream fish passage routes and other mitigation measures (e.g., reduced approach velocities, adequate plunge pools, ... etc.) will be required to encourage safe downstream fish passage.

Through the FERC relicensing process, a licensee will clearly describe the current fish protection measures at the facility and explore alternatives to enhance protection measures that keep all fish species out of the turbines. Special emphasis should be placed on migratory species such as American eel and on species of abundance.

American eel downstream passage & protection

To improve downstream fish passage protections for out-migrating individuals and reduce hydropower related downstream passage mortality to the greatest extent, PM&E measures specific to American eel passage will be evaluated at all FERC licensed facilities below Bakers Falls through an eel siting study.

Downstream American eel specific PM&E strategies will include:

- Physical Barriers
 - A. Angled Bar Racks that consist of -
 - 1) Constructed of metal or similar material and withstand debris loading.
 - 2) Contain no more than $\frac{3}{4}$ inch clear spacing as per the USFWS 2019 Fish Passage Engineering Design Criteria and per Travade et al. (2005)
 - 3) Installed at an angle no more than 45 degrees to flow.
 - B. Louvers or Screens
- Surface bypass
- Low Level bypass
- A. No smaller than 18"
 - Behavioral Guidance
 - A. Lights, sound and bubble curtains will be considered experimental and subject to efficacy testing to achieve the 98% passage survival criteria.
 - Operational Measures
 - A. Ex. Nightly shutdowns and alternative egress subject to efficacy testing to achieve 98% passage survival criteria.

American eel upstream passage & protection

Restoration of American eel within the Impounded Portion below Bakers Falls will require the installation of upstream eel passage structures at every lock or dam. These American eel passage structure(s) locations will be determined by individual eel passage siting studies and include the following options:

- Eel Ramps- which must incorporate:
 - A. Constructed of metal or plastic
 - B. Include climbing substrate
 - C. 8 – 18 inches wide
 - D. Opaque covering over the entire length/width, except below mean high water levels
 - E. Accommodate water level fluctuations, both head pond and tailwater
 - F. Ramp slopes that do not exceed 45 degrees
 - G. Include a minimum of one resting pool per 10 feet of vertical height
 - H. No length limit, but preferably under 100 feet
 - I. Exit away from turbine intakes, gates or spillways
 - J. Provide attraction flows of 50 – 300 gallons per minute (gpm) depending on width
 - K. Must be clean of debris

All Eel ramps must be installed with the ability to terminate in a trap or lift for future fish passage effectiveness studies.

- Eel Lifts or Traps- incorporating:
 - A. Minimum size of 2 cubic ft
 - B. Minimum Flow of 1 gpm with 0.5gpm/additional cubic ft of volume
 - C. Sufficient to maintain oxygen and ambient water temperatures
 - D. Designed to prevent Eel escape
 - E. Eels must be cleared or released every 48 hours or at 50% holding capacity
 - F. Eels must be released from traps at night

The above recommendations are in accordance with the USFWS Fish Passage Engineering Design Criteria. As this document is updated, the requirements above will adapt to reflect new technologies and adaptive management recommendations. This is not only a priority management action by DEC but also a recommendation of the Atlantic States Marine Fisheries Commission (AFSMC 2008) in their 2008 American eel management plan (addendum)