EXHIBIT E

GREEN LAKE PROJECT (P7189)

ENVIRONMENTAL REPORT

CONTENTS

Lists of Tables, Figures and Photos will be included in the FLA

0.0 INTRODUCTION

Green Lake Water Power Company (GLWP) is using the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP) for the relicensing of the Green Lake Hydroelectric Project (Project). The Licensee is filing a Draft License Application (DLA).

0.1 Document Organization

The format of Exhibit E for a DLA produced under the ILP is prescribed by 18 Code of Federal Regulation (CFR) § 5.18(b). This document generally follows FERC's guidelines for preparing Environmental Documents, but where there are differences between the two, 18 CFR § 5.18(b) is followed because, as FERC's guidelines document states in its Preface: "These guidelines… do not set Commission policy or substitute for the Commission's regulations."

Per 18 CFR § 5.18(b), this Exhibit E must meet the following format and content requirements:

Section 0.0 – General Description of the River Basin.

Section 1.0 – Cumulative Effects

Section 3.0 – Applicable Laws

Section 4.0 – Project Facilities and Operation

Section 5.0 – Proposed Action and Action Alternatives

1.0 RIVER BASIN

1.1 Overview

The Green Lake Dam Hydroelectric Project, FERC No. 7189 (GLWP, P7189, or the Project) is located on Green Lake and Reeds Brook near the City of Ellsworth, Hancock County, Maine. The Project intake is at the Green Lake dam and the tailrace discharges into Reeds Brook near Graham Lake. The Green Lake drainage area is part of the Union River watershed.

The Union River watershed has an area of 547 square miles. Within that area, the Green Lake watershed has an area of 45 square miles. Green Lake stretches 6.1 miles from the dam to the northwest end of the lake.

Reeds Brook flows about 2000 feet (about 1800 feet straight line distance) from Green Lake just downstream of the Green Lake dam to Graham Lake, dropping about 45 feet in the process. The elevation difference between Green Lake and Graham Lake is 56.5 feet with both lakes at normal high water.

The Project power station is about 7 miles upriver from the head of tidewater on the Union River at the Ellsworth dam. The tidewater of the Union River flows a further 4.2 miles and enters the Union

River Bay, part of the Atlantic Ocean. The power station is therefore about 11.2 miles, and the Green Lake dam about 11.6 miles, upstream of Union River Bay.

The following ponds and associated wetlands drain into Green Lake via streams:

- Hatcase Pond
- Mountainy Pond
- Little Burnt Pond
- Rocky Pond
- Wormwood Pond
- Little Duck Pond
- Little Rocky Pond
- Goose Pond

These ponds and wetlands absorb precipitation and have a large effect on the quantity and timing of rain runoff into Green Lake. Small amounts of precipitation result in little new water in Green Lake beyond that which falls directly on the lake. Larger amounts of precipitation cause disproportionately larger amounts of runoff—the actual amount depending on season, weather, and prior precipitation.

Ellsworth Hydroelectric's Union River Watershed map includes Phillips Lake. USGS maps show both Mann Brook and Mill Stream as possible outlets for Phillips Lake. GLWP conducted a field survey and determined that there was a large flow of water north from Phillips Lake into Mill Stream and, on the ground, Mann Brook does not connect with Phillips Lake. Because of this GLWP concluded Phillips lake drains to the north, away from the Union river, and is not part of the Green Lake Watershed.

1.2 Project Drainage Basin Tributary Streams

Most of the streams in the Project drainage basin are quite small, traveling one or two miles before entering the lake. The larger streams are the following:

- Great Brook, which drains Rocky Pond and Little Burnt Pond directly, and Mountainy Pond and Hatcase Pond via Mountainy Pond Brook. With all major forks included, this system of ponds and brooks runs about 11 miles before entering Green Lake.

Source of all photos: GLWP 2019 or as marked

Photo 1-1 Great Brook at Scott's Neck Road

Photo 1-2 Mountainy Pond Brook at Beech Hill Pond Road

- Mann Brook drains Goose Pond, Mann Bog, Coon Bog. It runs about 6.5 miles including all of its branches.

Photo 1-3 Mann Brook at Green Lake Road

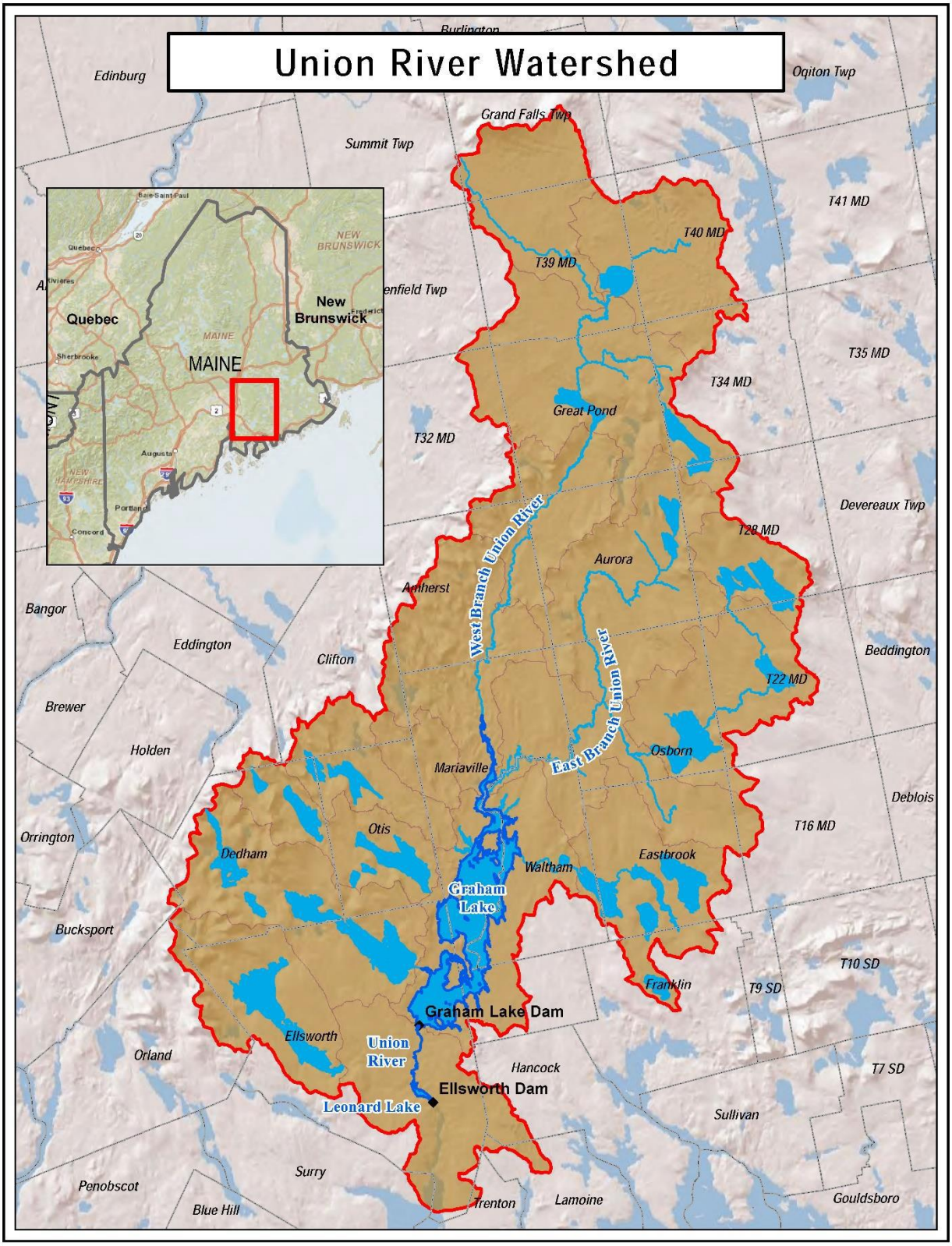
- Jellison Brook runs about 4 miles to Green Lake. It does not drain any ponds.

Photo 1-4 Jellison Brook at Green Lake Road

- Boggy Brook runs about 3 miles to Green Lake. It does not drain any ponds.

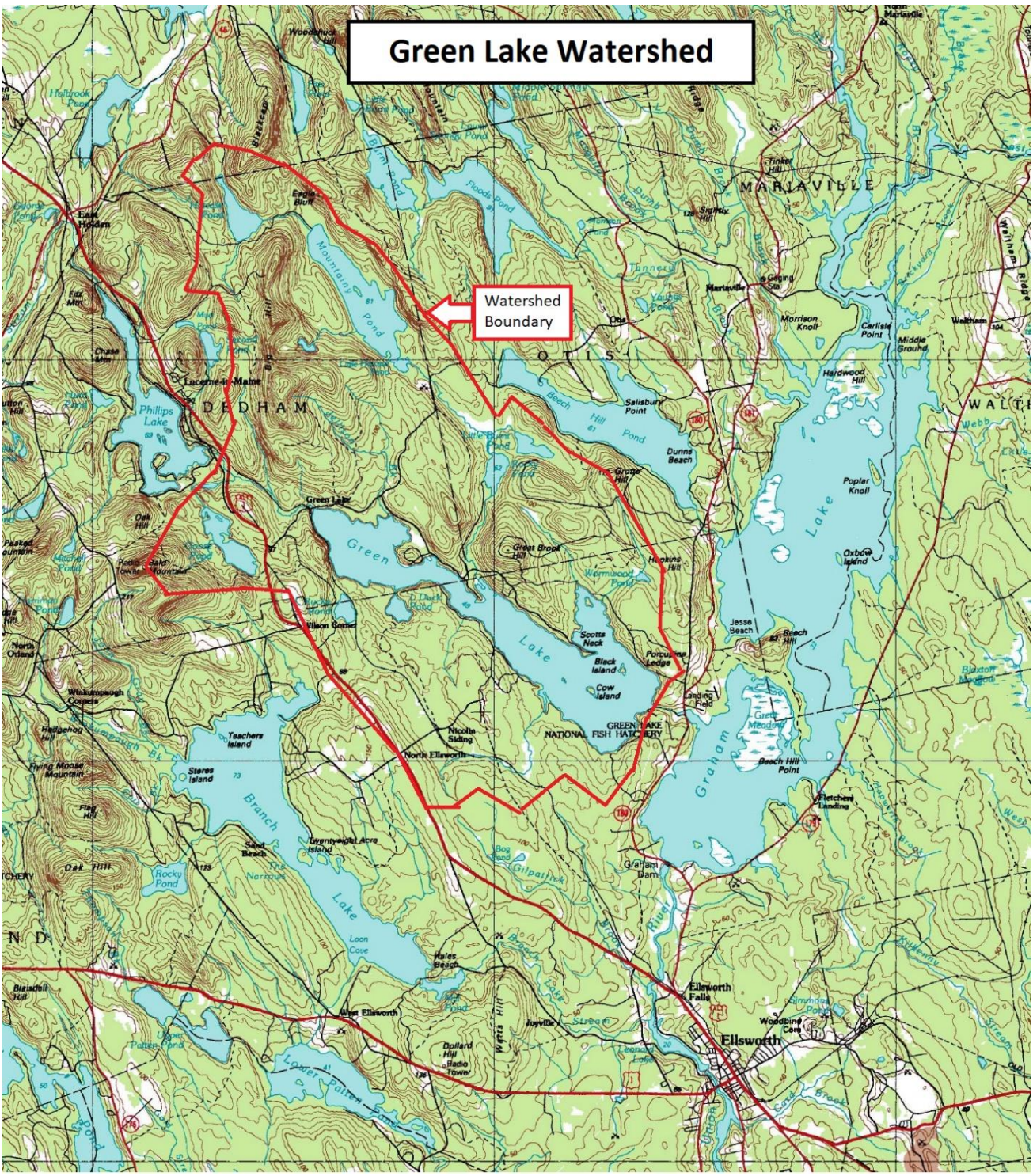
Photo 1-5 Boggy Brook at Upper Boggy Brook Road

Figure 1–1 Union River Basin



Source: Ellsworth Hydroelectric Project (FERC No. 2727) License application, Dec-2015

Figure 1–2 Project Drainage Area



Source: GLWP and USGS Map 44068-E1-TM-100, "Bangor, Maine", 1994 Revision

1.3 Topography

The land around Green Lake is characterized by hills to the north and broad ridges of moderate height to the south. The hills to the north within the project drainage area rise to a maximum elevation of just over 1100 feet. See Figure 1–2 *Project Drainage Area* above.

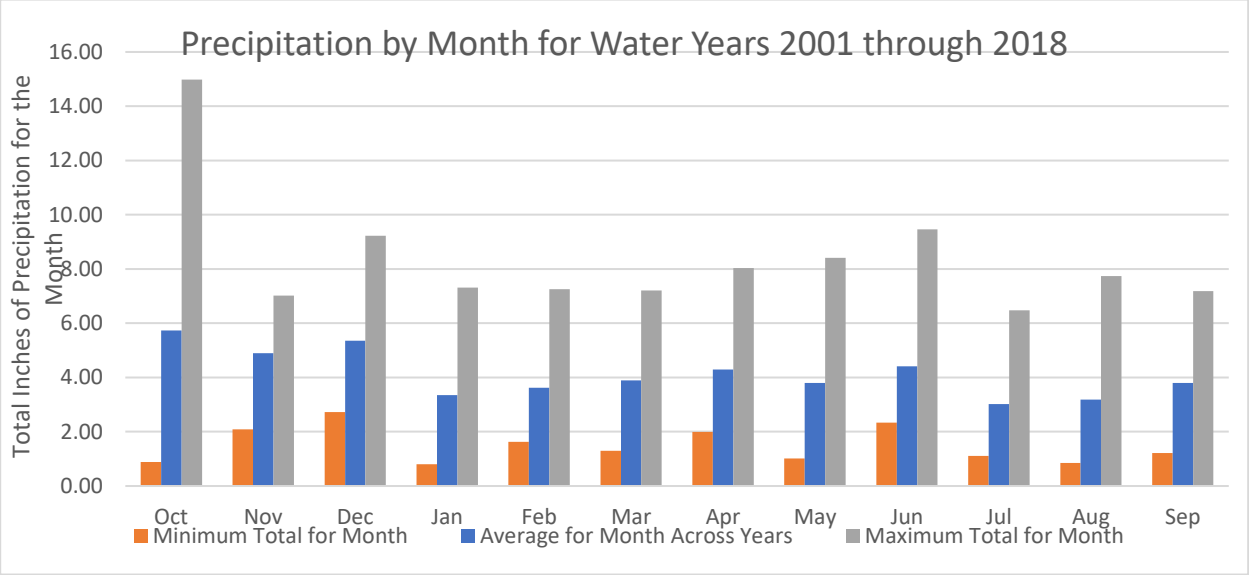
1.4 Climate

The climate of the Green Lake area is quite varied. Summer and fall can be anything from a severe, extended dry period to a period of frequent, heavy rain. Hurricanes and tropical depressions traveling northeast near the coast can spiral large amounts of moisture inland from the Gulf Stream. With Green Lake located about 30 miles from the ocean, winters are a battle between cold air masses traveling westward from the middle of the country and moist, warm onshore flows from storms. Resulting winter weather can bring snow which accumulates until spring; or snow followed by rain which results in a shallow, dense snow pack; or mostly rain, which results in negligible snow pack, but icy conditions between storms.

A "typical" water year would be damp in the late fall with rain and some snow. Snow starts accumulating from late December. Snow and frost melt and run off into Green Lake around mid-April. Spring rain is intermixed with sunny periods into June, which kicks the trees on the land surrounding Green Lake into full growth. From July through September precipitation is reduced from spring levels--trees are absorbing much of the precipitation that falls on the land surrounding Green Lake. Individual years can vary greatly from this typical scenario.

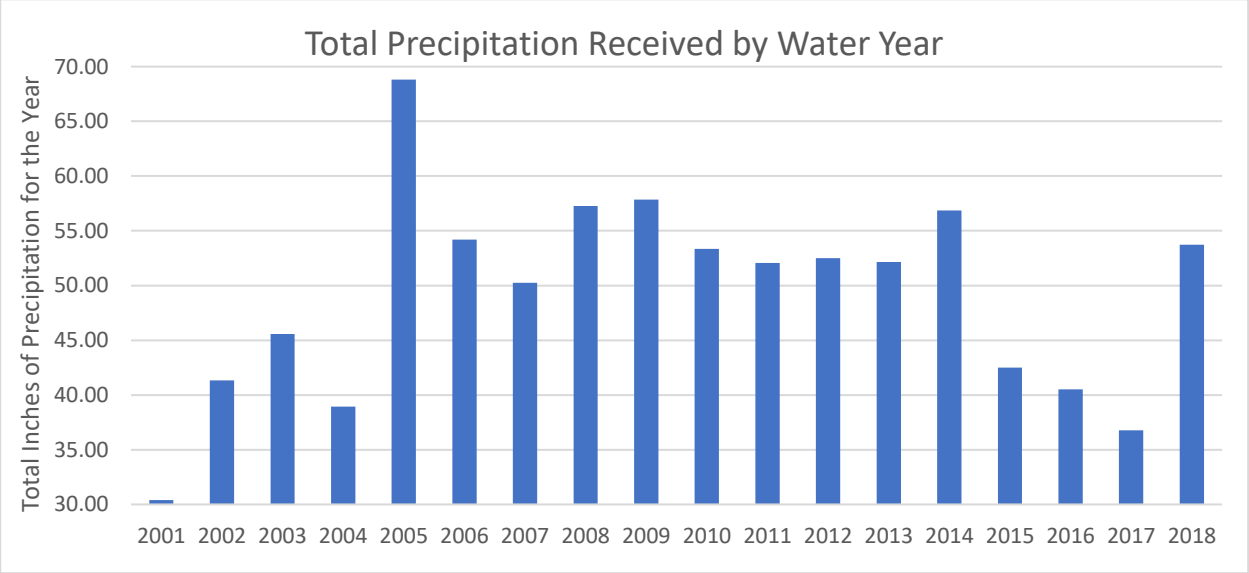
The hills to the northwest of Green Lake affect the climate of the Green Lake Watershed. Low pressure areas that track northeast near Maine cause a moist airflow from the southeast which condenses and forms rain/snow as it cools from being forced to rise over the hills. The Green Lake Watershed often receives more precipitation from large storms than surrounding areas and than the NWS predicts. Even though the Green Lake Watershed is located between two NWS monitoring and recording stations (the Bar Harbor and Bangor Airports), forecasts and records for these locations are not necessarily a good prediction of Green Lake Watershed precipitation. During the summer, Project experience has been that actual precipitation amounts are often quite a bit less than amounts called for by NWS forecasts 2 to 3 days before the rain.

GLWP recorded the following precipitation amounts by month and year over the last eighteen years: (Sources: GLWP Daily Hydrological Logs, 2000 to 2018)



Source: GLWP Daily Hydrological Logs, 2000 to 2018

Figure 1–3 Graph of precipitation range recorded by month



Source: GLWP Daily Hydrological Logs, 2000 to 2018

Figure 1–4 Graph of total precipitation recorded by year

1.5 Major Land Uses

Most of the land in the Green Lake watershed is used for tree growth. Some rural residential, seasonal recreational and commercial uses are also found within the drainage area.

1.6 Economic Activities

Much of the land in the Project vicinity is used for tree growth, with scattered residential and recreational uses. There are also a few businesses (small mechanics, stores, commercial beaches, rental properties, etc.)

1.7 References

U.S. Geological Survey (USGS) maps, https://store.usgs.gov/maps

Bangor, Maine, 1:100k, 1994

Bar Harbor, 1:100k, 1991

Beech Hill Pond, 1:24k, 1981

Branch Lake, 1:24k, 1981

Brewer Lake, 1:24k, 1982

Chemo Pond, 1:24k, 1988

Ellsworth, 1:24k, 1981

Green Lake, 1:24k, 1982

Hopkins Pond, 1:24k, 1988

Veazie, 1:24k, 1988

Ellsworth Hydroelectric Project (FERC No. 2727) License application, Dec-2015,

https://www.ferc.gov/docs-filing/elibrary.asp

Lakes of Maine, https://www.lakesofmaine.org/lake-overview.html?m=4294

2.0 CUMULATIVE EFFECTS

2.1 Introduction

According to the Council on Environmental Quality's regulation for implementing NEPA (40 C.F.R. § 1508.7), a cumulative effect is the effect on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

2.2 Resources Identified

The following potentially cumulatively affected resources were identified in the Commission's Scoping Document, consultation and study results:

- Migratory fish (i.e., alewife, American eel, American shad, Atlantic salmon, blueback herring, and sea lamprey)
- Lake wildlife (loons and arctic char)
- Aquatic habitat

2.3 Geographic Scope

The geographic scope chosen for migratory fish analysis is from the upstream extent of the Green Lake Project to the Graham Like Development of the Ellsworth Project No. 2727 (Ellsworth Project), and the Union River from the Ellsworth Project downstream to the Union River Bay. This geographic scope was chosen because the operation and maintenance of the Green Lake Project, in combination with several other dams on the Union River, may affect migratory fish. GLWP notes that the population of Atlantic salmon at the Green Lake National Fish Hatchery (GLNFH, or the Hatchery) is also affected by the Project (in addition to the obvious effects from the Hatchery) and believes the Hatchery should be included in the geographic scope for cumulative effects analysis.

The geographic scope chosen for lake wildlife analysis is Green Lake. This geographic scope was chosen because Project operation, combined with development around the lake and/or Hatchery operation, may affect lake wildlife.

The geographic scope chosen for aquatic habitat is from the upstream extent of the Green Lake Project to Graham Lake. This includes Green Lake, Reeds Brook and the Hatchery. This geographic scope was chosen because the operation of the Green Lake Project, combined with the operation of the Green Lake National Fish Hatchery and development around Green Lake could affect aquatic habitat.

2.4 Temporal Scope

The temporal scope for cumulative effects analysis includes a discussion of past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope will look 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions.

2.5 References

Scoping document 2 – 20190913-3000 – under Docket P-7189-014 on the FERC site https://elibrary.ferc.gov/eLibrary/search

Hatchery Populations of Atlantic Salmon - NOAA's *Endangered and Threatened Species: Determination of Endangered Status for the Gulf of Maine Distinct Population Segment of Atlantic Salmon"* (Federal Register/ Vol. 74, No. 117/Friday, June 19, 2009, page 29344)

40 C.F.R. § 1508.7 - CEQ Regulations for Implementing the Procedural Provisions of NEPA (energy.gov)

3.0 STATUTORY AND REGULATORY REQUIREMENTS

See the end of this section for a list of agencies and others consulted with respect to the following laws applicable to the Project.

Issues related to the following statutory and regulatory requirements are discussed in the Proposed Action and Action Alternatives section below.

3.1 Federal Power Act

3.1.1 Section 18 Fishway Prescriptions

Section 18 of the Federal Power Act specifies that the Commission shall require the construction, maintenance, and operation by a licensee at its own expense of such fishways as may be prescribed by the Secretary of Commerce or Secretary of the Interior.

3.1.2 Section 10(j) Recommendations

Conditions to protect and mitigate damage to, and enhance, fish and wildlife and their habitat affected by the Project shall be included in the license. Such conditions shall be based on recommendations received from the NMFS, USFWS, and state fish and wildlife agencies.

3.2 Section 401 of the Clean Water Act

The Project is subject to Water Quality Certification under Section 401(a)(1) of the federal Clean Water Act of 1977. The Maine Department of Environmental Protection (MDEP) establishes water quality standards and criteria required to be met to demonstrate attainment of these standards. MDEP is charged to do this by Maine state law under Title 38, Chapter 3.

Maine Title 38, Chapter 5 § 631 states: "**2. Policy and purpose**. The Legislature declares that hydropower justifies singular treatment. The Legislature further declares that it is the policy of the State to support and encourage the development of hydropower projects by simplifying and clarifying requirements for permits, while assuring reasonable protection of natural resources and the public interest in use of waters of the State…"

3.3 Endangered Species Act (ESA)

Section 7(a)(2) of the ESA specifies that a Federal agency that authorize activities must ensure that such activities are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species. Determination of the significance of effects on species and habitat are determined by the U.S. Fish and Wildlife Service (FWS) after consultation with the affected States.

Section 7(a)(3) of the ESA specifies that a Federal agency shall consult the FWS on any prospective agency action at the request of, and in cooperation with, the prospective permit or license applicant if the applicant has reason to believe that an endangered species or threatened species may be present in the area affected by this project and that implementation of such action will likely affect such species.

Section 4(b)(2) of the ESA states: "The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned." This section may apply to this Project when cumulative effects involving the Green Lake National Fish Hatchery are considered.

The Graham Lake watershed has been determined to be critical habitat for the Gulf of Maine Distinct Population Segment of Atlantic Salmon (GOM DPS). A federally listed threatened species, the northern long eared bat, could also exist in the Project area.

3.4 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary law that governs marine fisheries management in U.S. federal waters. First passed in 1976, the MSA fosters the long-term biological and economic sustainability of marine fisheries. Its objectives include:

- Preventing overfishing
- Rebuilding overfished stocks
- Increasing long-term economic and social benefits
- Ensuring a safe and sustainable supply of seafood

The MSA created eight regional fishery management councils. The New England Fishery Management Council (NEFMC) covers the Project area. This fishery management councils create management plans, which are covered in section 6 of this Exhibit.

The NEFMC created a fishery management plan for Atlantic Salmon in 1985, which was amended in 1996 to designate Essential Fish Habitat for Atlantic Salmon: "Essential fish habitat for Atlantic salmon is described as all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut and that meet conditions for eggs, larvae, juveniles, adults and/or spawning adults."

The Graham Lake watershed, including the Project area, is included in the EFH for the GOM DPS of Atlantic Salmon.

Included in the endangered GOM DPS are all associated conservation hatchery populations used to supplement the natural populations; currently, hatchery populations are maintained at Green Lake National Fish Hatchery and Craig Brook National Fish Hatchery, both operated by the U.S. Fish and Wildlife Service. Hatchery populations provide a safety net against low fish return rates in the Union River, and as such the Hatcheries should be considered EFH for Atlantic Salmon regardless of potential sematic arguments to the contrary.

3.5 Coastal Zone Management Act (CZMA)

Congress enacted the Coastal Zone Management Act (CZMA) (16 U.S.C. 1451 et seq.) to protect the coastal environment from growing demands associated with residential, recreational, commercial,

and industrial uses (e.g., State and Federal offshore oil and gas development). The CZMA provisions help States develop coastal management programs (Programs) to manage and balance competing uses of the coastal zone. Federal Agencies must follow the Federal Consistency provisions as delineated in 15 CFR part 930.

Maine's coastal zone includes all municipalities with tidal waters in their jurisdiction. Ellsworth, the municipality in which the bulk of the project is located, includes tidal waters (the Union River downstream of the Ellsworth dam.) GLWP expects to submit a certificate of consistency with the Maine Coastal Program to the Maine Department of Agriculture, Conservation and Forestry for their concurrence.

3.6 National Historic Preservation Act (NHPA)

The National Historic Preservation Act (NHPA) directs federal agencies to take into account the effect of any undertaking (a federally funded or assisted project) on historic properties.

Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

3.7 Consultation

The following agencies and individuals have been consulted during the Project licensing process to date. Agencies marked with an asterisk (*) were consulted directly (meeting, email, phone call, etc.), in addition to the consultation inherent in FERC's Integrated Licensing Process.

Federal Energy Regulatory Commission		
Dr. Nicholas Palso	FERC Coordinator	*
Bill Connelly	Fisheries Lead	*
National Fish Hatchery		
Oliver Cox	Green Lake Hatchery Manager	
National Marine Fisheries Service		
Dan Tierney	Protected Resources Division	*
Sean McDermott	Marine Habitat Resource Specialist	
Indian Tribes		
Susan Young, A/THPO	Houlton Band of Maliseet Indians	
Isaac St. John THPO	Houlton Band of Maliseet Indians	*
Jennifer Pictou, THPO	Aroostook Band of Micmacs	
Chris Sockalexis THPO	Penobscot Indian Nation	
Kirk Francis, Chief	Penobscot Indian Nation	
Donald Soctomah THPO	Passamaquoddy Tribe	
Pleasant Point Reservation	Passamaquoddy Tribe	

Indian Township Reservation	Passamaquoddy Tribe	
Local Government		
Glenn Moshier	City Manager / Police Chief	
David A. Cole	Prior City Manager	
U.S. Fish & Wildlife Service		
Steve Shepard	Maine Hydro Licensing Coordinator	*
Bryan Sojkowski, P.E.	Hydraulic Engineer - Fish Passage	
Julianne Rosset	Biologist - Migratory Fish/Hydropower	*
Corbin Hilling	Fish and Wildlife Biologist	*
Peter Lamothe	Program Manager	
Maine Dept of Environmental Protection		
Kathy Howatt	Hydro Coordinator	*
Christopher Sferra	Environmental Specialist III, Hydropower Unit	*
Jeanne DiFranco	Biological Monitoring Program Manager, Aquatic Biologist	*
MDEP Bureau of Water Quality, Division of Environmental Assessment		
Linda Bacon	Lake Assessment Biologist III	*
Doug Suitor	Biologist	*
Maine Dept of Inland Fisheries & Wildlife		
John Perry	Environmental Review Coordinator	*
Gregory Burr	Regional Fisheries Biologist - Region C	*
Steve Dunham	Regional Biologist	*
Danielle D'Auria	Wildlife Biologist	*
Susan Bard	Regional Fisheries Biologist	
Maine Dept of Marine Resources		
Casey Clark	Resource Management Coordinator	*
Gail Wippelhauser	Marine Resources Scientist	*
Anna Harris	Maine Field Office Project Leader	*
Maine Historic Preservation Commission		
Kirk F. Mohney	State Historic Preservation Officer	
Megan Rideout	Review & Compliance/CLG Coordinator	
Dr. Arthur Speiss	Chief Historic Preservationist	
Green Lake Association		
Audrey Tunney	President	*
Dale Jellison		*
David Megquier		
Donna Megquier		*
Harry Moore		
Jenkin's Beach		
Raymond L. Jenkins Jr		
Kleinschmidt Associates		
Andrew D. Qua	Senior Regulatory Coordinator	*
Jesse Weschler	Senior Environmental Scientist	*
Robert S Kleinschmidt		
Anne M Finlayson		

Advisory Council on Historic Preservation	
John T Eddins	
Dewey & LeBoeuf, LLP	
Thomas Mark	
GLWP Vice President	
David Kleinschmidt	
MDEP Bureau of Land and Water Quality	
Brian Kavanah, Director	
Jim Beyer	
Maine Department of Conservation	Land Use Regulation Commission
Maine Dept of Marine Resources	Resource Management Coordinator
Nixon Peabody LLP	
Celeste Ward	
Elizabeth Whittle, Partner	
NPS Hydro Program Coordinator	
Kevin Mendik, ESQ	
U.S. Army Corp of Engineers	
Jay Clement	
	Divisional Office, Regulatory
U.S. Department of Interior, Attorney	
Andrew Tittler	
U.S. Environmental Protection Agency	
Ralph Abele	
	Director Water Quality Control Branch
U.S. Fish & Wildlife Service	Regional Director
U.S. National Park Service	North Atlantic Region
Union River Watershed Coalition	
Elsie Hemmings	
Union Salmon Association	
Barb Watham	
Charles L Kelly, Jr	
Atlantic Salmon Federation	Atlantic Office
Downeast Salmon Federation	
Hancock County Commissioners Office	
Stinson Leonard Street LLP	

Table 3-1 – Consultation Table

3.8 References

Federal Power Act – federal_power_act.pdf (ferc.gov)

Section 401 of the Clean Water Act – Clean Water Act Section 401: State Certification of Water Quality | US EPA

Maine Title 38, Chapter 3 - Title 38, Chapter 3: PROTECTION AND IMPROVEMENT OF WATERS (mainelegislature.org)

Maine Title 38, Chapter 5 § 631 - Title 38, §631: Purposes (mainelegislature.org)

Endangered Species Act - Endangered Species Act of 1973 (fws.gov)

Critical habitat for the GOM DPS of Atlantic salmon - 50 CFR § 226.217(b)(2)(iii)

Magnuson-Stevens Fishery Conservation and Management Act - Laws & Policies: Magnuson-Stevens Act | NOAA Fisheries, Partners: Regional Fishery Management Councils | NOAA Fisheries

Essential Fish Habitat for Atlantic Salmon - USFWS/NCTC - Atlantic Salmon

Atlantic Salmon Hatchery Populations - Maine Field Office (fws.gov)

Coastal Zone Management Act - Coastal Zone Management Act | Bureau of Ocean Energy Management (boem.gov)

National Historic Preservation Act – National Historic Preservation Act | FEMA.gov

Historic Property - eCFR :: 36 CFR 800.16 -- Definitions.

4.0 PROJECT FACILITIES AND OPERATION

This information is provided in Exhibit A. If needed, it will be summarized and included here in the FLA.

5.0 PROPOSED ACTION AND ACTION ALTERNATIVES

5.1 Background

The Green Lake dam has a long history. It was originally authorized (as Reeds Pond dam to be build by the Great Brook and Reeds Pond Dam Company) in February of 1869, "on or near the dam of Benjamin Franklin and Sons, in the town of Ellsworth" for the purpose of running logs down Reeds Brook. Per this, it appears that some sort of dam has been on Green Lake since at least before 1865. The dam with its current height and configuration is believed to have been built in the early 1900's. Bangor Hydro Electric Company (BHE) construction drawings were found by GLWP dating from 1943 which show some details of the dam. These drawings pertain to rebuilding the fish screens and contain a note as follows: "Present screens to be altered to fit new frame" indicating fish screens have been used on the gates at the Green Lake dam to stop fish passage since before 1943. A BHE drawing from 1959 shows fish screens on the Green Lake dam spillway. It is not clear from the drawings if spillway fish screens were in place before 1943, but it is likely they were because fish screens were used on the gates. The Green Lake dam raises the water level about 7.5 ft from its original level.

BHE managed the dam before GLWP acquired the dam and created the Project in 1984. GLWP has copies of BHE level logs from1957 through mid-1981. BHE managed the lake level over a range of 3.0 to 8.0 feet on the staff gauge (156.5 – 161.5 USGS), with unusual levels as low as 2.4 feet and as high as 9.5 feet. They appear to have used a management approach based on moderately stable, mostly full levels during the summer, with a drawdown in the fall or winter for spring runoff. GLWP, under the current license, manages the lake to a smaller level fluctuation (4.0 – 7.2 feet) than BHE did historically (3.0 – 8.0 feet).

5.2 Geology and Soils Resources

5.2.1 Construction

No new construction is planned as part of the relicensing. Two areas of project repair involve some earthwork: 1) updating the septic system leaching field, 2) replacing or updating the wood-stave penstock section.

5.2.1.1 Leaching field

The leaching field for the operators quarters and power station is located in a small clearing in the woods. It generally works well, but is susceptible to intrusion by tree roots. After 40 years, it is due for repair or replacement. It is also susceptible to freezing where its pressure line crosses underneath the access road to the dam. This is only occasionally a problem, but if practical it will be addressed as part of the leaching field work. All necessary permits will be acquired before this work is started. The leaching field is not near the brook so there is no issue of equipment use in the brook buffer zone. Sediment control should not be a big problem with this work, but where water flows away from the work site, appropriate sediment control measures will be used.

5.2.1.2 Penstock

Engineering and planning for this work will begin if and after the requested subsequent license is issued. The complete scope of the proposed work will not be known until this design and planning work is done. If the wood-stave penstock section is replaced completely some ground work would be required to prepare and stabilize the existing bed for the new penstock. Even if the penstock is lined, there would likely be some work done to correct any problems with the bed.

The design and plan for the penstock work will be submitted to FERC and any other needed resource or permitting agencies for approval before physical work is begun. The penstock is currently functional, and could be maintained indefinitely, but with an increasingly impractical level of effort and expense.

5.2.2 Erosion

Green Lake was originally a natural lake, but its full pond water level was raised about 7.5 feet about 100 years ago when the current dam was built. Exposing a new, higher area of shore to water and wave action is bound to cause erosion around the lake as the shore adjusts to the new lake level. It has had many years to adjust at this point.

Water sampling for determination of the lake trophic state was done during the summer of 2020. Water clarity was high and total phosphorous levels were low, suggesting soil being washed into the lake is not a problem. See (ISR 2021)

An erosion survey was also conducted around the perimeter of Green Lake in 2020. No major or continuing erosion was found. The lake shore was generally covered with natural boulders and large cobble which appear to provide protection against wave action.

5.3 Aquatic Resources

5.3.1 Species

The Maine Department of Inland Fisheries and Wildlife (MDIFW) conducted a fish survey of Green Lake in August of 1942 which was revised in 1953, 1975 and 1995. (MDIFW, 1995) The following fishes were found in Green Lake:

Landlocked salmon	Minnow: Common shiner
Lake trout (togue)	Minnow: Greek chub
Brook trout	Minnow: Fallfish (chub)
Sunapee charr (Arctic charr)	White sucker
Rainbow smelt	Hornpout (bullhead)
Smallmouth bass	Branded killifish
White perch	Threespine stickleback
Yellow perch	Pumpkinseed sunfish

Chain pickerel	American eel

(MDIFW, 1995)

Landlocked salmon are native to Green Lake. (Boucher, 2012) Substantial numbers of wild salmon are produced in Great Brook and Jellison Brook. Creel surveys indicate that wild salmon comprise from 30-45% of the salmon harvest in most years. Biologists have also confirmed the presence of a relic population of Sunapee charr (AKA Arctic charr). Green Lake also produces smallmouth bass. (MDIFW, 1995)

The lake trout fishery is entirely dependent upon stocking. (MDIFW, 1995) Records were found on fish stocking in Green Lake since 2010. Every year from 2010 through 2020 landlocked salmon have been stocked in Green Lake, and lake trout about half of those years. (MDIFW, 2020)

Green Lake is one of 14 lakes and ponds in Maine in which arctic charr exist and reproduce. Arctic charr are believed to be native to the lake. They have a varied diet which is commonly adapted to feeding on a given prey which is available in a lake or pond. They are a cold water fish that is susceptible to over-harvesting and invasive species. (Charr 2021)

The following migratory fish were identified during scoping: alewife, American eel, American shad, Atlantic salmon, blueback herring, and sea lamprey. With the exception of landlocked salmon, none of these are currently present in Green Lake. These species are all migratory fish that have potentially been present in the Union River. Atlantic salmon are discussed in the Threatened and Endangered Species section below. The others will be discussed in this section.

5.3.2 Affected environment

The Green Lake dam affects the lake level of Green Lake and the flow in Reeds Brook. The dam also has fish screens to avoid passage of most fish and to stop turbine entrainment of large fish.

5.3.3 Environmental analysis

Fish and wildlife species that are present in Green Lake (other than landlocked salmon and lake trout, which are stocked) have at least successfully tolerated the historical conditions in the lake, and some may have benefited from them. It is unlikely that any fish or wildlife species in Green Lake is unduly stressed by the current lake management method, which is similar, but less extreme than, the prior lake level management approach. This would include all the species listed in Section 5.3.1 above.

Study results demonstrate that Green Lake and Reeds Brook meet the MDEP water quality criteria. Study results are in section 6.0 below.

Aquatic resources, called out by resource agencies for special consideration or identified during scoping, are discussed in the following sections and in sections 5.5 and 5.6 below:

5.3.3.1 Eel

A series of eel surveys were performed during study season 1 to determine if eels were climbing the Green Lake dam. No eels were found during the surveys. For study results, see section 6.0 below.

During the 16 years that the current team has managed the Project they have encountered three eels in the penstock: two that traveled down the penstock when the turbine was not running and attempted to swim out holes that were flowing water (that should not have been and were subsequently fixed) and one that was discovered when the turbine was shut down and opened up to remove debris. This action, which takes about an hour, is performed occasionally, often in the fall when sticks that can pass through the trash racks are common in Green Lake.

Out-migrating eels would currently need to pass through the trash racks (1" clear spacing) to gain access to the penstock, or through the slightly closer spacing of the gate fish screens to gain access directly to Reeds Brook.

5.3.3.2 Landlocked salmon

Landlocked salmon are stocked in Green Lake on a regular basis, but there also spawn in the lake's tributaries. Fish access to and travel within the tributaries would depend on the amount of water in the brooks and streams involved. As such, the effect of project operation on landlocked salmon would be from effects to lake water quality and the effect of the drawdown on the littoral zone. Lake trophic state and habitat studies done during the summer of 2020 indicate that Green Lake meets MDEP water quality standards. For study results see section 6.0 below.

5.3.3.3 Lake trout

Lake trout in Green Lake are purely from stocking, rather than from lake trout spawning in the lake. As such the effect of project operation on lake trout would be from effects to lake water quality and the effect of the drawdown on the littoral zone. Lake trophic state and habitat studies done during the summer of 2020 indicate that Green Lake meets MDEP water quality standards. For study results see section 6.0 below.

5.3.3.4 Arctic charr

Green Lake is a deep, cold-water lake that is a suitable habitat for arctic charr. The fall drawdown could affect arctic char spawning if it were done too late in the year. Arctic char spawn during the fall in water that is 1.5 to 6 feet deep when the water temperature drops below 10°C. A temperature logging study was performed in the fall of 2020. Through this, it was determined that the water temperature in likely arctic charr spawning locations in Green Lake dropped below 10°C during the first two weeks of November 2020. It was also determined that the water temperature near the bottom, just upstream of the dam (in 1.5-2.0 feet of water) tracked the water temperature at the potential arctic charr spawning sites well. For more study results, see section 6.0 below.

5.3.3.5 Smallmouth bass

Smallmouth bass are not native to Maine. Smallmouth bass are a common game fish, with successful fisheries in almost every U.S. state. As adults, they feed on smaller fish and crayfish. They are flexible in what species they eat, preferring to eat what is available rather than travel long distances for preferred prey. Young smallmouth bass eat a varied diet that changes as they mature—progressing from mainly aquatic microorganisms, small insects and larvae; to larger insects; to tadpoles, frogs, smaller fish and young crayfish. (Hetke 2008)

Smallmouth bass prefer clear, relatively cool water with sufficient levels of dissolved oxygen, but they are adaptable to less than perfect conditions. They are an upper-echelon predator in many natural freshwater ecosystems. There young are prey for numerous freshwater species (including other smallmouth bass), but once matured they are rarely prey for other fish. Other upper-echelon predator fish (such as lake trout) can be competitors for available prey and for spawning habitat. Largemouth bass are a competitor which will tend to outcompete and extirpate smallmouth bass in a small lakes where habitat diversity is low. Generally smallmouth prefer a rockier and largemouth bass prefer a weedier littoral habitat. (Hetke 2008), (Cornwell 2020)

Smallmouth bass will winter, summer and spawn in one body of water, using different habitats depending on water temperature. Spawning activity begins when water temperatures reach 59-65°F with nest building in shallow areas with gravel, bedrock, sand or other hard-bottom surfaces. The male builds and defends the nest. He continues to defend the nest, eggs and hatchlings until they cease schooling. (Hetke 2008)

Green Lake is a good smallmouth bass habitat, with clean, clear water, abundant habitat, and suitable prey. Project operations have not compromised smallmouth bass habitat in Green Lake. For study results, see section 6.0 below.

5.3.3.6 River herring (alewife, blueback herring)

River herring are currently captured by the Ellsworth dam fish trap. Some are trucked upstream and some are harvested. MDIFW, in a letter dated June 26, 2019, expressed concern with alewife fish passage upstream into Green Lake because of competition with landlocked smelts. Smelt are an established fishery in Green Lake as well as the preferred forage species of landlocked salmon. (MDIFW 2019)

Blueback herring are captured by the Ellsworth station trap operation along with alewives. Blueback herring typically run up-river later in the season than alewives. The trapped late run river herring are released in Lake Leonard which is regarded as more suitable spawning habitat for blueback herring than the larger lakes upstream. Graham lake dam upstream of Lake Leonard does not have fish passage. This means that blueback herring do not have access to Green Lake Project waters. (Ellsworth FLA 2015)

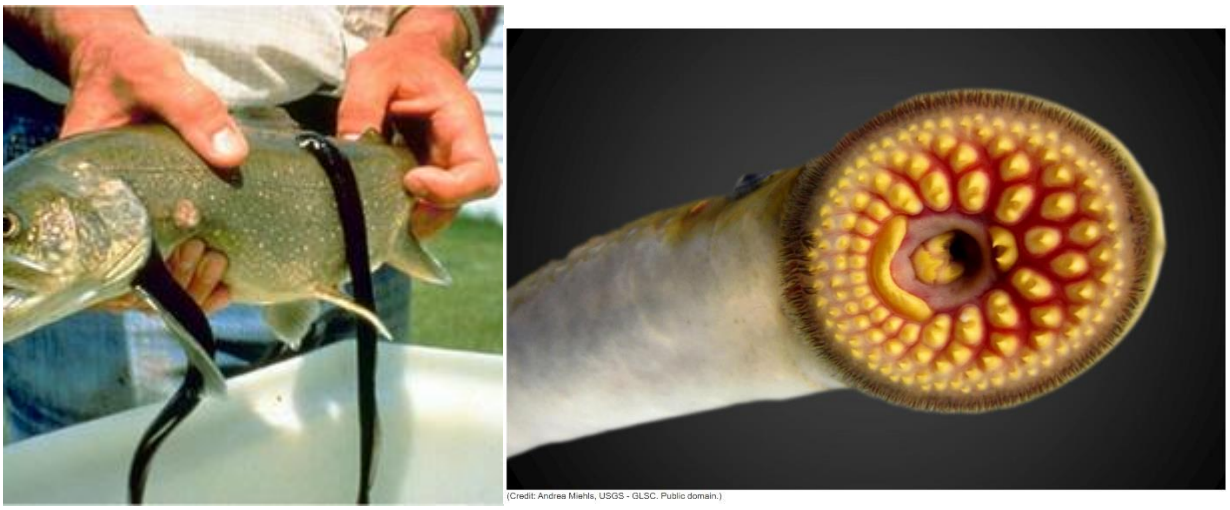
5.3.3.7 American shad

There is no habitat suitable to American shad in the Union River upstream of Lake Leonard. American shad are not expected to have access to Reeds Brook now, or in the future. (Ellsworth FLA 2015)

5.3.3.8 Sea lamprey

Sea lamprey have gotten a bit of a bad reputation for a couple of reasons:

1) Their physical appearance bothers many people.
2) They have decimated native fisheries in some lakes where they are an invasive species.



Source: NOAA

#1 is not very surprising given the above Sea Lamprey images.

#2 refers to sea lamprey in the Great Lakes where they have where they are a serious invasive species which has impacted lake trout.

Sea lamprey are native to Maine waters. They may still have a public relations problem in Maine, but in their natural area they do not cause invasive species problems. This is because they are an anadromous fish that feeds in salt water during most of its growth to maturity. During the first 4-8 years of their lives, they burrow into the muddy bottoms of streams, rivers and lakes, filter feeding upon planktonic drift. After emerging from their burrows, they metamorphose into their migration life stage which is similar to the final adult form. Unlike the sea lamprey in the Great Lakes, Maine's sea lamprey do not typically prey on fish while in fresh water. If migrating sea lamprey attach to a fresh water fish, it is rarely fatal for the fish (unlike in salt water). (Kircheis 2004)

Adult sea lamprey that return to fresh water die soon after spawning. Native Maine anadromous sea lamprey cannot survive in freshwater as adults. Sea lamprey are seen as a beneficial part of their native aquatic ecosystem. (Kircheis 2004)

Future fish passage for sea lamprey past the Ellsworth and Graham Lake dams, and even the future presence of these dams, are unknown at this point. (Ellsworth FLA 2015) Downstream fish passage of sea lamprey is facilitated by their lack of a swim bladder. In most situations they can pass through a turbine without suffering decompression damage. (Colotelo 2012)

5.3.4 Proposed environmental measures

5.3.4.1 Eel

There are currently no eel passage provisions on the Graham Lake dam nor on the Ellsworth dam. (Ellsworth FLA 2015) If eel passage is put in at the Graham Lake dam and at the Ellsworth dam, and young eel are found to be climbing or attempting to climb the Green Lake Dam, the need for upstream eel passage should be evaluated. Downstream passage should also be investigated at

that time. On an immediate basis, GLWP should maintain the current trash racks to minimize eel entrainment in the turbine.

5.3.4.2 Landlocked salmon

No changes are proposed for landlocked salmon. Landlocked salmon habitat in Green Lake has not been compromised by project operations and no changes are proposed in project operation that would modify this. Potential effects on landlocked salmon and their habitat should be evaluated as part of any fish passage evaluation in the future.

5.3.4.3 Lake trout

No changes are proposed for lake trout. Lake trout habitat in Green Lake has not been compromised by project operations and no changes are proposed in project operation that would modify this. Potential effects on lake trout and their habitat should be evaluated as part of any fish passage evaluation in the future.

5.3.4.4 Arctic charr

No changes are necessarily proposed for arctic charr at this time. Arctic charr habitat in Green Lake has not been compromised by project operations and no changes are proposed in project operation that would modify this. Potential effects on arctic charr and their habitat should be evaluated as part of any fish passage evaluation in the future.

The temperature study performed in Green Lake during the fall of 2020 showed that arctic charr spawning conditions occurred in early November. This indicates that it could be possible to delay the fall drawdown by two weeks so that it ended at the beginning of November. This would leave a minimum of 1.5 feet of water over the spawning locations during the winter.

Basing a long-term drawdown decision on one year's sampling could be risky, though any warming climate trend over time would be likely to make the beginning of November drawdown end more and more conservative. As part of the lake temperature study it was verified that water temperatures near the dam tracked well with water temperatures at likely arctic charr spawning sites. Temperature monitoring at the dam during the fall could be used to verify 2020 temperatures were not unusual. Such temperature monitoring is unlikely to be effective for determining the start of the drawdown during any particular year because the 2020 temperatures reflect water temperatures with the turbine operating part of the time, which is very likely to affect water temperatures at the dam.

If a drawdown change is warranted, GLWP recommends the drawdown start on 15-Sep and end on 31-Oct. Temperature monitoring during the drawdown at the dam and possibly at likely arctic charr spawning locations could be used at GLWP's option to determine if the drawdown period should be delayed further over a period of years. An approval system for such changes would be needed.

5.3.4.5 Smallmouth bass

No changes are proposed for smallmouth bass. Smallmouth bass habitat in Green Lake has not been compromised by project operations and no changes are proposed in project operation that

would modify this. Potential effects on smallmouth bass and their habitat should be evaluated as part of any fish passage evaluation in the future.

5.3.4.6 River herring

No changes are propose for river herring. Alewife passage would risk fish in the lake and blueback herring are not expected to have access to Reeds Brook.

5.3.4.7 American shad

No changes are proposed for American shad. American shad are not expected to have access to Reeds Brook.

5.3.4.8 Sea lamprey

No changes are proposed for sea lamprey. There is currently no fish passage for sea lamprey into Graham Lake. If such fish passage is established in the future, sea lamprey passage past Green Lake dam should be evaluated as to benefits, dangers and costs.

5.3.5 Unavoidable adverse impacts

5.3.5.1 Invasive species

Operation of the Project per the current and any expected future license makes Green Lake more appealing for recreational and habitational uses. With the concomitant launching of small boats, landscaping and access by people who also frequent other areas there is an increased risk of invasive wildlife species being introduced to the lake. No invasive species are documented as occurring in Green Lake, and the Green Lake Association has a boat inspection program. Invasive species are not considered to be a problem for Green Lake at this time.

The introduction of zebra mussels to a watershed poses a serious threat to native freshwater mussels in the watershed. Zebra mussels out compete native mussels for space and food. Zebra mussels have not been found in Maine as of the writing of this document. (MDIFW 2003a)

5.4 Terrestrial Resources

The northern long-eared bat and small brown bat, terrestrial resources that may occur in the Project area, are discussed in the Threatened and Endangered Species and Maine State listed species sections below.

5.4.1 Affected environment

Project operation affects the level of the water in Green Lake. Along with the effects on the littoral zone of the lake, this affect the distance from points on the shore (that may be used by nesting loons, for example) to the water in the lake. Given the small range of the summer water level fluctuations (+/- 6 inches) and the small drawdown (3.2 feet of a 55 foot littoral zone) the effects on most terrestrial resources around the lake (from such things as water table variations and accessibility of water by most wildlife species) are unlikely to be greater than effects of natural lake variations.

5.4.2 Environmental analysis

5.4.2.1 Loon

Common loon information provided by MDIFW in their ISR responses (MDIFW 2021) is overly simplistic: "Maine is home to 75% of the territorial pairs of loons in New England and New York, making it the stronghold for the northeast breeding population. Thus, despite the common loon's relatively stable and secure population within the State, Maine holds a high responsibility in the Northeastern United States for the species' continued conservation." This statement ignores the fact that that New England and New York are in the extreme southern limit of common loon breeding habitat.

From an area of habitat point of view, the Northeastern United States has a relatively small responsibility for the species' continued conservation. It is at the southern extreme of the climactic conditions tolerated by the loon. A continuing summer climate warming trend in North America would likely move the loon's preferred habitat further north.

"Water level management was shown to cause 60-70% of nest failure for loons on three lakes in Voyageur's National Park in Minnesota (Reiser 1988)." (MDIFW 2021) This statement is misleading. The report in question studied two lakes in the Voyageur's National Park that are relatively large, with managed levels, as well as a number of smaller lakes with no level management. The two large lakes studied were Rainy Lake (Rainy) and Namakan Reservoir (Namakan). The two lakes had level management schemes that resulted in Rainy having less level fluctuation than natural, and Namakan more level fluctuation than normal. Loon breeding success was higher than normal on Rainy Lake and lower than normal on Namakan Reservoir. So technically, lake level management both increased and decreased loon nest failure in Voyageur's National Park. Rainy had similar lake level fluctuations during the late spring and summer (the time period of concern for loons) to Green Lake. The recommendation of the cited study is "regulated water levels should peak by the first week of June and remain relatively stable through the second week of July." (Reiser 1988)

Loons may delay nesting until fluctuating water allow access to traditional nesting sites. (Windels 2013) This aligns well with the very high spring melt runoff conditions that occur some years at Green Lake. The maximum Green Lake water level that the Project is allowed to manage to is 160.7 ft USGS year round. The absolute minimum level is 157.5 ft during the winter, allowing a 3.2 ft range for the lake, but this is only during the parts of the year that do not affect loon nesting. From the first of June until early September (Labor Day) the minimum level the Project can manage

to is 159.7 ft. Typically the lake is near 160.7 on the first of June, reflecting the effects of spring runoff on the lake.

MDIFW's recommendation for the new license is to require the Green Lake water level be maintained with no more than 0.5 vertical feet up and 1 vertical foot down occurring within any 28-day period from 15-May through 31-July. GLWP believes this level maintenance method is impractical, and not necessarily in the best interest of the loons on Green Lake. It has the potential to drop water levels ever lower during the summer without the possibility of restoring water levels when heavy rain occurs. This ignores the fact that loons attempt to use traditional nest sites again. Dropping the lake without restoring the lake level quickly when possible, could leave traditional nest sites difficult for loons to access.

GLWP consulted with MDIFW on 05-May-2021 to work out a more practical solution that would also be less risky for the loons. The opinion of the staff biologist concerned with waterfowl on the call (Danielle D'Auria) was that the only solution was as stated in the recommendations (range of +0.5/-1.0 ft during any 28 day period for the 11 week period from 15-May to 31-Jul) and that the time range could not be narrowed down more than that by considering the specifics of Green Lake. The MDIFW Environmental Review Coordinator (John Perry) suggested that other projects have recommended a fixed range to manage the lake level to during the loon nesting season.

GLWP notes that MDIFW's statement that "water level management" is responsible for loon difficulties is, at face value, contradictory with their proposed solution: water level management. Perhaps a better statement would be that "water level mismanagement" is responsible for loon difficulties. GLWP does not believe it has been mismanaging water levels with respect to the loons.

GLWP has been operating under the current license with a range of 160.2 +/- 0.5 ft from 01-Jun through Labor Day, except for conditions beyond GLWP's control. This summer level range has been in use on Green Lake at least since 1985, so it is likely that traditional loon nesting sites will have been established by the loons based on this range.

5.4.2.2 Bald Eagle

Bald eagles have been reported in the project area. There are no nesting sites in the Green Lake nor Reeds Brook immediate vicinity, bald eagles may feed around the lake and in Reeds Brook. There is no major construction, major blasting or large tree felling expected as a result of relicensing.

5.4.3 Proposed environmental measures

5.4.3.1 Loons

GLWP recommends the new license maintain the summer level range from the current license.

5.4.3.2 Bald Eagle

Any minor blasting considered as an alternative for the leaching field feed piping work would be conducted during a season that minimize disturbance of eagles. All necessary permits and approvals would be obtained before work began.

5.4.4 Unavoidable adverse impacts

5.4.4.1 Invasive species

Operation of the Project per the current and any expected future license makes the Green Lake area more appealing for recreational and habitational uses. With the concomitant landscaping and access by people who also frequent other areas there is an increased risk of invasive wildlife species being introduced to the area. No invasive species are documented as occurring around Green Lake. Invasive species are not considered to be a problem for the Green Lake area at this time.

5.5 Maine State-listed Species

5.5.1 Species

The following Maine State-listed Species have been identified as potentially in the project area:

- Golden Eagle
- Northern Long-eared Bat
- Little Brown Bat
- Brook Floater Mussel
- Tidewater Mucket Mussel
- Yellow Lampmussel

5.5.2 Affected environment

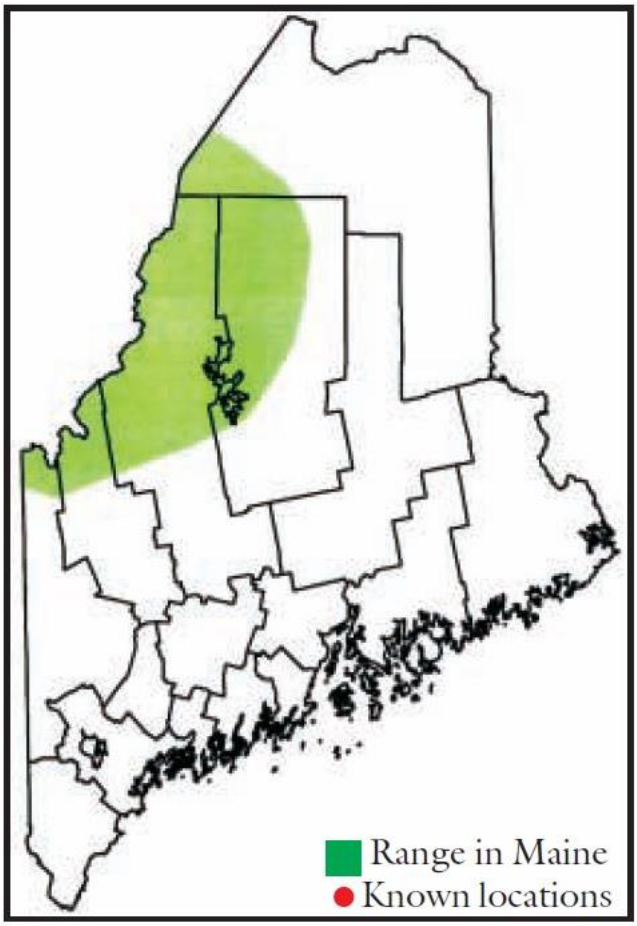
Project operation affects the level of the water in Green Lake. Along with the effects on the littoral zone of the lake, this affects the distance from points on the shore (that may be used by nesting loons, for example) to the water in the lake. Given the small range of the summer water level fluctuations (+/- 6 inches) and the small drawdown (3.2 feet of a 55 foot littoral zone) the effects on most terrestrial resources around the lake (from such things as water table variations and accessibility of water by most wildlife species) are unlikely to be greater than effects of natural lake variations.

Project operation also affects the flows in Reeds Brook. The range of flows in the brook is similar to the natural range, but on the average project operations reduce the yearly flow down Reeds Brook, which is a cumulative affect with Hatchery water use. On a rough scale, the timing of flows will be similar to natural flows (high flows in the spring and low flows in the late summer, for example), but project operations may affect the timing and duration of such flows on a shorter timescale.

5.5.3 Golden Eagle

Golden eagles are traditionally associated with rugged topography and open country including rangelands, tundra and alpine areas. In Maine, golden eagles have been typically associated with

mountainous areas in the western and northwestern portions of the state. Golden eagles have always been rare in Maine. Their range in Maine is shown in the following map:



The golden eagle range in Maine is far removed from the greater project area. No known golden eagle sightings have occurred in the project area.

5.5.4 Northern Long-eared Bat

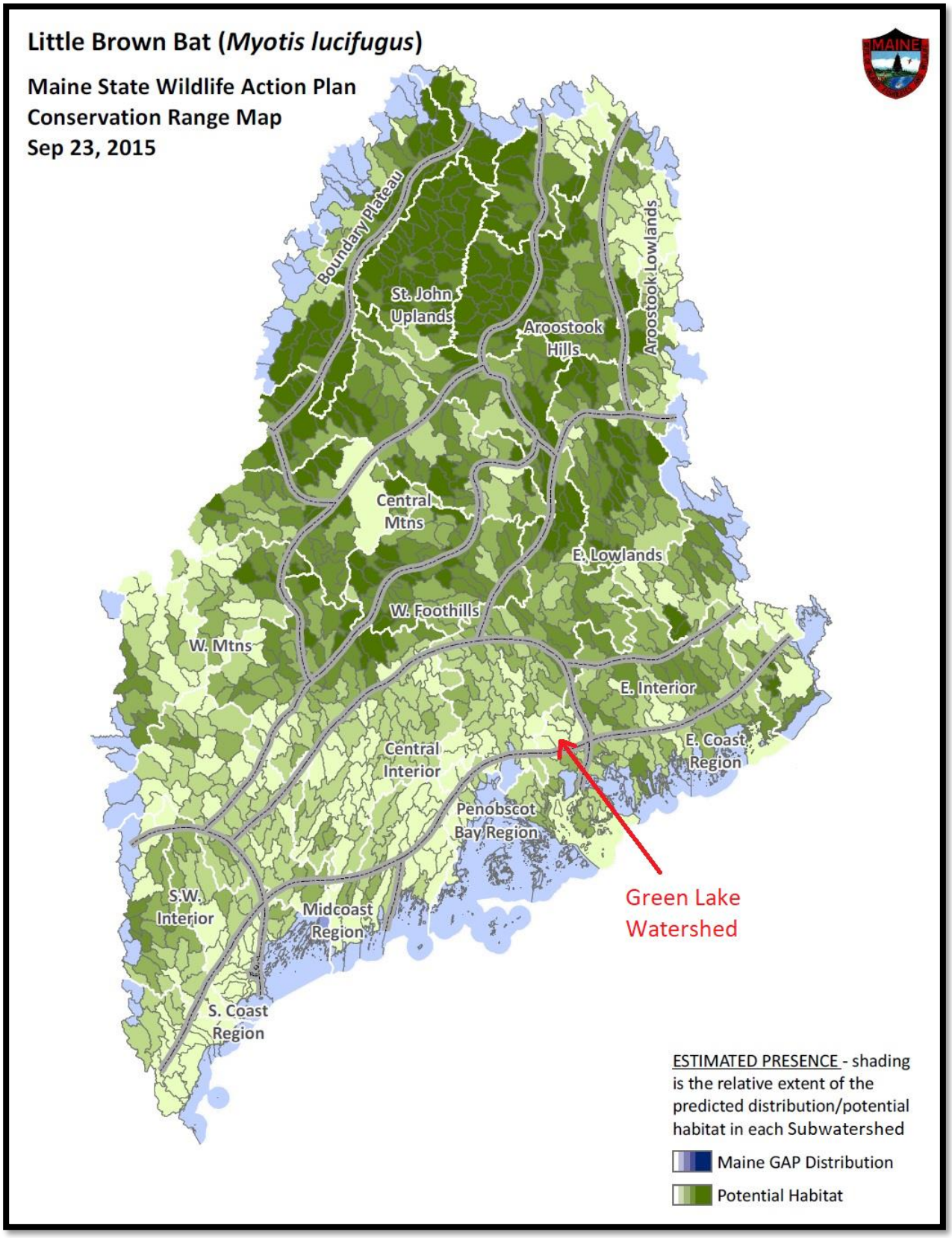
The northern long-eared bat is discussed in the Threatened and Endangered Species section, 5.6 below.

5.5.5 Little Brown Bat

Little brown bats hibernate in large groups in caves and mines during the winter. During the summer they roost during the day in such places as tree hollows, wood piles, rocky outcrops, buildings, etc. They prefer to roost in places that are warm and dark. Since little brown bats eat insects, they often forage along the edges of lakes and streams. (IFW 2015), (Fenton 1980)

Wind turbines are listed as a high severity stressor for little brown bats. Dams/water level fluctuation are not listed as a stressor. (IFW 2015)

The Green Lake watershed has a relative estimated little brown bat habitat potential of 2 on a 1-7 scale:



(IFW 2015), GLWP modified: legend "Town" to "Subwatershed", labeled Green Lake

By supporting clean water in the Green Lake watershed and Reeds Brook and maintaining stable water levels during the summer the Project is unlikely to adversely affect little brown bats.

5.5.6 Brook Floater Mussel

In Maine, the brook floater mussel's distribution is largely concentrated in the Penobscot River drainage and several Downeast river systems, with a few scattered populations in the Kennebec, St. George and Sheepscot River watersheds. An isolated population in the Pleasant River (Cuberland Co.) is the only known occurrence in southern Maine. The Union River watershed is near the Penobscot watershed, and is commonly considered a "Downeast river system." (IFW 2012)

Brook floater mussels are documented as being present in the West Branch of the Union River above Graham Lake. (DACF UpperUnion)

Brook floater mussels inhabit flowing water, from small streams to large rivers. It does not live in high-gradient streams with very fast current, nor is it usually found in slow water. It seems to prefer stable substrates such as coarse sand and gravel, and is often found in association with rooted aquatic vegetation. During part of their life cycle they burrow into the bottom, anchoring themselves with a muscular foot. (IFW 2012)

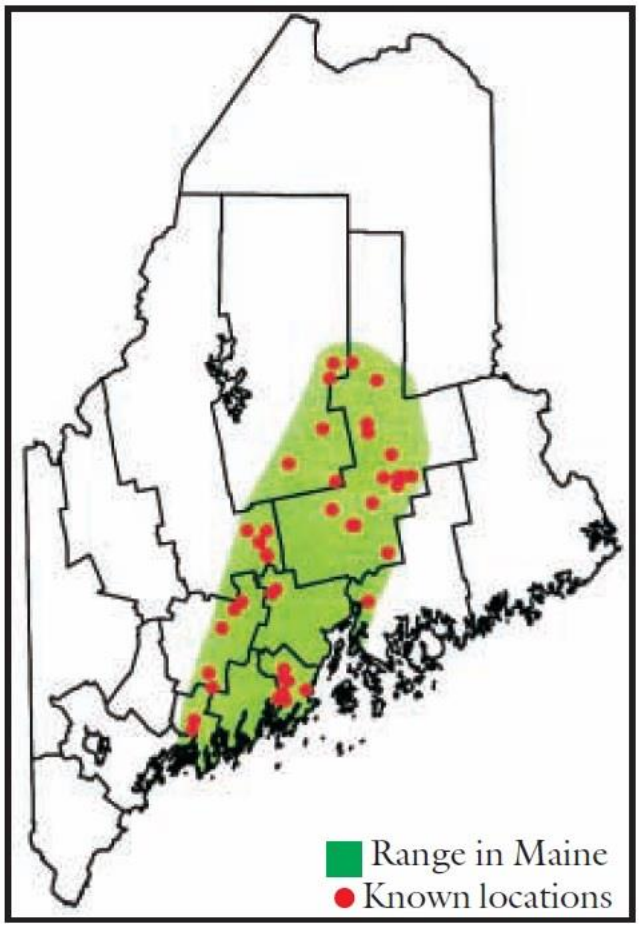
Green Lake, being essentially still water, would not be suitable habitat for brook floater mussels. Reeds Brook has sections that are medium or low gradient with moderate flows. The percentage of substrates that could be described as "course sand and gravel" is 11%, and this is in small pockets between cobble or boulders. The other 89% of the substrate is larger. Average flow velocities, even at higher CFS flow levels in Reeds Brook were not particularly high. Project operation has been shown to maintain good water quality in Reeds Brook. (See Study Results in section 6.0 below.)

Reeds Brook offers some habitat for brook floater mussels, but it does not appear to be ideal, or (on average) very acceptable habitat. With moderate flow speeds and support for good water quality in Reeds Brook, GLWP believes project operations have not, and are not expected to, adversely affect brook floater mussels or their habitat.

5.5.7 Tidewater Mucket Mussel

In Maine, the tidewater mucket mussel is found in the Merrymeeting Bay and the Penobscot, St. George, lower Kennebec and lower Androscoggin River watersheds. Its distribution is very similar to that of the yellow lampmussel, and they are often found together. (MDIFW 2003a)

The range of the tidewater mucket mussel in Maine is shown in the following map:



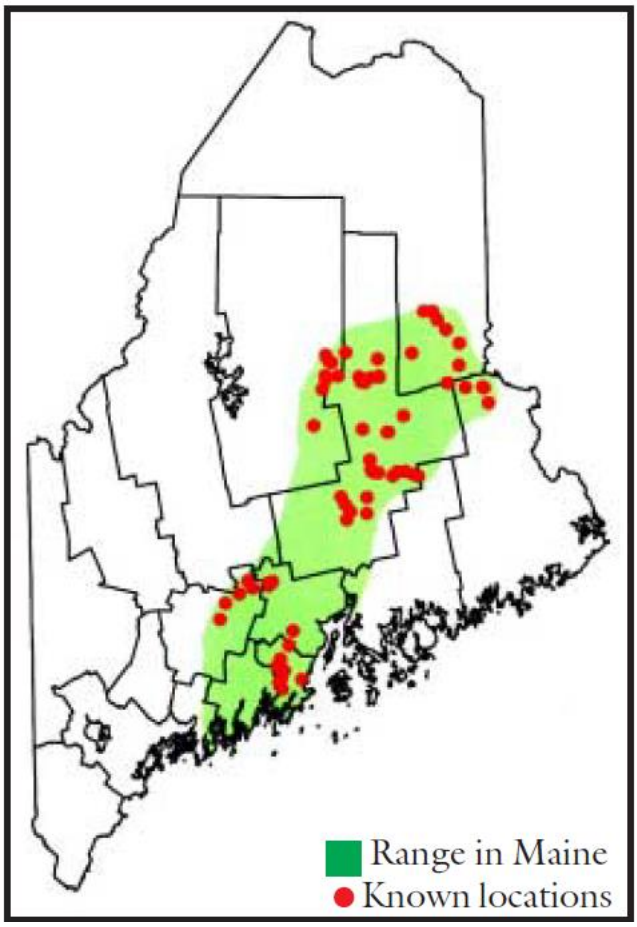
(MDIFW 2003b)

The tidewater mucket mussel range does not include any of the Green Lake watershed.

5.5.8 Yellow Lampmussel

In Maine, the yellow lampmussel is only known to exist in the Penobscot, St. Geore and lower Kennebec River watersheds. This species typically prefers medium to large rivers, but in Maine is often found in lakes and ponds, and will tolerate impounded sections of reivers. (MDIFW 2003b)

The range of the tidewater mucket mussel in Maine is shown in the following map:



(MDIFW 2003b)

The yellow lampmussel range does not include any of the Green Lake watershed.

5.5.1 Proposed environmental measures

No changes are proposed for Maine state listed species.

5.6 Threatened and Endangered Species

5.6.1 Affected environment

The Green Lake dam affects the lake level of Green Lake and the flow in Reeds Brook. The dam also has fish screens to avoid passage of most fish and to stop turbine entrainment of large fish.

Project operation also affects the Green Lake National Fish Hatchery.

5.6.2 Environmental analysis

5.6.2.1 Atlantic salmon

Atlantic salmon are native to Green Lake. Atlantic salmon potentially have fish passage into Graham Lake (if fish trapped at the Ellsworth dam are released in the southern end of Graham Lake and not kept as brood stock or released in the Union River above Graham Lake.)

With the current return rates for Atlantic salmon in the Union River, if returning salmon were released into southern Graham Lake and swam to the upper Union River and Reeds Brook proportionally to the drainage area, fewer than one Atlantic salmon in 20 years would swim up Reeds Brook.

Upstream fish passage at the Green Lake dam would risk allowing invasive species and warm water fish from Graham Lake into Green Lake, a cold water lake. Some species, such as largemouth bass, are likely to over-compete with existing fisheries in Green Lake. Green Lake has been a largely landlocked lake for many years. The existing fisheries have likely adapted to that environment.

Per US FWS, fish passage downstream requires at least 25 cfs and upstream fishway requires at least 40 cfs. The Green Lake National Fish Hatchery has priority use of up to 30 cfs from Green Lake. During the summer they typically use much less than this, but most summers with their actual use, the release of 1 cfs minimum flow in Reeds Brook, and no generation, the Project has a water deficit in the lake (the lake level drops). Details on this are in GLWP's *Comments and Information Regarding NMFS Study Dispute*. (GLWP 2020)

Any discussion of Atlantic salmon at the Green Lake project must consider cumulative effects with the Green Lake National Fish Hatchery (Hatchery). The Green Lake project is beneficial to the Hatchery. The Hatchery requires the Green Lake dam for a reliable supply of high quality water. Without the lake level rise caused by the dam, the Hatchery intake pipes would not be able to flow sufficient water to meet their needs. Also, a penstock tap provides the Hatchery with a reliable supply warm, oxygenated surface water during seasons when that is beneficial.

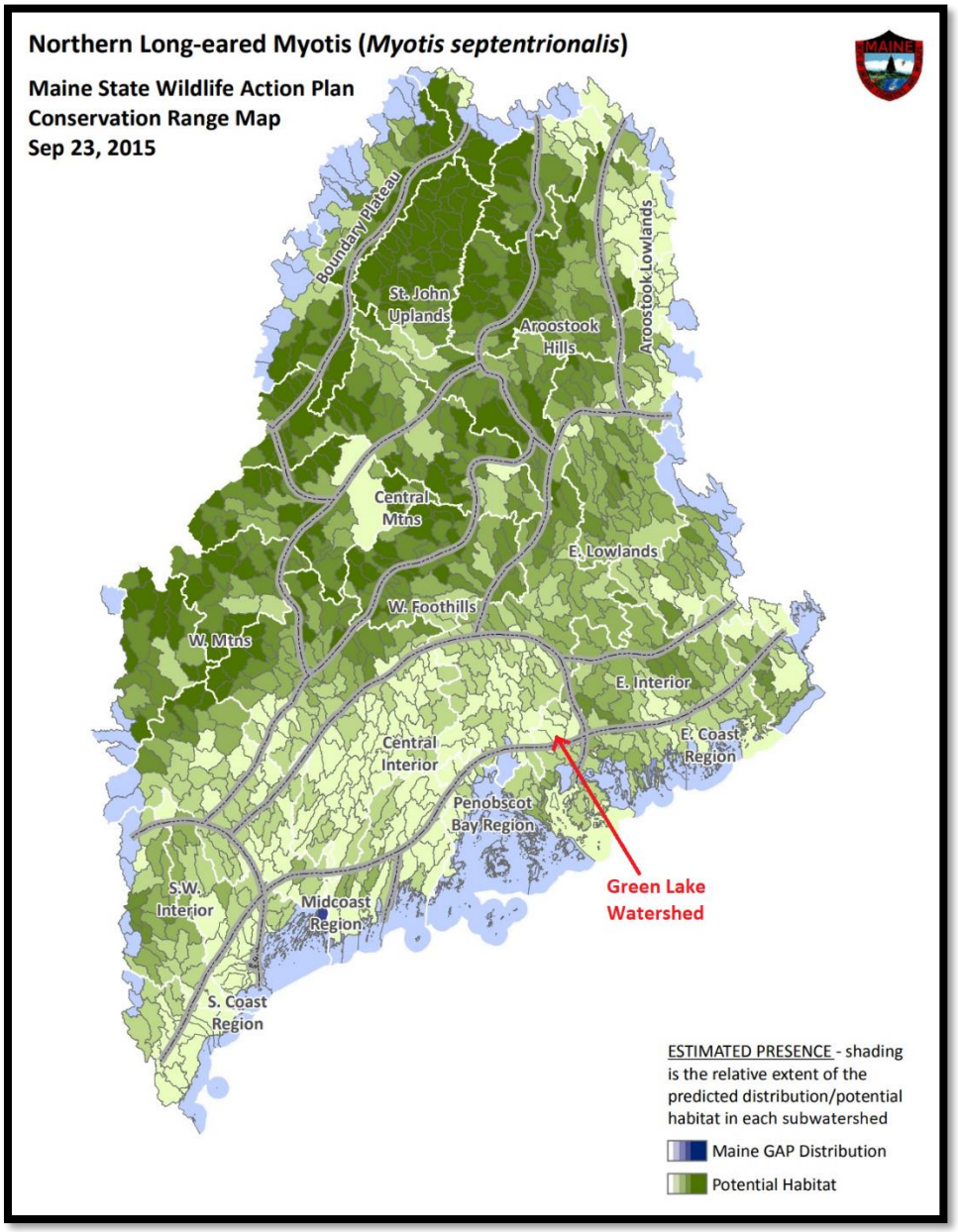
Because of pressure changes in the penstock when the turbine is running, turbine startups must be coordinated between GLWP and the Hatchery. Also, normal penstock patching can not be performed in the summer and must be deferred until the fall. These Project activities involve expense and inconvenience for GLWP, but they are taken seriously as part of support of the Hatchery and its mission to protect and restore Atlantic salmon.

5.6.2.2 Northern long-eared bat

Northern long-eared bats hibernate in large groups in caves and mines during the winter. During the spring and summer they spend the day roosting in trees and artificial structures, switching roosts every other day on average. Roost trees tend to be close together and within 2000 ft of forage areas. They are well suited to foraging in the forest interior on a diet focused on moths, but they also eat beetles, flies and other insects. They forage under the forest canopy or at the edge of forests. (IFW 2015b), (Foster 1999)

Wind turbines are listed as a high severity stressor for little brown bats. Dams/water level fluctuation are not listed as a stressor. (IFW 2015)

The Green Lake watershed has a relative estimated northern long-eared bat habitat potential of 2 on a 1-7 scale: (IFW 2015b)



GLWP modified: legend "Town" to "Subwatershed", labeled Green Lake

By supporting clean water in the Green Lake watershed and Reeds Brook and maintaining stable water levels during the summer the Project is unlikely to adversely affect northern long-eared bats.

5.6.3 Proposed environmental measures

5.6.3.1 Atlantic salmon

No changes are proposed for Atlantic salmon.

5.6.3.2 Northern long-eared bat

No changes are proposed for northern long-eared bats.

5.6.4 Unavoidable adverse impacts

No unavoidable adverse impacts are expected for threatened and endangered species.

5.7 Recreation, Land Use, and Aesthetic Resources

5.7.1 Affected environment

The project affects the lake level in Green Lake. This affects docks, beaches and boat ramps on Green Lake.

5.7.2 Environmental analysis

Green Lake is a scenic, deep-water lake. It is desirable place to have a seasonal camp or year-round residence, and is popular for boating and fishing. It has a boat ramp and beach created and maintained by the City of Ellsworth on the southwest side near the middle of the lake. The boat ramp was recently extended so that it is usable at lower water levels in the fall. There is a commercial beach at the extreme northwest end of the lake and various private beaches around the lake. There are about 218 docks on the lake associated with camps and residences. Typically docks and floats are deployed in the spring and moved onto the shore, outside the reach of water and ice during the winter.

Much of the shore of Green Lake is rocky, with boulders or large cobble of varying sizes. During the 2020 study period an erosion survey was done, and no serious major or progressing erosion was found. Study results are in section 6.0 below.

Traditionally, other than ice fishing and other on-ice activities, recreational use of the lake has been during the summer period. The construction of year-round residences around the lake has started to change that somewhat. Depending on the weather conditions of any particular fall, residents may want to use the lake into September, and some years into October. A warming climate would further this shift.

Current project operations give priority to recreational uses of the lake during the summer. During the summer the water level is maintained within a one-foot range from159.7 to 160.7 feet USGS. This stable water level facilitates the use of simple dock structures and increases predictability when navigating boats around rocks.

Outside the summer months, other factors are foremost in the management objectives. With concerns about dewatering fish eggs laid in the fall, the fall water level sets the minimum allowed water level until the following summer. This means that having room in Green Lake to absorb heavy spring runoff requires the lake be drawn down in the fall, and that the drawdown is completed before the fish in question spawn.

Another issue affecting lake residents as more permanent dock structures are built around the lake is ice. The maximum drawdown allowed by the Project is 2.2 feet below the summer range. During a heavy ice year with ice motion this is not enough of a height buffer to guarantee that structures that are near or under water in the summer will be protected from ice. It is not uncommon to have 2.5 feet of ice on some parts of the lake. When this ice is floating it rises about 3 inches above the water level, but pushed against the shore by wind it will rise 30 inches above the bottom.

The weather in the Ellsworth area is affected by the ocean more than non-coastal areas of central Maine. Some winters have thaws throughout the winter that keep an appreciable snowpack from forming. These winters may have cold dry spells that build significant ice on the lake as well. Without a snowpack to refill the lake in the spring, the lake must be kept reasonably full during the winter to avoid it the lake level being too low during the following summer. These winters have the combined problem of higher than is considered "normal" water levels plus reasonably thick ice.

5.7.3 Proposed environmental measures

No changes are proposed at this time.

5.7.4 Unavoidable adverse impacts

Water level fluctuations, waves and ice conditions are inherent in the lake, whether the lake level is managed or not.

5.8 Cultural resources

5.8.1 Architectural

An architectural survey was done for the project in 2020. No architectural properties associated with the Project were found eligible for listing in the National Register of Historic places. The Maine State Historic Preservation Commission concurred. See study results in section 7.0 below.

5.8.2 Archeological

The Maine State Historic Preservation Commission determined, during the original licensing of the Green Lake project that it would not affect archeological resources:

MAINE HISTORIC PRESERVATION COMMISSION
55 Capitol Street
Augusta, Maine 04333

Earle G. Shettleworth, Jr.
Director

Telephone:
207-289-2133

September 14, 1981

Mr. Frank H. Dunlap
Kleinschmidt and Dutting
75 Main Street
P. O. Box 76
Pittsfield, Maine 04967

re: Green Lake Hydroeclectric Project, FERC #4894

Dear Mr. Dunlap:

My staff archaeologist, Dr. Arthur Spiess, has carefully field checked the project area for the proposed Green Lake Hydroelectric Project. There are archaeological sites nearby, but they are outside the project impact area.

I find that this project will have no effect upon any structure or site of historic, architectural, or archaeological significance as defined by the National Historic Preservation Act of 1966.

If I can be of further assistance concerning this matter, please do not hesitate to let me know.

Sincerely,

Earle G. Shettleworth, Jr.
State Historic Preservation Officer

EGS/slm

No changes to the basic project boundary are being requested during relicensing, and no erosion was found that would extend the area of potential affect beyond that of the original project. See study results in 7.0 below.

5.9 References

Where the reference is for a document on the FERC site beginning with a number representing the date, the documents can be found on the FERC Site at https://elibrary.ferc.gov/eLibrary/search

Fish Stocking Report: Fishing Resources: Fishing: Fishing & Boating: Maine Dept of Inland Fisheries and Wildlife

Fish survey - green_lake.pdf (maine.gov)

MDIFW, 1995 - green_lake.pdf (maine.gov)

MDIFW, 2020 - Fish Stocking Report: Fishing Resources: Fishing: Fishing & Boating: Maine Dept of Inland Fisheries and Wildlife

Boucher, 2012 - LANDLOCKED SALMON MANAGEMENT PLAN (maine.gov)

RSP, 2021 – GLWP Revised Study Plan - 20200113-5153 - Docket P-7189-014 on the FERC site

Reiser 1988 - Effects of Regulated Lake Levels on the Reproductive Success, Distribution, and Abundance of the Aquatic Bird Community in Voyageurs National Park, Minnesota (nps.gov)

Windels 2013 - Effects of Water-Level Management on Nesting Success of Common Loons (unl.edu)

Hetke 2008 - Smallmouth bass (Home) (uwlax.edu)

Charr 2021 - Arctic Charr: Species Information: Fisheries: Fish & Wildlife: Maine Dept of Inland Fisheries and Wildlife

Cornwell 2020 - https://www.bassresource.com/fish_biology/smallmouth-largemouth-together-pond.html

ISR 2021 - GLWP Initial Study Report – 20210211-5007 –Docket P-7189-014 on the FERC site

Ellsworth FLA 2015 – 20151230-5275 - under Docket P-2727-092 on the FERC site

IFW 2015 - https://www.maine.gov/ifw/wildlife/reports/pdfs/SGCN_Reports/SGCN/Little%20Brown%20Bat__Myotis%20lucifugus.pdf

Fenton 1980 - https://academic.oup.com/mspecies/article/doi/10.2307/3503792/2600557

IFW 2012 - https://www.maine.gov/ifw/docs/endangered/BrookFloater2012.pdf

DACF UpperUnion - https://www.maine.gov/dacf/mnap/focusarea/upper_union_river_focus_area.pdf

MDIFW 2003a - https://www.maine.gov/ifw/docs/endangered/tidewatermucket_90_91.pdf

MDIFW 2003b - https://www.maine.gov/ifw/docs/endangered/yellowlampmussel_92_93.pdf

MDIFW 2019 - 20190626-5053(33646564)-MDIFW-John-Perry

Ellsworth FLA 2015 - 20151230-5275_P-2727_ELLSWORTH_FLA PUBLIC_FINAL.pdf

GLWP 2020 - 20200320-5152_20200320-Dispute-Letter-to-the-Secretary.pdf

IFW 2015b - https://www.maine.gov/ifw/wildlife/reports/pdfs/SGCN_Reports/SGCN/Northern%20Long-eared%20Myotis__Myotis%20septentrionalis.pdf

Foster 1999 - https://academic.oup.com/jmammal/article/80/2/659/899920

Colotelo 2012 - https://doi.org/10.1016/j.fishres.2012.06.001

Kircheis 2004 - https://www.fws.gov/GOMCP/pdfs/lampreyreport.pdf

6.0 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. § 803(a)(2)(A), requires FERC to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. On April 27, 1988, FERC issued Order No. 481-A, revising Order No. 481, issued October 26, 1987, establishing that FERC will accord FPA Section 10(a)(2)(A) comprehensive plan status to any federal or stat plan that: (1) is a comprehensive study of one or more of the beneficial uses of a waterway or waterways; (2) specifies the standards, the data, and the methodology used; and (3) is filed with the Secretary of FERC.

FERC currently lists 40 comprehensive plans for the state of Maine (FERC 2021). Of the listed plans, FERC named the following 20 plans, that may be relevant to the project, in the Green Lake Scoping Document 2.

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 1

Volume 1 contains the Comprehensive Hydropower Plan issued by the Maine Office of Energy Resources (MOER) in October 1982. The Comprehensive Hydropower Plan consists of three parts: Maine Rivers Policy, The Projected Contribution of Hydroelectric Generation to Meeting Maine's Electricity Needs in 1990 and 2000, and the Statewide Fisheries Plan, Summary.

"Maine Rivers Policy," Executive Order No. 1, FY 82/83

On July 6, 1982, Governor Joseph E. Brennan issued the above-captioned Executive Order designating certain river stretches as meriting special protection. The Governor ordered that no new dams shall be constructed on these stretches and that additional development or redevelopment of existing dams on these stretches be designed and executed in a manner that either enhances significant resources values or does not diminish them. This policy was adopted legislatively as part of the Maine Rivers Act.

The Project is not located on one of the listed river segments meriting special protection. Therefore, the order is not applicable to the Project.

The Projected Contribution of Hydroelectric Generation to Meeting Maine's Electricity Needs in 1990 and 2000 (Maine Office of Energy Resources, October 1982)

Executive Order No. 1, FY82/83 directed MOER to prepare an estimate of the contribution that hydropower could make to meet the State's electricity needs in the years 1990 and 2000. The report was prepared in 1982; therefore, much of the information in the MOER report is outdated. However, the report does stress that Maine's energy policy "call for increased reliance on indigenous and renewable resources, such as hydro, in preference to imported and nonrenewable resources, such as oil."

The Project currently conforms with this portion of the Plan in that it contributes hydroelectric generation (an indigenous and renewable resource) in meeting Maine's electricity needs. The new license for the Project is projected to be issued in 2024 and the Project will continue to conform with this portion of the Plan.

Statewide Fisheries Plan, Summary (Maine Department of Inland Fisheries and Wildlife, June 1982)

The Statewide Fisheries Plan evaluates, by river basin, whether new or improved fish passage facilities may be needed at hydro development sites. It also specifies the fishery agencies' management goals, as they existed in 1982. This Plan represents the policies of the three author agencies (Maine Department of Inland Fisheries and Wildlife [MDIFW], Department of Marine Resources [DMR], and Atlantic Sea-Run Salmon Commission – now under the auspices of the Division of Sea-run Fisheries and Habitat within the Maine DMR) regarding conservation, management, and enhancement of river fishery resources in Maine. The Plan also identifies and evaluates significant river fisheries based upon several criteria. The Plan was written before the Green Lake Project existed but it states that at the Ellsworth Project, "No fish passage is required at this time".

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 2

Volume 2 of the State of Maine Comprehensive Rivers Management Plan consists of the 1982 Maine Rivers Study. The Maine Rivers Study defines a list of unique and natural recreation rivers and classifies the rivers as A, B, C, or D. This study, prepared by the Maine Department of Conservation and National Park Service, identifies the main stem of the Union River from its outlet in Union Bay to Graham Lake, as Class C waters.

The project is not directly on the main stem of the Union River, but this plan may still apply. GLWP has not been able to locate a copy of this plan online for preparation of the DLA. GLWP will complete this section for the FLA.

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 3

Volume 3 of the State of Maine Comprehensive Rivers Management Plan contains two parts. Part I is a compilation of laws which affect the construction, operation, maintenance, and licensing of hydro projects in Maine. Part II is a compilation of Executive Department Orders and other plans. (Note: A discussion of revised laws and Executive Department Orders implemented after the submittal of Volume 3 to the FERC in 1987 is contained in Volume 4 of the State of Maine Comprehensive Rivers Management Plan submitted to FERC in 1992, see discussion below.)

Volume 3, Part I – Core Laws

The applicability of these Core Laws to the Green Lake Project are discussed below.

Maine Rivers Act

> In the Maine Rivers Act 12 M.R.S.A.§401 et. seq., the Legislature expressly found: …..the state's rivers comprise one of its most important natural resources, historically vital to the state's commerce and industry; that the value of the state's rivers and streams has increased due to the growth in demand for hydropower; that the rivers and streams afford Maine

people with major opportunities for economic expansion through the development of hydropower; and that "the best interests of the state's people are served by a policy which recognizes the importance that their rivers and streams have for meeting portions of several public needs, provides guidance for striking a balance among the various uses which affords the public the maximum benefit and seeks harmony rather than conflict among these uses." 38 M.R.S.A.§402(6).

Green Lake has consulted with and actively worked to resolve issues as they were raised by appropriate federal and state agencies, tribes, local governments, and non-governmental organizations (NGOs) during the relicensing process. This process has identified the importance of continued operation of the Project while identifying the relative importance of the lake and brook and their resources for various uses in providing public benefits. The Project conforms with these Core Laws.

Maine Waterway Development and Conservation Act (MWDCA) 38 M.R.S.A.§630 et. seq.

The MWDCA replaced several earlier laws and requires the developer to obtain one permit from the Maine Department of Environmental Protection (MDEP) or the Land Use Planning Commission (LUPC). The legislature emphasized the importance of hydropower to the State of Maine when it enacted the MWDCA.

> The legislature finds and declares that the surface waters of the State constitute a valuable indigenous and renewable energy resource; and that hydropower development utilizing these waters is unique in its benefits and impacts to the natural environment, and makes a significant contribution to the general welfare of the citizens of the State for the following reasons:
>
> - Hydropower is the State's only economically feasible, large-scale energy resource which does not rely on combustion of a fuel, thereby avoiding air pollution, solid waste disposal problems and hazards to human health from emissions, wastes and byproducts. Hydropower can be developed at many sites with minimal environmental impacts, especially at sites with existing dams or where current type turbines can be used.
> - Like all energy generating facilities, hydropower projects can have adverse effects; in contrast with other energy sources, they may also have positive environmental effects. For example, hydropower dams can control floods and augment downstream flow to improve fish and wildlife habitats, water quality and recreation opportunities.
> - Hydropower is presently the State's most significant indigenous resource that can be used to free our citizens from their extreme dependence on foreign oil for peaking power.

GLWP is proposing to continue to operate the Project to provide a source of renewable energy available to the people of Maine. Therefore, the continued operation of the Project is consistent with the policies expressed by the Maine legislature. By continuing to operate the Project as

proposed, the energy-related benefits noted above will continue, as will the benefits to fish and wildlife habitat, water quality and recreation opportunities.

An Act Concerning Fishways in Dams and Other Artificial Obstructions in Inland Waterways – 12 M.R.S.A.§7701-A

This act was enacted with the intent of conserving, developing, or restoring anadromous or migratory fish resources by requiring the construction or repair of fishways. The decision to require a fishway at a dam must, under the Act, be based on the restoration of one or more fish species of anadromous or migratory fish to the area upstream of the obstruction. In addition, the decision to require a fishway may be justified by the protection or enhancement of any rare, threatened, or endangered fish species.

See discussion of fishway facilities – Exhibit E, Section 5

An Act Concerning Fishways in Dams and Other Artificial Obstructions in Coastal Waters – 12

M.R.S.A.§6121

This act states that the Commissioner of Inland Fisheries and Wildlife shall annually examine all dams and other artificial obstructions to fish passage within the coastal waters in order to determine whether fishways are necessary, sufficient or suitable for the passage of anadromous fish.

See discussion of fishway facilities – Exhibit E, Section 5

The Maine Dam Inspection, Registration, and Abandonment Act – 38 M.R.S.A.§815 et. seq.2

This law allows MDEP to establish water level regimes and minimum flow requirements for impoundments not within the jurisdiction of FERC.

This statute is not applicable to the Project since it is a FERC-licensed Project and is not subject to Maine DEP jurisdiction regarding establishment of water levels.

An Act to Amend the Classification System for Maine Waters and Change the Classification of Certain Waters – 38 M.R.S.A.§464 et. seq.

This Act was enacted to restore and maintain the chemical, physical, and biological integrity of the State's waters and to preserve certain pristine state waters. Water quality standards for fresh surface waters established by the Act that are pertinent to the Green Lake Project consist of Class B, and Class GPA waters. The Project conforms with these standards.

Alteration of Rivers, Streams and Brooks – 38 M.R.S.A.§425 et. seq.

This article prohibited the alteration of a river, stream, or brook or areas adjacent to rivers, streams, or brooks due to dredging, filling, or construction such that any dredged spoil, fill or structure may fall or be washed into these waters without first obtaining a permit from the Commissioner. This act was replaced with the Natural Resources Protection Act (NRPA), 38 M.R.S.A.§480-A et. seq. which regulates similar activities along the State's waters. However, projects that are reviewed under the MWDCA are not subject to review under the Natural Resources Protection Act (NRPA).

The Licensee is not proposing any construction or redevelopment of the Project that would require an NRPA permit. If any construction is proposed in the future, the appropriate permits will be obtained.

Mandatory Shoreland Zoning and Subdivision Control – 38 M.R.S.A.§435 et. seq.

This article requires that lands within 250 feet of the normal high water mark of certain waters or wetlands be subjected to municipal zoning and subdivision control.

The City of Ellsworth and the Town of Dedham currently have zoning requirements for those lands located within 250 feet of the normal high water mark of the Project impoundments.

Land Subdivision – 30-A M.R.S.A.§4401-4407

This article grants special protection from land subdivisions to particular river reaches identified in the article. This article does not include any Project area lands. GLWP is not proposing any construction that would be considered a subdivision. The Project conforms with this article.

Land Use Regulations – 12 M.R.S.A. §681 et. seq

This article requires the sound planning, zoning, and subdivision control of the unorganized and organized townships of the State.

The City of Ellsworth and Town of Dedham are located in an organized portion of the state that is subject to the jurisdiction of the Maine Department of Environmental Protection and local municipalities. The Project conforms to this article.

Special River Protection Zoning Map. Legend List (Maine Land Use Regulation Commission, 1987)

This map identifies river segments that have been designated by the Land Use Regulatory Commission3 for "Special River Protection Zoning." The Project is located in an organized portion of the state that is subject to the jurisdiction of the Maine Department of Environmental Protection and local municipalities. The project is not located in the Special River Protection Zoning area.

Maine Rivers Access and Easement Plan (Joseph Handy, 1985)

GLWP does not manage any recreational facilities. However, we support recreational use of the lake as covered in Section 5.7 above.

Designating the State Agencies Responsible for Water Quality Certification, Executive Order No. 5, FY85/86 Note: Updated Order No. 3, 96/97

This executive order identifies the state agencies responsible for reviewing and authorizing water quality certifications for hydropower projects. Maine DEP has jurisdiction for water quality certification for the licensing of the GLWP Project.

GLWP will apply for water quality certification from Maine DEP in accordance with FERC's regulations.

State of Maine Comprehensive River Management Plan – December 1992 – Volume 4

Volume 4 of the State of Maine Comprehensive River Management Plan consists of three sections. Part I is a summary of the revised Core Hydro Laws subsequent to those contained in Volume 3 which were approved in 1987. Part II is a compilation of Executive Orders and other plans including Maine resource agency policy regarding hydropower. Part III contains reports and studies regarding hydropower and relicensing.

Volume 4, Part I – Revised Core Hydro Laws

The revisions to the Core Hydro Laws contained in Volume 4 of the Plan are not all pertinent to the GLWP Project. The revised Core Hydro Laws that are pertinent to the Project are discussed below.

Hydropower Relicensing Standards

These standards require that existing hydropower impoundments be managed to protect habitat and aquatic life criteria commensurate with the appropriate water quality classifications. The operation of the Project and its consistency with these standards is discussed in Exhibit E, Section 3

Volume 4, Part II – Compilation of Executive Orders and Other Plans

Part II of Volume 4, Implementing Plans and Orders, contains State resource agency plans and policies regarding hydropower. The following plans and orders are discussed:

State of Maine Statewide River Fisheries Management Plan, June 1982

This plan is discussed previously under State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 1.

Addendum to the State of Maine Statewide Fisheries Management Plan, June 1982

The addendum includes the Union River, which it lists as having the potential for two million alewives.

Maine Comprehensive Hydropower Plan, July 1992

This plan assessed the then current and future demand for hydropower in the State of Maine. Hydropower is recognized as a significant resource available for use in meeting current and future energy needs. Operation of the Green Lake Project is consistent with this plan as it will continue to produce reliable, efficient indigenous energy from hydropower to meet the State of Maine energy needs.

Maine State Agency Hydropower Policy Statements

These policy statements provide the basis for agency comments on hydro-project license applications. These statements are not directly applicable to the Green Lake Project as they set out the policy for State agencies to follow in commenting on hydro projects in general. Agency comments on the Project are addressed in the appropriate sections of Exhibit E.

Executive Order Designating the State Agencies Responsible for Water Quality Certification

This order identifies Maine DEP as the agency responsible for reviewing and providing water quality certification. GLWP will apply for water quality certification from Maine DEP in accordance

with FERC regulations. Project water quality and its consistency with these standards is discussed in Exhibit E, Section 5

Feasibility Study of Maine's Small Hydropower Potential

This study was performed for the Maine Office of Energy Resources and examined the potential for development/expansion of hydropower development of Maine's low head dams.

This plan is not applicable to the Green Lake Project.

Maine Hydropower Licensing and Relicensing Status Report 1989-91

These reports update hydropower licensing and relicensing activities in the State of Maine for 1989 through 1991.

Volume 4, Part III – Hydropower and Relicensing Reports and Studies

This section of Volume 4 of the State of Maine Comprehensive River Management Plan describes the current regulations for hydropower relicensing and reports the status of Maine projects with regard to the federal relicensing process.

The studies and reports contained in Part III of the State of Maine Comprehensive River Management Plan are not pertinent to the Green Lake Project.

Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, and Atlantic Sea-Run Salmon Commission

This plan is discussed previously under State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 1.

Management of Atlantic Salmon in the State of Maine: A Strategic Plan – July 1984, Maine Atlantic Sea-Run Salmon Commission

This plan lists as its objectives the maintenance of Atlantic salmon populations in rivers where they currently exist, and the restoration of Atlantic salmon populations in historical salmon rivers. The plan also identifies specific strategies to achieve the stated objectives, including fishway installation or improvement, increased hatchery capacity, and diversion of hatchery stocks once natural reproduction increases in stocked rivers. This plan was written in 1984 so the Green Lake Project was not yet built. The Ellsworth Project was not targeted by these restoration plans.

Maine State Comprehensive Outdoor Recreation Plan (SCORP) 2003-2008, Maine Department of Conservation, Bureau of Parks and Lands

This plan serves as the State's official policy document for statewide outdoor recreation planning and for acquisition and development of public outdoor recreation areas and facilities. The plan identifies outdoor recreation issues of Statewide importance based upon, but not limited to, input from the public participation program and also provides information about the demand for and supply of outdoor recreation resources and facilities in the state. The SCORP satisfies the requirements of the Land and Water Conservation Fund (LWCF) Act (P.I. 88-578) which dictates that each state have an approved SCORP available on file with the National Park Service in order to participate in the LWCF program. The SCORP contains an implementation program that identifies

the State's strategies, priorities, and actions for the obligation of its LWCF apportionment. The SCORP also includes a wetlands priority component with Section 303 of the Emergency Wetlands Resources Act of 1986. This wetland component provides information on state wetland conservation planning efforts as reflected in the Maine State Wetlands Conservation Plan published in 2001.

The SCORP does not contain any recommendations or assessments that are specific to the Green Lake Project area. GLWP is in compliance with the strategies outlined in this plan.

2.8.2 FERC-Approved Federal Comprehensive Plans

Atlantic Salmon Restoration in New England, Final Environmental Impact Statement 1989-2021. U.S. Fish and Wildlife Service, 1989; Recovery Plan for the Gulf of Maine DPS of Atlantic Salmon – NMFS 2018

After originally listing the Gulf of Maine (GOM) distinct population segment (DPS) of Atlantic salmon as endangered in December 2000 and publishing a recovery plan in November 2005, the USFWS and NMFS conducted a second status review and listed an expanded GOM DPS on June 19, 2009. The expanded DPS encompasses all anadromous Atlantic salmon in a freshwater range covering the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River and includes all associated conservation hatchery populations used to supplement these natural populations. Concurrent with the new listing, NMFS identified and designated critical habitat within the range of the expanded GOM DPS.

This recovery plan is based on two premises: first, that recovery actions must focus on rivers and estuaries located in the GOM DPS until we better understand threats in the marine environment, and second, that survival of Atlantic salmon in the DPS will be dependent on conservation hatcheries through much of the recovery process.

Please see Exhibit E, Section 5 for more information.

Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service

This policy, under the auspices of the 1988 National Recreational Fisheries Policy (National Policy), encompasses the guiding principles, goals, and objectives set forth by the National Policy. The Policy, in short, defines the USFWS's stewardship role in management of the Nation's recreational fishery resources, which include not only angling, but fish watching and photographing. With the Fisheries USA, USFWS committed to accomplish three goals:

- Usability – to optimize the opportunities for people to enjoy the Nation's recreational fisheries.
- Sustainability – to ensure the future of quality and quantity of the Nation's recreational fisheries; and
- Action – to work in partnership with other Federal governmental agencies, states, tribes, conservation organizations, and the public to effectively manage the Nation's recreational fisheries.

GLWP does not manage any recreational facilities. However, we support recreational use of the lake as covered in Section 5.7 above.

Nationwide Rivers Inventory. National Park Service, January 1982, updated 1995

The Nationwide Rivers Inventory (NRI), completed in 1981 for the New England Region, is a survey of the nation's rivers conducted to identify segments meeting the minimum criteria for further study and/or potential inclusion into the National Wild and Scenic Rivers System (NWSRS). Once included on the NRI, a river is protected to the extent that pursuant to Section f(d) of the Wild and Scenic Rivers Act, and in accordance with a Presidential Directive and guidance in the form of "Procedures for Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory," issued by the Council on Environmental Quality:

> "Each federal agency shall, as part of its normal planning and environmental review process, take care to avoid or mitigate adverse effects on Rivers identified in the Nationwide Inventory." [Presidential Directive, August 2, 1979.]

This directive gives guidance to federal agencies on protecting the resources that cause the river to qualify for listing on the NRI.

This directive is not applicable to the Green Lake Project.

North American Waterfowl Management Plan – 1986 U.S. Fish and Wildlife Service and Canadian Wildlife Service

This plan identifies waterfowl population goals and outlines the requirements of a waterfowl management and conservation program that would attain these goals. The plan addresses 37 species of the family *Anatidae*, (i.e., ducks, geese and swans) which occur in both the United States and Canada. The plan also discusses groups of similar species in terms of their ecological niche, distribution, abundance, breeding, population status and outlook, and causes of population declines or increases. The plan outlines a variety of initiatives and recommendations which will protect and enhance waterfowl resources, including: financial incentives for landowners for habitat maintenance; outright purchase of significant habitat; protective zoning; private land conservation promotion; financial participation of private conservation organizations; prioritization of public land management to enhance waterfowl resources; public works planning which considers and mitigates waterfowl resource impacts; and encouragement of joint ventures between private and public groups to enhance and preserve waterfowl habitat. Specific recommendations identify areas to be preserved, bag limits, and other hunting limitations for certain species and survey activities.

The majority of initiatives and recommendations contained in this plan are beyond the scope of GLWPs operation of the Green Lake Project. Continued operation of the Green Lake Project, as proposed, will have no new effects to Project wildlife or their habitats. The Project is in conformance with the plan.

Final Amendment #11 to the Northeast Multi-species Fishery Management Plan; Amendment #1 to the Atlantic Salmon FMP; and Components of the Proposed Atlantic Herring FMP for Essential Fish Habitat. Volume 1. (USFWS, 1998)

In 1996 the U.S. Congress recognized the increasing pressure on marine resources in the country and addressed these problems in its reauthorization of the Magnuson Fishery Conservation and Management Act, now known as the Magnuson-Stevens Act. This Act required the eight Regional Fishery Management Councils, in collaboration with National Oceanic and Atmospheric Administration (NOAA) Fisheries, to give heightened consideration to Essential Fish Habitat (EFH) in resource management decisions. Congress defined EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity." The designation and conservation of EFH seeks to minimize adverse effects on habitat caused by fishing and non-fishing activities.

The EFH designation for Atlantic salmon represents all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. Other species of fish incorporated under the NMFS amendments are not applicable to the Project.

Before a Federal agency proceeds with an activity that may adversely affect a designated EFH (e.g., relicensing of a hydro project), the agency must: 1) consult with NOAA Fisheries and, if requested, the appropriate Council for the recommended measures to conserve EFH and 2) reply within thirty days of receiving EFH recommendations. The agency response must include proposed measures to avoid or minimize adverse impacts on the habitat, or alternatively an explanation if the agency cannot adhere to the recommendation from NOAA Fisheries.

FERC will initiate consultation with NMFS regarding EFH for Atlantic salmon in the Project area following receipt of this application.

As mentioned previously, the CFMP addresses the need for fish passage facilities at the Project in a comprehensive fashion. The state and federal natural resource agencies are signatories to the CFMP, which is consistent with the objectives described in this document.

Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission: Shad and River Herring – Technical Addendum 1 to Amendment 1 of the Interstate Fisheries Management Plan for Shad and River Herring

The Atlantic States Marine Fisheries Commission prepared a Fishery Management Plan for the shad and river herring fishery in order to protect and restore the species. The goal of this amendment is to: protect, enhance, and restore East Coast migratory spawning stocks of American shad, hickory shad, and river herrings in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass.

These documents describe the goals and objectives for the species, its current status, the ecological challenges affecting the species, and management options and actions needed to reach and maintain management goals.

Shad and River Herring are discussed in Section 5.3.3 above.

Interstate Fishery Management Plan for Shad and River Herring Amendment 2 - 2009. Atlantic States Marine Fisheries Commission.

Amendment 2 was developed based on the concern that river herring are in decline coast-wide. Amendment 2 prohibits interstate commercial and recreational fisheries beginning January 1, 2012, unless a sustainable management plan was submitted for approval by a state or jurisdiction by January 1, 2010. Amendment 2 also required fishery independent and dependent monitoring from member states to conserve, restore, and protect critical river herring habitat

Interstate Fishery Management Plan for Shad and River Herring Amendment 3 - 2010. Atlantic States Marine Fisheries Commission.

Amendment 3 establishes a coast wide commercial and recreational moratorium, with exceptions for sustainable systems, for shad and river herring. To improve data collection of shad and herring, Amendment 3 implemented additional fisheries independent and dependent monitoring for some states or jurisdictions, such as, monitoring stocks, hatchery production, and commercial, recreational, and bycatch fisheries. Finally, Amendment 3 requires states and jurisdictions to submit a habitat plan regardless of whether their commercial fishery would remain open.

Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fisheries Management for American Eel (*Anguilla rostrata*) – 2000;

Amendment 2 to the Interstate Fishery Management Plan for American eel – 2008; Addendum III to the Interstate Fishery Management Plan for American eel – 2013; Addendum IV to the Interstate Fishery Management Plan for American eel – 2014.

The Atlantic States Marine Fisheries Commission prepared a Fisheries Management Plan for the American eel fishery in order to protect and restore the species. The Atlantic States Marine Fisheries Commission American Eel Fisheries Management Plan is a working document that describes the goals and objectives for the species, its current status, the ecological challenges affecting the species, and management options and actions needed to reach and maintain management goals. The stated goals of the Fisheries Management Plan are to: (1) protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic States and jurisdictions and contribute to the viability of the American eel spawning population, and (2) provide for sustainable commercial and recreational fisheries preventing the over harvest of any eel life stage.

Amendment 2 recommends stronger regulatory language to improve upstream and downstream passage of American eel. Addendums III and IV establish new management measures for both the commercial (glass, yellow, and silver) and recreational eel fisheries, as well as implements fishery independent and fishery dependent monitoring requirements.

The American Eel is discussed in Section 5.3.3 above.

6.1.1 References:

Federal Energy Regulatory Commission (FERC). 2021. List of Comprehensive Plans. *April 06, 2021* - Available online: https://cms.ferc.gov/media/list-comprehensive-plans Accessed October 25, 2021

7.0 STUDY RESULTS

7.1 Overview

GLWP proposed several studies to be done during the 2020 and 2021 field seasons. Significant progress has been made despite the summer being very dry. For reference, the turbine was only run during the following times in the study period:

Turbine Operation During Study Period

Start Running	Lake Level	Shut Down	Lake Level	Comments
Fall 2019	Full	4-Jun-20	6.45	Summer
11-Sep-20	5.50	23-Sep-20	4.45	Fall Drawdown
10-Oct-20	4.19	18-Oct-20	4.19	Fall Drawdown
29-Nov-20	5.04			Winter 2020/2021

Table 7-1 – Turbine Operation During Study Period

7.1.1 Process and Schedule

7.1.1.1 FERC Determination and Study Plan Modification

7.1.1.2 Study Reporting Timeline through Updated Study Report Meeting

7.1.1.3 Summary List of Studies

List of approved studies and additional data requested:

- 1 – Water Quality
- 1-1 – Impoundment Trophic State Study
- 1-2 – Impoundment Habitat Study
- 1-3 – FERC's Impoundment Temperature Study
- 1-4 – Downstream BMI Study
- 1-5 – Downstream Temperature and Dissolved Oxygen Study

- 2 – Aquatic Habitat Cross-Section and In-Stream Flow Study

- 3 – Eel Passage Survey

- 4-1 – Architectural Survey
- 4-2 – Erosion Survey

- 5 – FERC's additional data
- 5-1 – Loon counts and nests
- 5-2 – Impoundment Levels
- 5-3 – Docks and Beaches

7.2 Study Results

7.2.1 Study #1 – Water Quality – Encompasses Data Requested from the Maine Department of Environmental Protection (MDEP), United States National Marine Fisheries Service (US NMFS), United States Fish and Wildlife Service (US FWS) and FERC to determine current impoundment and downstream water quality.

Photo 7-1 – On Green Lake to gather samples

The objectives of the suite of water quality studies, including impoundment trophic state, impoundment aquatic habitat, temperature and dissolved oxygen, and benthic macroinvertebrate, are to collect contemporary water quality data in Green Lake and Reeds Brook upstream and downstream of the Green Lake dam to determine whether the Project waters meet MDEP's water quality standards and maintain the structure and function of the resident benthic macroinvertebrate community.

7.2.1.1 Impoundment Trophic State Study 1-1:

Sampling was done in Green Lake (the impoundment), twice each month for five months from June 17, 2020 through October 19, 2020, with samples being taken from the locations called Station #1 (in the North end) and Station #2 (in the South end), as specified by MDEP and per the protocols laid out in MDEP's *Sampling Protocol for Hydropower Studies* (September 2019).

This table shows the depth the water samples were taken, the lab results for the water samples and the Secchi disk readings for Station #1for all 10 weeks.

Date	Time	Depth (m)	Alkalinity (mg/L)	Chlorophyll A (mg/L)	Color (PCU)	pH	Total Phosphorus (ug/L)	Secchi Disk (m)
17-Jun	3:00 PM	9	4	0.002	16	6.9	17	7.99
30-Jun	3:50 PM	7	4	0.002	15	7.1	11	7.70
15-Jul	3:36 PM	7	4	0.002	13	6.9	6	8.80
29-Jul	11:38 AM	7	5	0.003	13	6.9	5	7.90
12-Aug	11:59 AM	8	4	0.002	13	6.9	12	9.05
^ 26-Aug	11:57 AM	7	5	0.002	12	7.0	5	9.90
9-Sep	1:22 PM	10	5	0.002	11	6.9	4	9.17
21-Sep	12:10 PM	10	5	0.002	12	6.9	4	9.71
5-Oct	12:35 PM	10	5	0.002	11	7.0	4	9.22
19-Oct	1:01 PM	10	5	0.002	12	6.8	3	7.38
	Average	**8.5**	**4.6**	**0.002**	**12.8**	**6.93**	**7.1**	**8.68**
	Median	**8.5**	**5.0**	**0.002**	**12.5**	**6.90**	**5.00**	**8.93**
	Minimum	**7.0**	**4.0**	**0.002**	**11.0**	**6.80**	**3.00**	**7.38**
	Maximum	**10.0**	**5.0**	**0.003**	**16.0**	**7.10**	**17.00**	**9.90**

Table 7-2 – Station #1 – Base Water Samples and Secchi Disk data

^ The samples did not get to HETL within 24 hours due to weather conditions as described in section 2.1.1.1 above. They arrived within 48 hours.

This table shows the depth the water samples were taken, the lab results for the water samples and the Secchi disk readings for Station #2

Date	Time	Depth (m)	Alkalinity (mg/L)	Chlorophyll A (mg/L)	Color (PCU)	pH	Total Phosphorus (ug/L)	Secchi Disk (m)
17-Jun	5:35 PM	7	4	0.002	18	6.9	5	7.05
30-Jun	5:40 PM	7	4	0.002	15	7.0	5	7.49

15-Jul	5:14 PM	7	4	0.002	16	6.9	4	7.73
29-Jul	1:28 PM	8	5	0.003	13	6.9	4	8.85
12-Aug	2:23 PM	8	4	0.002	13	6.9	5	8.59
27-Aug	7:08 PM	10	4	0.002	11	7.0	4	8.22
9-Sep	2:55 PM	9	5	0.002	11	6.9	5	9.43
21-Sep	2:01 PM	10	4	0.002	11	6.9	4	8.83
5-Oct	2:25 PM	10	5	0.002	10	7.0	4	8.57
19-Oct	2:37 PM	10	5	0.002	10	6.8	4	6.34
	Average	**8.6**	**4.4**	**0.002**	**12.8**	**6.92**	**4.4**	**8.11**
	Median	**8.5**	**4.0**	**0.002**	**12.0**	**6.90**	**4.0**	**8.40**
	Minimum	**7.0**	**4.0**	**0.002**	**10.0**	**6.80**	**4.0**	**6.34**
	Maximum	**10.0**	**5.0**	**0.003**	**18.0**	**7.00**	**5.0**	**9.43**

Table 7-3 – Station #2 – Base Water Samples and Secchi Disk data

In late August the extended samples were collected from both Station #1 and Station #2

	26-Aug-20	27-Aug-20
	Station #1	Station #2
Chain of Custody:	2007522-01	2015255-01
Conductivity uMHOS/cm	30	29.8
Silicon mg/L	1.2	1.2
Aluminum mg/L	0.024	0.017
Calcium mg/L	1.7	1.2
Iron mg/L	<0.05	<0.05
Magnesium mg/L	0.43	0.32
Potassium mg/L	0.29	0.19
Sodium mg/L	2.6	1.9
Sulfate mg/L	2	2
Chloride mg/L	4	
Nitrate Nitrogen mg/L	0.01	0.01
Chain of Custody:	2007522-02	2015255-02
Metals: Aluminum mg/L	0.016	0.015
Chain of Custody:	2007522-03	2015255-03
Dissolved Organic Carbon mg/L	3.5	3.5
Chain of Custody:	2007522-04	2015255-04

Phosphorus Total ug/L	5	8
2nd Phosphorus sample depth	14 meters	10 meters
Chain of Custody:	2007522-05	2015255-05
Phosphorus Total ug/L	7	13
3rd Phosphorus sample depth	50 meters	18 meters

Table 7-4 – Late August extended water sample results

7.2.1.1.1 Weekly DO & Temp graphs

The graphs are not included here but can be found in the ISR that was submitted on 11th February 2021

7.2.1.1.2 Variances from FERC-approved Study Plan and Proposed Modifications

The collection of the more extensive set of water samples in the late summer was impacted by the weather. The high winds made it impossible to anchor at Station #2 after the samples had been collected from Station #1. The choices were either to gather the samples from Station #2 the following day, or to throw out the Station #1 samples and do a full new set after acquiring more sample bottles from HETL. After coordinating with MDEP it was decided to do the first option. This delayed the transport of the Station #1 set by 24 hours. This is noted on the results. With this exception, the study plan and schedule did not vary from the FERC-approved study plan.

7.2.1.1.3 References

MDEP – Sampling Protocol for Hydropower Studies (September 2019).
MDEP – Instruction Manual for Baseline Water Quality Sampling by Webster Pearsall (12/22/1997)

7.2.1.2 Impoundment Habitat Study 1-2:

From MDEP DEP SAMPLING PROTOCOL FOR HYDROPOWER STUDIES:

"Habitat Study

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use 'habitat for fish and other equatic life' will be determined as follows. Using the depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times.

Alternatively, studies of fish and other aquatic life communities..."

The Green Lake Trophic State Study conducted by GLWP during the summer of 2020 determined that the mean Secchi disk reading was 27.5 feet, giving a value of 55 feet for the bottom of the littoral zone. Using this value, and the maximum drawdown value of 3.2 ft, GLWP determined that

the amount of the littoral zone area that is dewatered by the maximum drawdown is 14.4% and the volume drawdown is a maximum of 13.3%

The areas measured were processed in a spreadsheet. The sums of the areas rolled up as follows:

GL Gross Area	3167.54	ac
Islands Area	40.34	ac
Net Area	3127.20	ac
Littoral Exclusion	608.77	ac
Littoral Zone Area	2518.43	ac
Inside Perimeter Draw	2851.24	ac
Perimeter Draw	316.30	ac
Gross Island Draw	86.89	ac
Island Draw	46.55	ac
Total Draw Area	362.85	ac
Littoral Draw Fraction	0.14	
Area Drawdown Percentage	14.41%	

Figure 7–1 – Littoral Drawdown Area

7.2.1.2.1 Littoral Drawdown Volume

To calculate the volume drawdown, the 6 ft contour lines from a depth of 6 feet to 54 ft were traced in Adobe Acrobat Reader DC to measure areas. Areas were identified as adding or subtracting from the area at that depth depending on whether the area surrounded was shallower water than the contour line or deeper water. The Navionics Plus bathymetric map on the Axiom 9 RV were consulted during the tracing of the contour lines to make this determination.
This table contains the results:

Volume of lake from 3.2 ft depth to 55 ft	80471.11	ac-ft
Volume outside littoral zone from 3.2-55 ft	31534.21	ac-ft
Littoral zone 3.2-55 ft volume	48936.91	ac-ft
Littoral draw	7478.42	ac-ft
Total Littoral Zone Volume	56415.33	ac-ft
Drawdown Fraction	0.1326	
Volume Drawdown	13.26%	

Figure 7–2 – Littoral Drawdown Volume

7.2.1.2.2 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan did not vary from the FERC-approved study plan.

7.2.1.3 Impoundment Temperature Study 1-3:

Green Lake contains one of the 14 remaining arctic char populations in the contiguous U.S. The Maine Department of Inland Fisheries and Wildlife (Maine DIFW) lists arctic char as a species of special concern, and considers the Green Lake population to be at low abundance (Frost, 2001). Arctic char spawn in areas between 1.5 and 6 feet deep when the water temperature reaches 50 °F in the fall (Frost, 2001). The exact spawning period for arctic char in Green Lake is unknown. Maine DIFW states that arctic char spawning occurs between October 20 and November 7 in Flood's Pond, which is located approximately 6.5 miles north of Green Lake.

Given the possible spawning sites for artic char, loggers were deployed from August 31, 2020 to December 1, 2020 with the goal of determining when the temperature of the lake goes below 50 °F

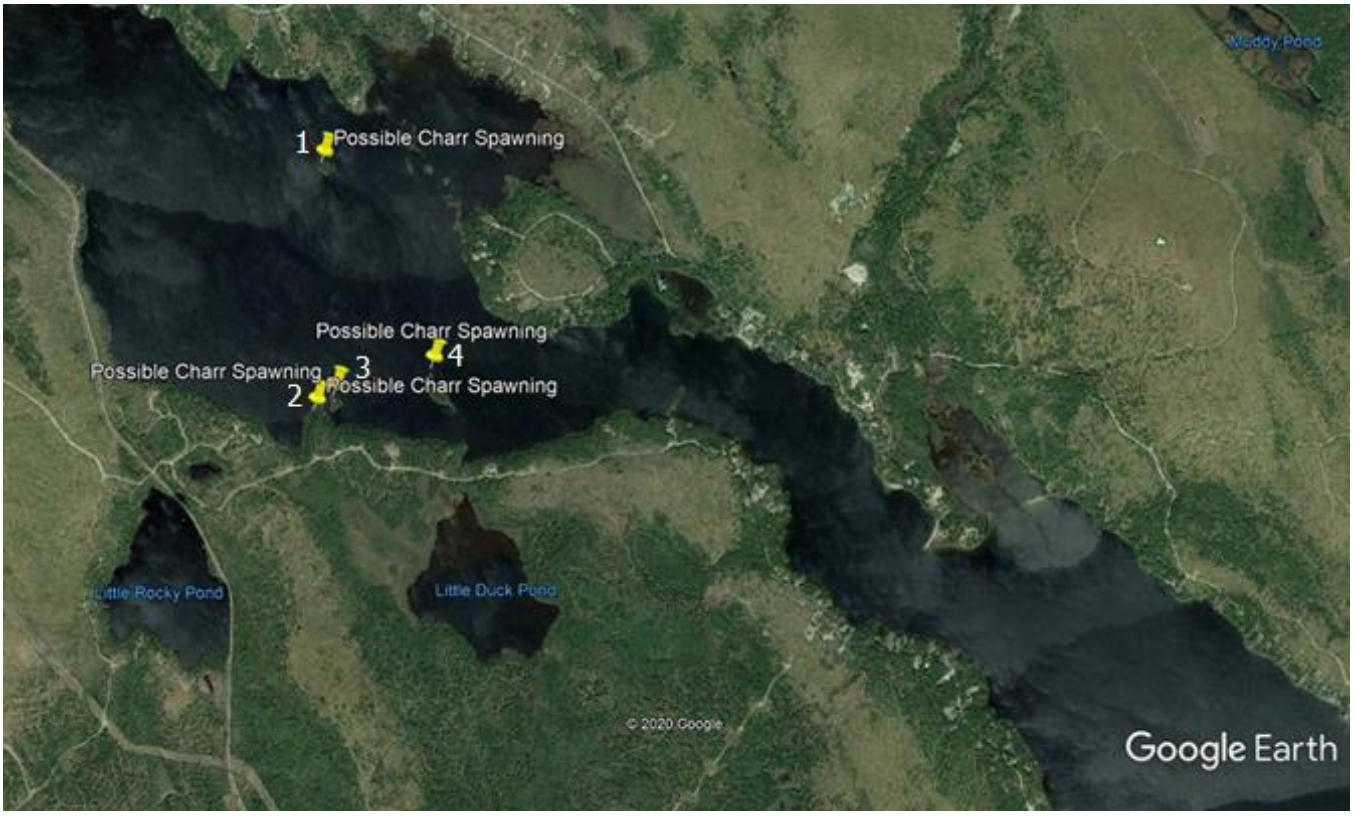


Figure 7–3 – Possible Arctic Char Spawning Sites – Map provided by MDIFW

Two data loggers were deployed in two separate locations on August 31, 2020. The Loggers were located at location 2 and 4 on the map above. The other sites proved unsafe to access with our boat.

The devices were placed such that they would stay within the 18" to 6' deep range required throughout the allowed lake level range.

Over the three month period, that the loggers were in the lake, the water temperature went from 68 °F up through 73 °F and then down to 44 °F. The loggers show that the water temperature in

Green Lake reached 50 °F initially in the evening of November 2, 2020, then went back above 50 °F and finally went below, and stayed below, 50 °F on November 13, 2020

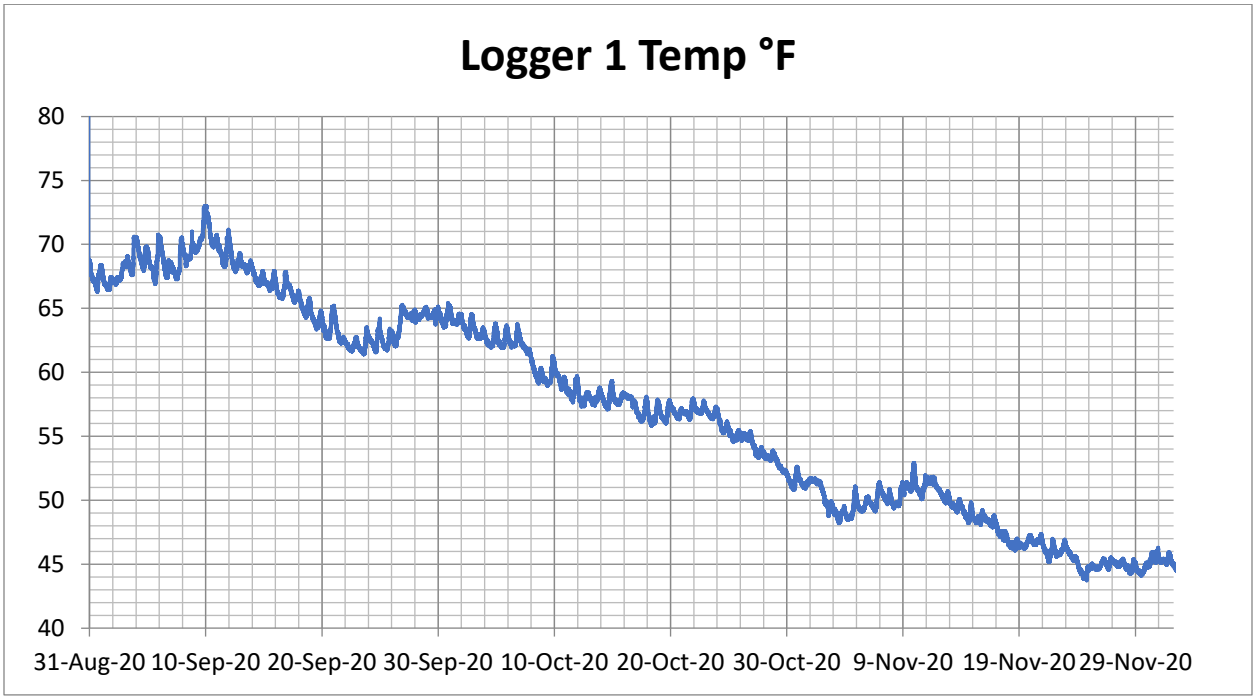


Figure 7–4 – Logger 1 Temp °F Graph – at potential spawning location 4

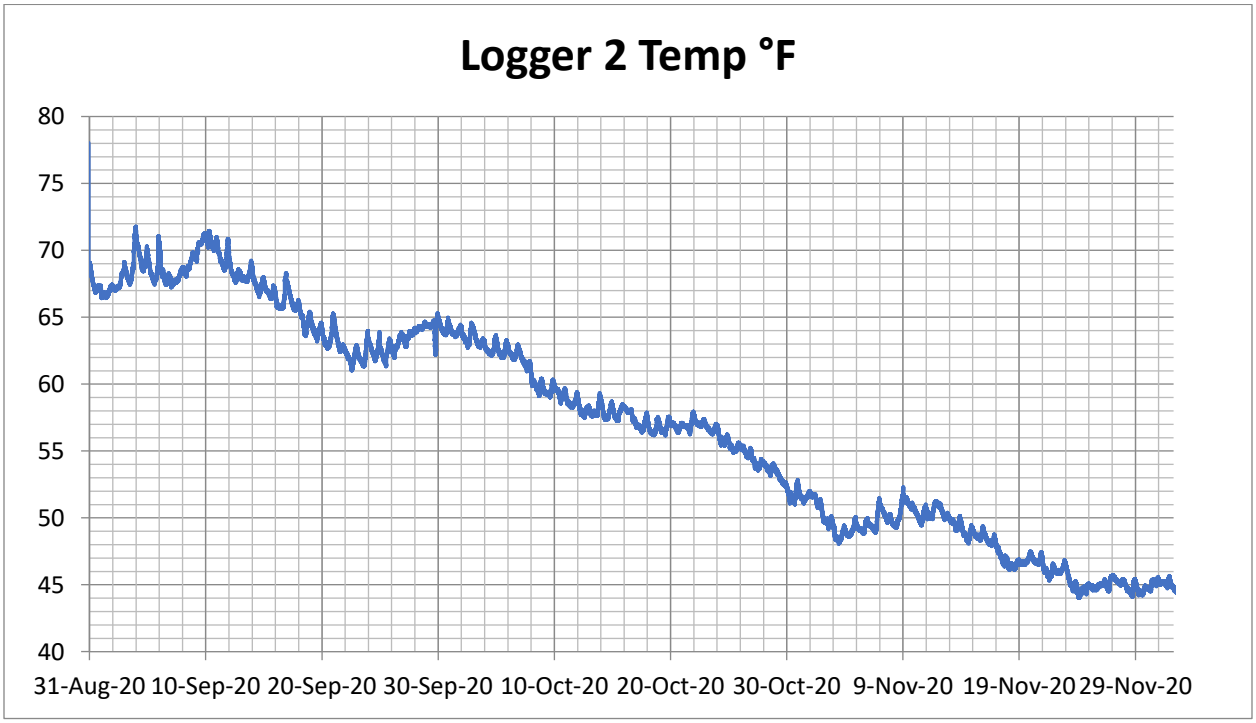


Figure 7–5 – Logger 2 Temp °F Graph – at potential spawning location 2

The logger at the dam, although it doesn't start until October 7, does follow the temperature of the initial 4 loggers quite closely.

1.1.1.1 Green Lake Level

The lake level, on August 31, 2020, when the loggers were installed was 5.75 at the staff gauge. On November 30, 2020, the lake level was 5.01 at the staff gauge.

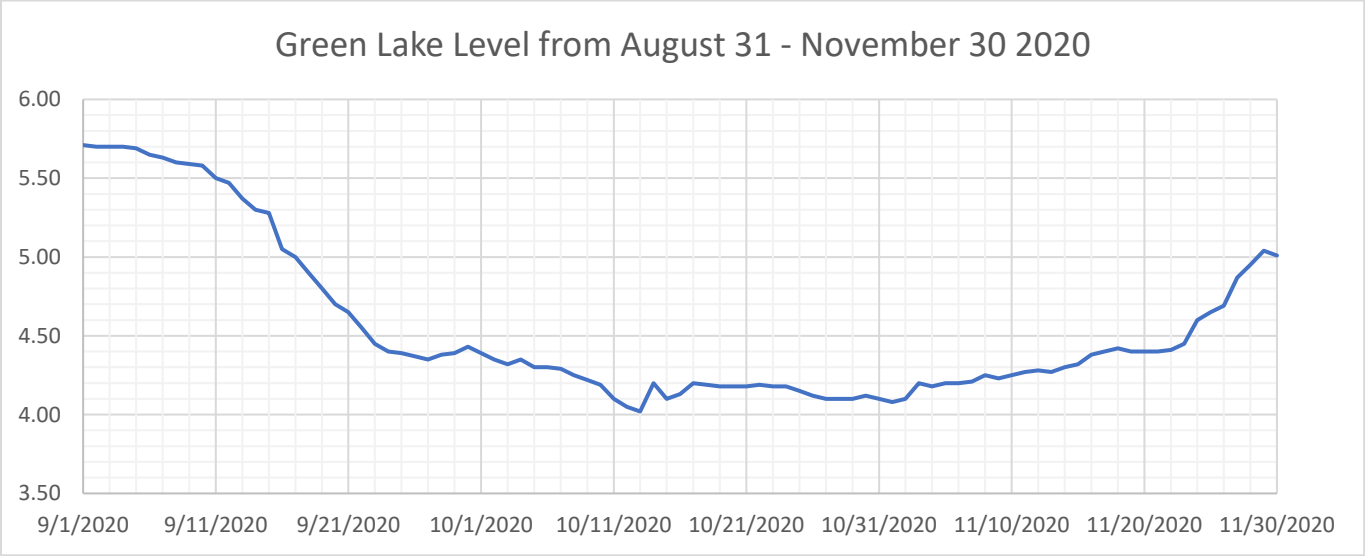


Figure 7–6 – Green Lake Level from August 31 - November 30 2020

7.2.1.3.1 Temperature Monitoring Equipment

Temperature monitoring containers were created, using HOBO Onset MX Pendant Temp MX2201 devices. Each container has one HOBO device, holes for the water to circulate through, a weight and a floating handle for retrieval.

7.2.1.3.2 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan and schedule did not vary from the FERC-approved study plan.

7.2.1.3.3 References

Frost, F.O. 2001. Arctic char management plan. Department of Inland Fisheries and Wildlife, Division of Fisheries and Hatcheries. November 2001.

7.2.1.4 Downstream Benthic Macroinvertebrate (BMI) Study 1-4:

The purpose of this study is to demonstrate whether current in-stream flow releases affect attainment of aquatic life and habitat criteria in the waters downstream of the Green Lake Dam. The BMI study will evaluate the current macroinvertebrate community structure and assess any impacts caused by project operations on waters downstream of the Project.

GLWP consulted with Paul Leeper – Biologist at Moody Mountain Environmental Services. Paul set up baskets of rocks in the locations coordinated with MDEP

On August 27, 2020 – Paul placed 3 rock filled baskets in Reeds Brook at sites agreed with MDEP.

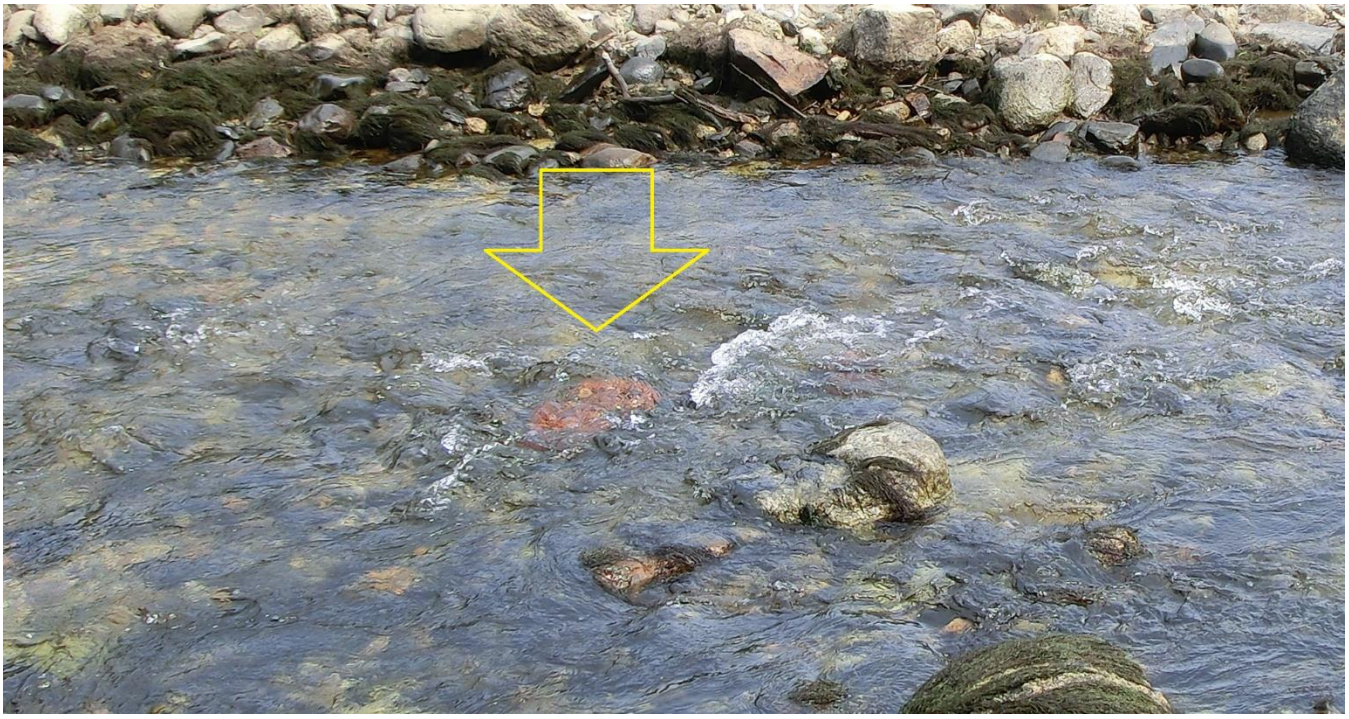


Photo 7-2 – A Rock Filled Basket in Reeds Brook

On September 24, 2020 Paul retrieved the baskets. He then collected the baskets and reviewed the contents. The data for Site 1 was sent to MDEP for analysis using the Linear Discriminant Model (LDM).

Study results from the first site shows that the upper reaches of Reeds Brook achieve Class B.

MDEP has asked for the results from the two sites below the power station to be analyzed. This has been done and the data sent in to MDEP and as of writing the DLA we do not have the data back yet.

This information will be included in the Updated Study Plan and FLA.

7.2.1.4.1 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan and schedule did not vary from the FERC-approved study plan.

7.2.1.5 Downstream Temperature and Dissolved Oxygen (DO) Study 1-5:

Temperature and dissolved oxygen (DO) must be monitored downstream of the Green Lake Dam to demonstrate whether the Project meets Maine's DO numeric criteria.

The data gathering was done in accordance with MDEP's Sampling Protocol for Hydropower Studies (September 2019).

Figure 7–7 – Locations for Temperature and DO sampling in Reeds Brook.

Beginning on July 25, 2020 GLWP took 10 sets weekly of dissolved oxygen and temperature readings in Reeds Brook, one in the early morning and one after 2pm, at the locations requested by MDEP.

- DO 1) The Reeds Brook bypass reach below the dam but upstream of the Green Lake National Fish Hatchery filter backwash discharge.
- DO 2) The tailrace downstream of the powerhouse.
- DO 3) In the confluence of the tailrace and the Reeds Brook bypass.
- DO 4) The Reeds Brook bypass reach directly upstream of the confluence of the bypass and the tailrace.

7.2.1.5.1 Downstream Temperature and Dissolved Oxygen

The gates at the dam remained closed during the study period. With the gates closed, the flow past the dam into the brook is from dam and gate leakage. Such leakage will vary with lake level—

higher lake levels mean more flow and lower levels less leakage. The following table shows the Flow Duration percent based on the level of the lake.

The Flow Duration % is divided in to 1500 to produce the value in the °C goal column.

Based on this, all sampling days from July through August comply with the required conditions.

			% Flow						
Date		Lake Level	Duration	°C goal	Point 1	Point 2	Point 3	Point 4	Ave Temp
25-Jul	AM	6.15	94.00	15.96	25.00	22.00	22.90	22.00	22.98
25-Jul	PM	6.15	94.00	15.96	27.00	25.00	26.10	24.70	25.70
31-Jul	AM	6.20	92.00	16.30	26.20	22.60	22.70	23.10	23.65
31-Jul	PM	6.20	92.00	16.30	28.00	25.30	25.30	25.10	25.93
7-Aug	AM	6.13	72.00	20.83	24.60	19.90	19.20	21.30	21.25
7-Aug	PM	6.13	72.00	20.83	25.60	23.60	20.50	23.50	23.30
14-Aug	AM	6.00	81.21	18.47	26.10	19.10	19.50	23.40	22.03
14-Aug	PM	6.00	81.21	18.47	26.90	25.00	23.20	25.50	25.15
21-Aug	AM	5.83	84.00	17.86	23.80	20.60	19.00	20.50	20.98
21-Aug	PM	5.83	84.00	17.86	24.50	22.70	19.60	22.50	22.33
29-Aug	AM	5.70	86.80	17.28	21.00	18.70	16.90	18.70	18.70
29-Aug	PM	5.70	86.80	17.28	21.10	19.00	17.40	18.90	19.10
4-Sep	AM	5.70	38.00	39.47	20.10	18.60	17.20	18.60	18.63
4-Sep	PM	5.70	38.00	39.47	22.50	21.50	19.20	21.80	21.25
11-Sep	AM	5.50	48.00	31.25	20.80	18.20	16.90	18.30	18.55
11-Sep	PM	5.50	48.00	31.25	21.20	21.10	20.50	19.30	20.53
18-Sep	AM	4.90	76.00	19.74	18.70	18.60	18.30	16.30	17.98
18-Sep	PM	4.90	76.00	19.74	17.80	18.80	18.40	17.00	18.00
24-Sep	AM	4.40	92.00	16.30	16.60	16.60	16.50	15.50	16.30
24-Sep	PM	4.40	92.00	16.30	17.90	17.40	17.10	17.40	17.45

Table 7-5 – Calculation for Water Temperature and Flow Duration exceeding 1500

The following table provides the DO and temperature for the four locations for the full 10 weeks. The table included in the Initial Study Report was missing the DO Saturation percentage. That has been added to the table below.

					DO 1			DO 2			DO 3			DO 4		
Date	Time	Flow Duration	Average Water Temp	1500.00	Water Temp (°C)	DO (mg/L)	DO (% Sat)	Water Temp (°C)	DO (mg/L)	DO (% Sat)	Water Temp (°C)	DO (mg/L)	DO (% Sat)	Water Temp (°C)	DO (mg/L)	ODO (% Sat)
25-Jul	6:30 AM	94.00	22.98	2159.65	25.0	8.05	97.5	22.0	8.21	94.3	22.9	8.42	98.1	22.0	8.55	98.0
25-Jul	2:17 PM	94.00	25.70	2415.80	27.0	7.62	95.7	25.0	8.72	105.3	26.1	9.14	112.7	24.7	8.45	101.8
31-Jul	6:06 AM	92.00	23.65	2175.80	26.2	7.64	94.6	22.6	8.03	92.8	22.7	8.08	93.7	23.1	8.30	96.9
31-Jul	2:17 PM	92.00	25.93	2385.10	28.0	7.50	95.7	25.3	8.61	104.7	25.3	8.68	105.7	25.1	8.45	102.5
7-Aug	6:09 AM	72.00	21.25	1530.00	24.6	7.94	95.3	19.9	8.83	93.1	19.2	8.60	93.1	21.3	8.72	98.4
7-Aug	2:14 PM	72.00	23.30	1677.60	25.6	7.92	96.8	23.6	8.72	102.8	20.5	8.99	99.9	23.5	8.64	101.7
14-Aug	6:04 AM	81.21	22.03	1788.65	26.1	7.65	94.5	19.1	7.89	85.1	19.5	8.55	93.2	23.4	8.33	97.8
14-Aug	2:26 PM	81.21	25.15	2042.43	26.9	7.73	96.9	25.0	8.73	105.7	23.2	8.76	102.6	25.5	8.43	103.0
21-Aug	6:17 AM	84.00	20.98	1761.90	23.8	7.78	92.0	20.6	8.71	97.0	19.0	8.60	92.7	20.5	8.75	97.2
21-Aug	2:34 PM	84.00	22.33	1875.30	24.5	7.81	93.6	22.7	8.65	99.9	19.6	9.08	98.7	22.5	8.71	100.6
29-Aug	6:07 AM	86.80	18.83	1634.01	21.0	7.59	85.2	18.7	9.00	96.4	16.9	9.07	93.6	18.7	9.07	97.2
29-Aug	4:04 PM	86.80	19.10	1657.88	21.1	7.71	86.5	19.0	8.87	95.6	17.4	8.99	93.7	18.9	8.96	96.5
4-Sep	6:13 AM	38.00	18.63	707.75	20.1	7.94	96.1	18.6	8.83	96.8	17.2	8.60	93.0	18.6	8.72	97.3
4-Sep	3:06 PM	38.00	21.25	807.50	22.5	7.92	98.2	21.5	8.72	99.3	19.2	8.99	97.3	21.8	8.64	99.8
11-Sep	6:09 AM	48.00	18.55	890.40	20.8	7.65	96.2	18.2	7.89	98.3	16.9	8.55	96.6	18.3	8.33	98.1
11-Sep	2:40 PM	48.00	20.53	985.20	21.2	7.73	97.8	21.1	8.73	102.1	20.5	8.76	101.0	19.3	8.43	101.5
18-Sep	6:12 AM	76.00	17.98	1366.10	18.7	7.78	94.8	18.6	8.71	97.5	18.3	8.60	97.3	16.3	8.75	97.5
18-Sep	2:38 PM	76.00	18.00	1368.00	17.8	7.81	96.4	18.8	8.65	99.0	18.4	9.08	98.7	17.0	8.71	101.8
24-Sep	6:19 AM	92.00	16.30	1499.60	16.6	7.59	92.6	16.6	9.00	97.4	16.5	9.07	97.2	15.5	9.07	97.4
24-Sep	2:36 PM	92.00	17.45	1605.40	17.9	7.71	95.6	17.4	8.87	100.8	17.1	8.99	97.2	17.4	8.96	101.4
				Average		7.75	94.6		8.62	98.2		8.78	97.8		8.65	99.3
				Median		7.73	95.7		8.72	97.9		8.76	97.3		8.68	98.3
				Minimum		7.50	85.2		7.89	85.1		8.08	92.7		8.30	96.5
				Maximum		8.05	98.2		9.00	105.7		9.14	112.7		9.07	103.0

Table 7-6 – Dissolved Oxygen and Temperature Readings at DO 1, DO 2, DO3, and DO 4

7.2.1.5.2 Variances from FERC-approved Study Plan and Proposed Modifications

GLWP had proposed installing loggers to capture the Temperature and DO readings in Reeds Brook. MDEP recommended using the discrete grab technology. With this exception, the study plan and schedule did not vary from the FERC-approved study plan.

7.2.2 Study #2 – Aquatic Resources – Encompasses Data Requested from MDEP for Aquatic Habitat Cross-Section Flow and from US NMFS In-stream Flow

Reeds Brook Habitat – NOTE: See Section 4 of this document for additional data on this study!

Reeds Brook (the Brook) flows from the Green Lake Dam to Graham Lake, a straight line distance of 1800 feet . (Whole quantity numbers in this section are approximate) From just below the Green Lake Dam the Brook drops 45 feet and flows 2000 feet before discharging into Graham Lake.

The marked points in the following image are on the right side of the Brook facing downstream (on the south side).

Image: Brook Path, Source GLWP and Google Maps

The following image shows the USGS elevation of the water surface of the Brook.

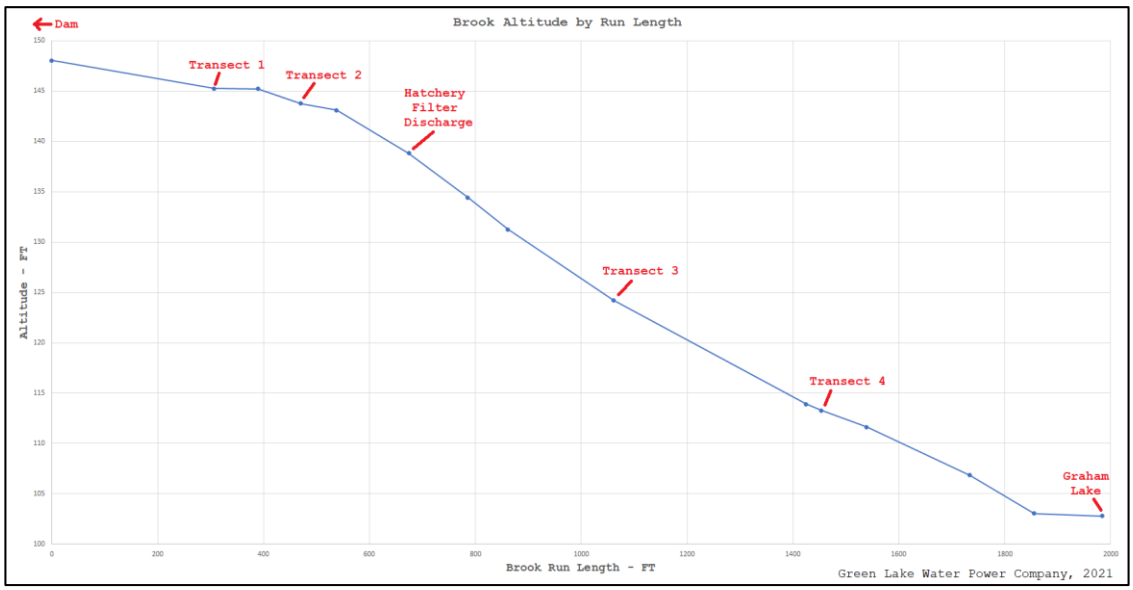


Figure 7–8 – Brook Run Elevation, Source GLWP

During the Brook Habitat study the Brook was mapped to determine its course and slope, its extents were surveyed as to their characteristics, and four transects across the Brook were mapped in detail at multiple flows.

7.2.2.1 Study Flows

Four flow levels were used for performing the Transect cross flow measurements. The flows were chosen to cover the range of current minimum flow up to the ½ cfs per square mile of drainage area flow.

Name	Dam Gate Opening	Approximate CFS
Flow 1	Dam & gate leakage	2
Flow 2	0.75 inches	5.5
Flow 3	1.5 inches	11
Flow 4	3.0 inches	22

The following graph shows the flow through Waste Gate 2 at the Green Lake dam for small openings at the lake level encountered during the transect flow study work. This graph reflects the flow through the gate with a clean fish screen in place upstream of the gate.

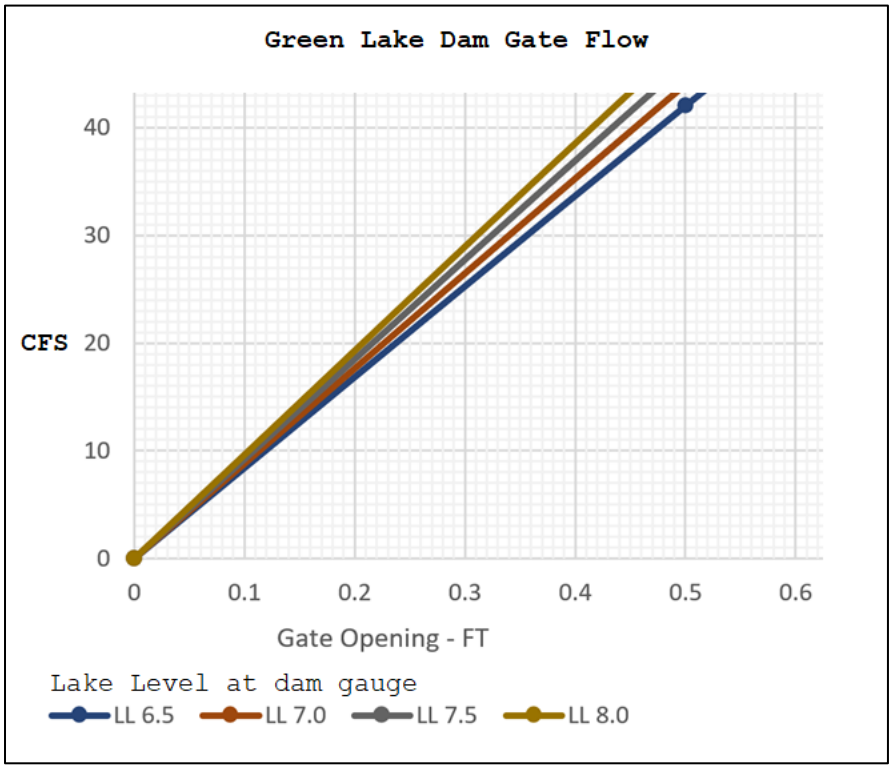


Figure 7–9 – Flow through Waste Gate 2

Source: GLWP and Bangor Hydroelectric

7.2.2.2 Transects

Four transects were proposed by GLWP after consultation with a Kleinschmdit Group biologist. These sites were verified as acceptable by MDEP and NMFS. The transect locations are shown on the Brook Path and Run Elevation images earlier in this section.

7.2.2.2.1 Transect 1

Transect 1 is 307 ft from the start of the Brook. It is a large, wide pool with an in-water substrate of small and medium cobble with interspersed gravel of varying sizes.

This table shows the measured/calculated geometric and flow quantities for each of the four study flows at Transect 1:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	145.10	37.43	37.43	21.76	2.33	0.58	0.11
Flow 2	145.38	38.04	38.04	29.45	9.07	0.77	0.31
Flow 3	145.50	38.79	38.79	34.59	12.56	0.89	0.36
Flow 4	145.72	39.22	39.22	44.30	23.03	1.13	0.52

Table 7-7 – Transect 1 Flow Quantities

In the above table, "Width" is the overall distance from where the water meets the near bank to the far bank. "Flow Width" is the length of the water surface along the transect (would be less than "Width" if there were rocks projecting above the water surface, which there aren't on Transect 1.) "Avg Depth" is "Area" divided by "Flow Width." "Avg Flow" is "Flow" divided by "Area."

Bank full at Transect 1 appears to be about Flow 4, as shown in the following picture:

Photo 7-3 – Bank full at Transect 1

7.2.2.2.2 Transect 2

Transect 2 is 471 ft from the start of the Brook and 164 feet from Transect 1. It is in a part of the Brook that is largely riffle, with some pools.

This table shows the measured/calculated geometric and flow quantities for each of the four study flows at Transect 2:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	143.47	22.83	10.50	4.82	4.15	0.46	0.86
Flow 2	143.67	23.92	12.33	7.81	5.85	0.63	0.75
Flow 3	143.78	26.00	14.92	9.48	12.44	0.64	1.31
Flow 4	143.92	26.83	15.50	11.55	19.17	0.75	1.66

Table 7-8 – Transect 2 Flow Quantities

Bank full for Transect 2 is about Flow 2 as shown in the following picture:

Photo 7-4 – Bank full for Transect 2

The following picture shows Flow 3 overtopping the bank:

Photo 7-5 – Transect 2

7.2.2.2.3 Transect 3

Transect 3 is 1061 ft from the start of the Brook and 590 feet from Transect 2. It is in the steepest part of the Brook that is largely riffle, with some small pools.

This table shows the measured/calculated geometric and flow quantities for each of the four study flows at Transect 3

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	124.23	17.17	15.75	7.51	6.44	0.48	0.86
Flow 2	124.53	17.75	16.75	12.53	15.60	0.75	1.24
Flow 3	124.63	20.25	17.33	14.33	22.33	0.83	1.56
Flow 4	124.86	20.83	17.92	17.39	27.52	0.97	1.58

Table 7-9 – Transect 3 Flow Quantities

Bank full is a bit more difficult to determine at Transect 3 because the banks are composed of large cobble and boulders. It appears to be about Flow 3, as shown in the following picture:

Photo 7-6 – Transect 3 Bank Full

7.2.2.2.4 Transect 4

Transect 4 is 1453 ft from the start of the Brook, 392 feet from Transect 3, and 531 feet from Graham Lake. It at the end of the steepest part of the Brook. The Brook from Transect 4 to Graham Lake is a mixture of riffle and pools.

This table shows the measured/calculated geometric and flow quantities for each of the four study flows at Transect 4:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	113.16	15.12	15.12	21.08	5.82	1.39	0.28
Flow 2	113.24	15.52	15.52	22.49	8.85	1.45	0.39
Flow 3	113.35	15.74	15.74	24.23	14.28	1.54	0.59
Flow 4	113.66	16.28	16.28	28.95	33.02	1.78	1.14

Table 7-10 – Transect 4 Flow Quantities

Transect 4 appears to be bank full around Flow 3, as shown in the following picture:

Photo 7-7 – Transect 4 Bank Full

7.2.2.3 Methodology:

The methodology is described in detail in the Initial Study Report.

This additional data was provided in the ISR Meeting Summary:

Study 2: <u>Bypass Reach Aquatic Habitat and In Stream Flow Study</u>

This ISR supplement contains the bank-full widths and channel depths measured at each transect for each study flow value.

Transect 1: Bank-full bank to bank width: 40.92 ft

	Bank to Bank Width - ft	Flow - cfs	Average Depth - ft	Channel Depth - ft	Average Speed - ft/s	Percent Bank-full Width
Flow 1	37.43	2.33	0.58	0.77	0.11	91.48%
Flow 2	38.04	9.07	0.77	1.22	0.31	92.98%
Flow 3	38.79	12.56	0.89	1.40	0.36	94.79%
Flow 4	39.22	23.03	1.13	1.60	0.52	95.85%

Transect 2: Bank-full bank to bank width: 27.08 ft

	Bank to Bank Width - ft	Flow - cfs	Average Depth - ft	Channel Depth - ft	Average Speed - ft/s	Percent Bank-full Width
Flow 1	22.83	4.15	0.46	0.74	0.86	84.31%
Flow 2	23.92	5.85	0.63	0.91	0.75	88.31%
Flow 3	26.00	12.44	0.64	1.27	1.31	96.00%
Flow 4	26.83	19.17	0.75	1.35	1.66	99.08%

Transect 3: Bank-full bank to bank width: 21.08 ft

	Bank to Bank Width - ft	Flow - cfs	Average Depth - ft	Channel Depth - ft	Average Speed - ft/s	Percent Bank-full Width
Flow 1	17.17	6.44	0.48	0.8	0.86	81.42%
Flow 2	17.75	15.60	0.75	0.95	1.24	84.19%
Flow 3	20.25	22.33	0.83	1.23	1.56	96.05%
Flow 4	20.83	27.52	0.97	1.34	1.58	98.81%

Transect 4: Bank-full bank to bank width: 16.54 ft

	Bank to Bank Width - ft	Flow - cfs	Average Depth - ft	Channel Depth - ft	Average Speed - ft/s	Percent Bank-full Width
Flow 1	15.12	5.82	1.39	2.56	0.28	91.39%
Flow 2	15.52	8.85	1.45	2.82	0.39	93.84%
Flow 3	15.74	14.28	1.54	3.06	0.59	95.15%
Flow 4	16.28	33.02	1.78	3.3	1.14	98.43%

7.2.2.4 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan did not vary from the FERC-approved study plan but, because of heavy rain during the fall, this work was completed January 23, 2021.

7.2.3 Study #3 – Aquatic Resources - Eel Passage Survey Requested by the United States Fish and Wildlife Service (US FWS)

The Green Lake Project structures are believed to block the upstream and downstream movement of American eel. Passage facilities designed for American eel may be needed to reestablish the connection between rearing and spawning habitats.

Eel observation was carried out at night at the dam and lower in the Brook. Eel observation began in May and was done weekly in June and into July. No eels were observed and no potential predators were sighted.

The study was ended in coordination with Anna Harris, US Fish and Wildlife Service, who wrote "I believe you spoke with Gail from DMR earlier this week. Gail and I connected today and based on her recommendation, and my knowledge of our study request, it is recommended that at the Green Lake Project, you conduct two more studies in July to be sure there are no eels present. And if nothing is caught, additional studies would be referred until after there is upstream passage at the Ellsworth dam". Two additional night time observations were done in July with no eels observed so the study was ended.

7.2.3.1 Eel Passage Survey Event

Photo 7-8 – Looking for eels at night – spillway

Photo 7-9 – Looking for eels at night – below dam

Date	Start (hours)	End (hours)	Weather	Notes
11-May-20	9pm	9:45pm	Light rain.	Observation at and below the dam followed by observation at the brook by the power house. No eels were observed. One spill gate 20% open. Spillway damp from waves. Pond full. No eels or potential predators sighted.
6-Jun-20	9:12pm	9:56pm	0.47 inch rain earlier in the day.	Observation at and below the dam and in the gate wells. Looked in gaps between rocks in the brook and up toward the North East spillway. Pond at 6.46' on the staff gauge. Plenty of water running downstream. Inspected stream below dam and into the gate wells – no signs of eels. Also checked the brook by the power house. No eels were observed. No potential predators sighted.
14-Jun-20	9:17pm	9:57pm	No rain, 57 F	Plenty of water running downstream Inspected stream below dam and into the gate wells - no signs of eels Checked in gaps between rocks Checked around brook by the power station, no sign of eels. Saw some crayfish 5-6" in pool by spillway flume and one or two down the stream. No predators.

20-Jun-20	9:25pm	9:56pm	No rain, 72 F	Plenty of water running downstream Inspected stream below dam and into the gate wells - no signs of eels Checked in gaps between rocks Checked around brook by the power station, no sign of eels Saw some crayfish 5-6" in pool by spillway flume and one or two down the stream No predators Lots of fireflys.
29-Jun-20	9:47pm	10:43pm	Light rain, ground is damp, temp 65F wind 3mph NE	Plenty of water running downstream. Inspected stream below dam and into the gate wells - no signs of eels. Big turtle just below the gates! Maybe a foot long. Checked in gaps between rocks. Checked around brook by the power station. Saw some big spiders by the gates and in the spillway flume. No eels were observed. No potential predators sighted. Pond at 6.4' on the staff gauge.
5-Jul-20	9:10pm	9:58pm	Overcast, light rain, ground is damp, temp 58F wind 3mph SE	Plenty of water running downstream. Inspected stream below dam and into the gate wells - no signs of eels. Checked in gaps between rocks. Checked around brook by the power station. Spiders, lots of big ones, probably 3" across on rocks, spillway and in the gates. Pond at 6.36' on the staff gauge. No eels were observed. No potential predators sighted.
14-Jul-20	9:50pm	10:45pm	Overcast, no rain, ground is dry, temp 63F wind 6mph NE	Plenty of water running downstream. Inspected stream below dam and into the gate wells - no signs of eels. Checked in gaps between rocks. Checked around brook by the power station, no sign of eels. Spiders, lots of big ones, probably 3" across on rocks, spillway and in the gates. A couple of crayfish in the brook. Pond at 6.30' on the staff gauge. No eels were observed. No potential predators sighted
26-Jul-20	9:16pm	9:50pm	Light rain, ground is damp, temp 76F wind 2mph WNW	Plenty of water running downstream. Inspected stream below dam and into the gate wells - no signs of eels. Checked in gaps between rocks. Checked around brook by the power station. Saw some big spiders by the gates and in the spillway flume. Pond at 6.15' on the staff gauge. No eels were observed. No potential predators sighted.

Table 7-11 – Night time Eel Surveys

7.2.3.2 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan and schedule did not vary from the FERC-approved study plan.

7.2.4 Study #4 – Cultural Resources – Erosion Reconnaissance Survey

7.2.4.1 Architectural Study

In accordance with Section 106, GLWP consulted with Patrick O'Bannon, an Historian at Gray & Pape, who is on the list of approved historic preservation consultants. Patrick conducted an architectural survey within the Project boundary to assess possible effects to historic resources from issuance of a new operating license for the continued maintenance and operation of the existing Project.

MHPC agreed with the results in the report from Gray & Pape as noted in this letter:

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

JANET T. MILLS
GOVERNOR

KIRK F. MOHNEY
DIRECTOR

September 2, 2020

Ms. Kendal Anderson
Gray & Pape
60 Valley Street
Suite 103
Providence, RI 02909

Project: MHPC# 0155-19 Green Lake Hydroelectric Project; Reed Brook; FERC 7189
Architectural Survey
Town: Ellsworth, ME

Dear Ms.Anderson:

In response to your recent request, the Commission has reviewed the information received August 19, 2020 to continue consultation on the above referenced project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

Our office concurs with Gray & Pape's finding that no architectural properties are eligible for listing in the National Register of Historic Places.

Please contact Megan M. Rideout of our staff if we can be of further assistance in this matter.

Sincerely,

Kirk F. Mohney

Kirk F. Mohney
State Historic Preservation Officer

Figure 7-10 – Approval Letter from MHPC

7.2.4.1.1 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan and schedule did not vary from the FERC-approved study plan.

7.2.4.2 Erosion Survey

GLWP used USGS maps to identify the areas around Green Lake that have steep banks. 17 sites were identified.

On August 31, 2020 GLWP took a boat out on Green Lake and toured the perimeter to inspect the identified steep slope sites for erosion, as well as to locate any additional sites that had significant erosion. One picture was taken of each site.

No erosion was found that GLWP believes would extend the Area of Potential Effect beyond the Project Boundary.

One of the targeted sites, and another site that was identified during this reconnaissance, had minor erosion issues. Both of these sites are on the point South West of the dam as noted on this section of map. GLWP went out on the lake again on October 19, 2020 to gather further pictures of these 2 sites.

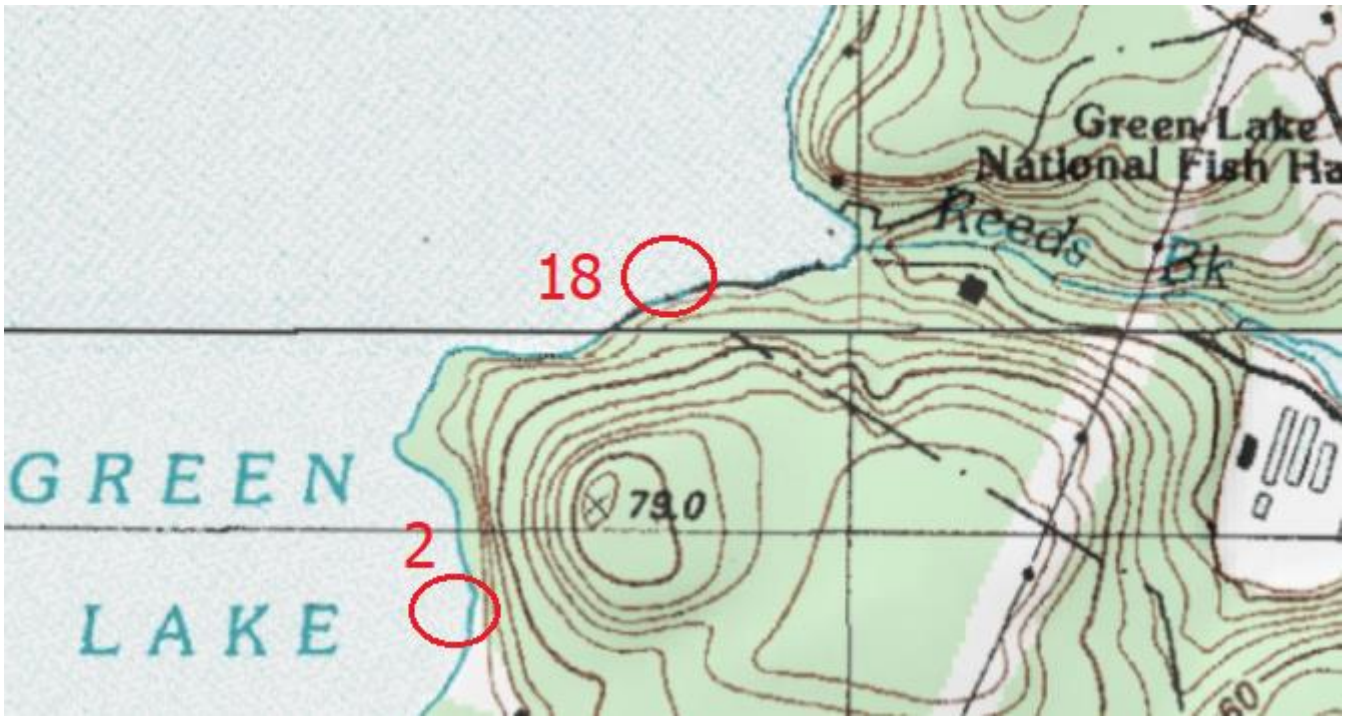


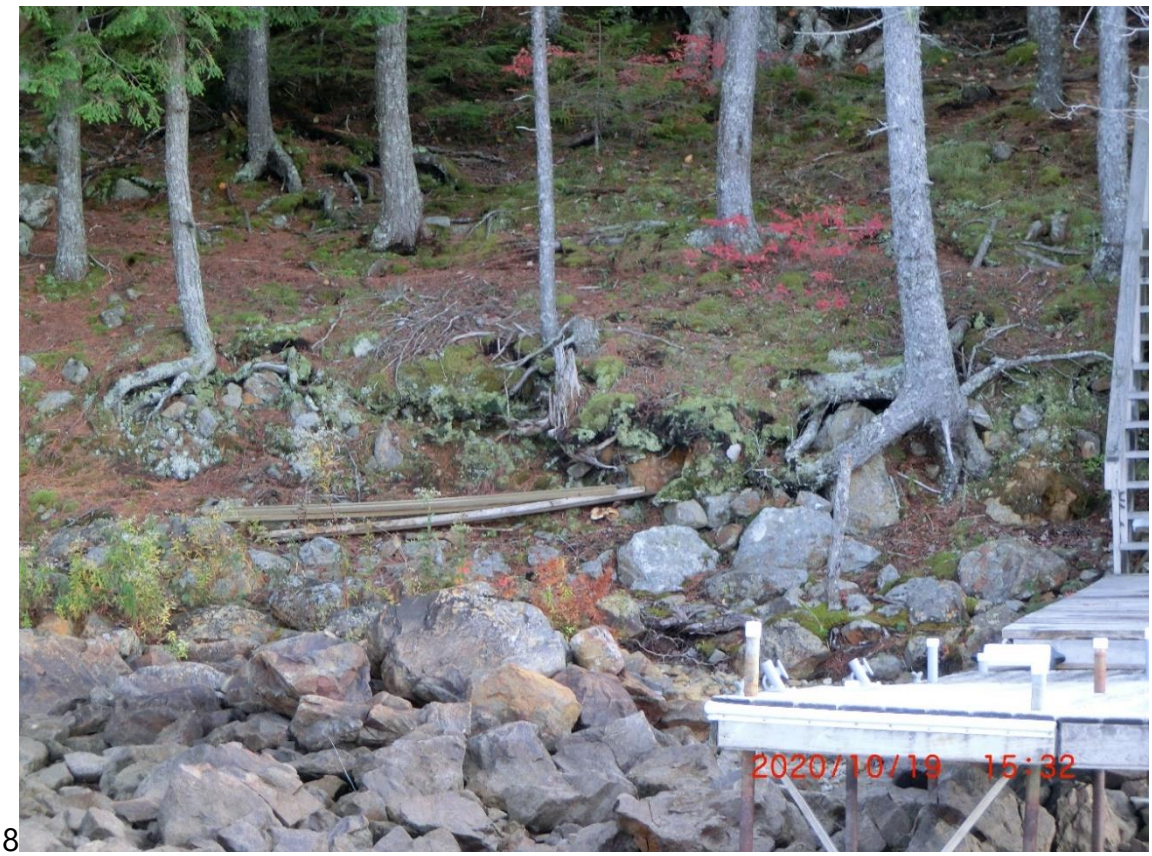
Figure 7-11 – Map of possible Erosion Sites

Site 2:

Site 2:

Site 18

Site 18



Site 18

7.2.4.2.1 Survey Pictures around Green Lake

These are the sites that were reviewed and determined not to have erosion issues. Starting at the south corner and heading North East, anti-clockwise, the three map sections show the location of each of the pictures – the pictures can be found in the Initial Study Report.

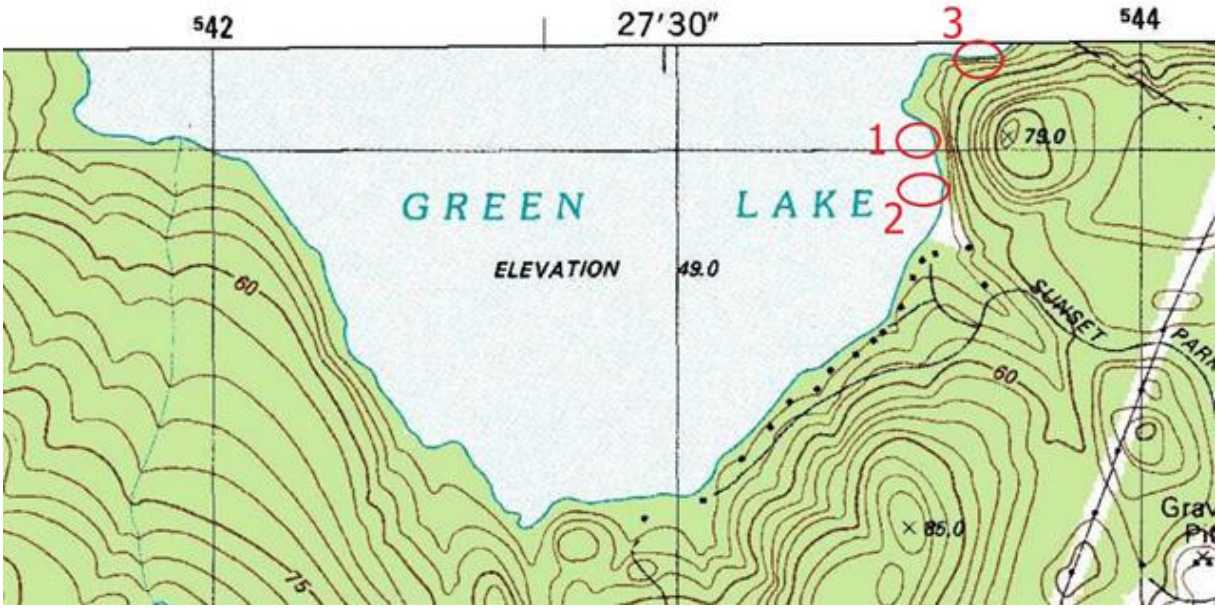


Figure 7-12 – Erosion Survey South End

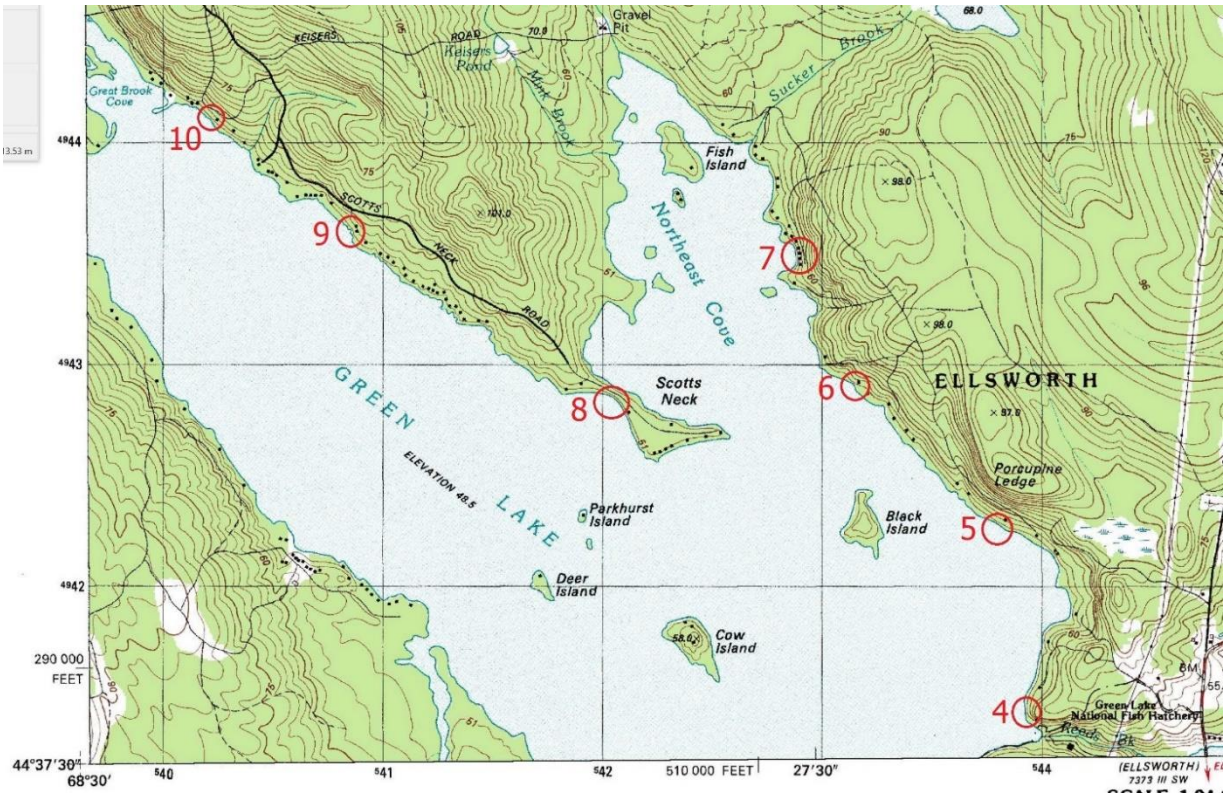


Figure 7-13 – Erosion Survey South East End

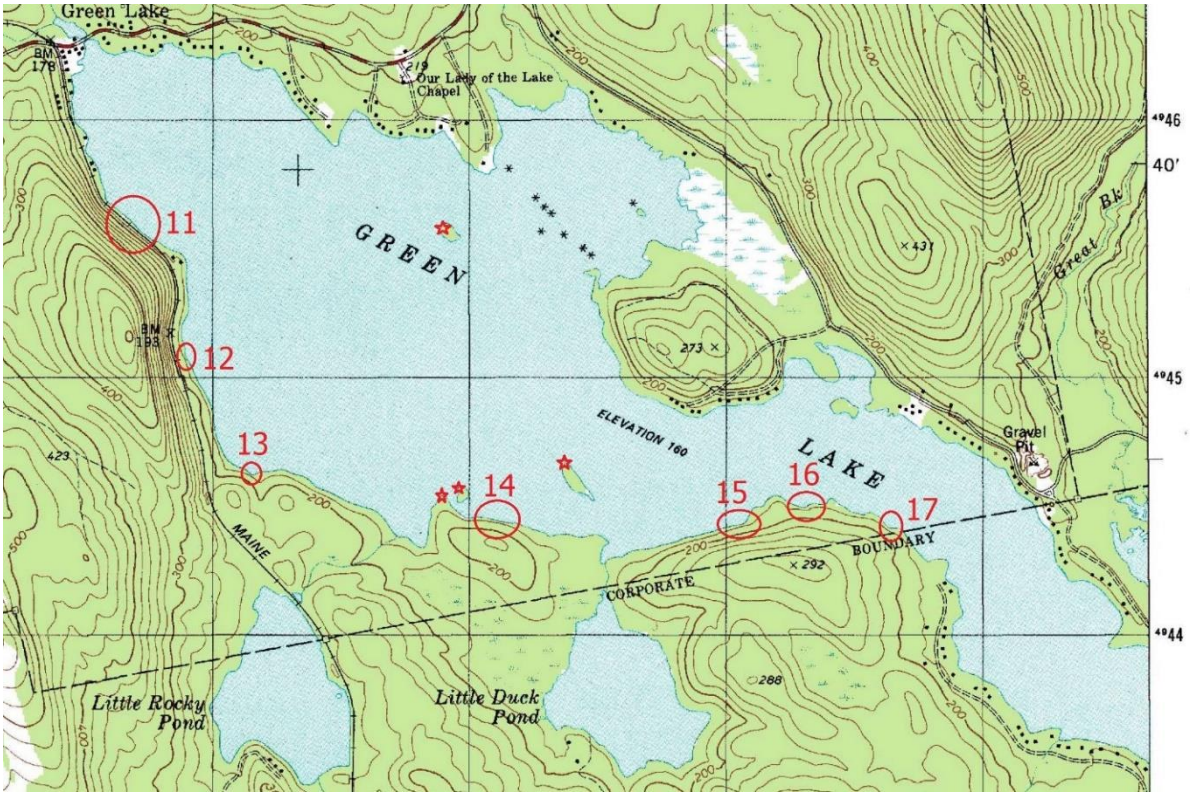


Figure 7-14 – Erosion Survey North End

And while we were on the lake, we were kept company by the loons.

Photo 7-10 – Loons on the lake

7.2.4.2.2 Variances from FERC-approved Study Plan and Proposed Modifications

The study plan and schedule did not vary from the FERC-approved study plan.

7.2.5 ADDITIONAL INFORMATION REQUESTED

In a letter to GLWP submitted on December 5, 2019, in Schedule B, FERC requested additional information on the Project.

7.2.5.1 Terrestrial Resources

7.2.5.1.1 Loon Data

1. Section 5.7.1 of the PAD states that loons occur in the project area. However, the PAD does not describe the abundance, timing, activities, and general distribution of common loons within the project area. The Green Lake Association has indicated that they participate in the Maine Audubon's annual loon count on Green Lake. To assist staff with its environmental analysis of the proposed project, please provide the results from the loon counts on Green Lake. To the extent possible, the information should include annual totals of adults and chicks observed, the timing of nesting, and the locations of nests.

The Green Lake Association coordinated with the Audobon Society to collect the data on the loon, chick and nest counts. Given the information on where the data had been gathered by the GLA, GLWP collected the latest loon and nest counts from the Lakes Of Maine website.

The Audobon organization started gathering the count on the nests in 1999, they don't track or store the location of the nests.

On the timing of nesting, females usually lay two mottled brown eggs between mid-May and mid-June. Both parents incubate the eggs for about 29 days. From: https://www.maineaudubon.org/wp-content/uploads/2018/06/Loon-Guide.pdf

YEAR	#Adults	#Chicks	Nests
1983	11	0	
1984	14	0	
1985	14	1	
1986	12	1	
1987	38	11	
1988	25	5	
1989	26	3	
1990	21	7	
1991	20	3	
1992	18	3	
1993	19	0	
1994	15	0	
1995	22	1	
1996	17	2	
1997	12	3	
1998	21	2	
1999	23	1	1
2000	26	3	0
2001	2	0	0
2002	19	0	2
2003	14	1	2
2004	12	2	0
2005	23	1	1
2006	16	0	1
2007	11	0	0
2008	9	0	0
2009	12	0	0
2010	15	2	0
2011	11	1	2
2012	21	0	0
2013	22	2	0
2014	20	3	0
2015	14	3	0
2016	25	1	0
2017	21	1	0
2018	43	1	0
2019	29	3	1

Table 7-12 – Loon and Nest Count

7.2.5.2 Recreation and Land Management

7.2.5.2.1 Impoundment Levels

2. Private landowners expressed concern during scoping about the effects of lowering the lake level after Labor Day on recreation within the project boundary. To assist staff with its environmental analysis of the effects of the annual drawdown on recreation, please file daily impoundment levels for the project from September 1 through November 31 from 2015 through 2019.

7.2.5.2.1.1 IMPOUNDMENT LEVELS FROM 2015-2019 – SEPTEMBER – NOVEMBER

	2015	2016	2017	2018	2019		2015	2016	2017	2018	2019
1-Sep	5.90	5.55	5.20	5.79	6.82	17-Oct	4.21	3.80	3.45	4.10	4.20
2-Sep	5.85	5.50	5.15	5.79	6.80	18-Oct	4.25	3.80	3.45	4.10	4.25
3-Sep	5.85	5.50	5.12	5.72	6.75	19-Oct	4.20	3.80	3.40	4.00	4.25
4-Sep	5.85	5.50	5.20	5.72	6.71	20-Oct	4.20	3.80	3.40	4.01	4.19
5-Sep	5.80	5.48	5.11	5.69	6.68	21-Oct	4.20	3.70	3.39	4.00	4.25
6-Sep	5.80	5.40	5.10	5.69	6.65	22-Oct	4.25	3.75	3.39	4.00	4.25
7-Sep	5.80	5.31	5.18	5.65	6.68	23-Oct	4.30	3.80	3.35	3.90	4.55
8-Sep	5.75	5.25	5.15	5.59	6.65	24-Oct	4.25	3.80	3.30	4.00	4.70
9-Sep	5.70	5.25	5.12	5.45	6.59	25-Oct	4.25	3.80	3.35	4.05	4.79
10-Sep	5.69	5.25	5.10	5.32	6.55	26-Oct	4.25	3.80	3.60	4.00	4.80
11-Sep	5.70	5.25	5.00	5.39	6.55	27-Oct	4.25	3.80	3.70	3.90	4.90
12-Sep	5.70	5.25	4.91	5.30	6.49	28-Oct	4.20	3.80	3.70	4.00	5.08
13-Sep	5.69	5.15	4.81	5.29	6.43	29-Oct	4.59	3.85	3.65	4.10	5.18
14-Sep	5.70	5.10	4.78	5.19	6.38	30-Oct	4.80	3.85	3.65	4.20	5.25
15-Sep	5.65	5.00	4.69	5.18	6.33	31-Oct	4.85	3.85	3.75	4.15	5.39
16-Sep	5.51	4.90	4.60	5.18	6.29	1-Nov	4.85	3.85	3.80	4.20	5.50
17-Sep	5.45	4.80	4.55	5.10	6.25	2-Nov	4.85	3.85	3.80	4.29	5.68
18-Sep	5.39	4.79	4.45	5.09	6.18	3-Nov	4.80	3.85	3.80	4.50	5.78
19-Sep	5.31	4.70	4.39	5.09	6.13	4-Nov	4.80	3.85	3.71	4.80	5.89
20-Sep	5.25	4.60	4.29	5.05	6.05	5-Nov	4.79	3.85	3.71	4.90	5.98
21-Sep	5.21	4.50	4.20	5.00	6.00	6-Nov	4.75	3.85	3.70	5.08	6.15
22-Sep	5.01	4.45	4.11	4.98	5.97	7-Nov	4.75	3.85	3.70	5.30	6.22
23-Sep	4.91	4.40	4.10	4.90	5.88	8-Nov	4.75	3.85	3.75	5.42	6.30
24-Sep	4.89	4.40	4.09	4.80	5.83	9-Nov	4.70	3.85	3.75	5.51	6.40
25-Sep	4.75	4.40	4.05	4.72	5.80	10-Nov	4.69	3.85	3.75	5.70	6.50
26-Sep	4.70	4.29	4.00	4.71	5.77	11-Nov	4.65	3.85	3.75	5.90	6.55
27-Sep	4.59	4.29	3.99	4.74	5.71	12-Nov	4.60	3.85	3.70	6.00	6.60
28-Sep	4.49	4.19	3.99	4.69	5.65	13-Nov	4.55	3.85	3.65	6.08	6.70
29-Sep	4.41	4.19	3.99	4.58	5.60	14-Nov	4.55	3.80	3.65	6.10	6.62
30-Sep	4.79	4.15	3.90	4.50	5.51	15-Nov	4.55	3.80	3.60	6.40	6.62
1-Oct	5.65	4.10	3.90	4.45	5.45	16-Nov	4.55	3.80	3.59	6.50	6.60
2-Oct	5.79	4.10	3.90	4.39	5.40	17-Nov	4.60	3.80	3.60	6.55	6.57
3-Oct	5.70	4.05	3.90	4.40	5.32	18-Nov	4.65	3.80	3.55	6.58	6.58
4-Oct	5.69	4.01	3.61	4.35	5.25	19-Nov	4.62	3.90	3.60	6.58	6.60
5-Oct	5.48	4.00	3.61	4.25	5.10	20-Nov	4.69	3.90	3.70	6.57	6.63
6-Oct	5.30	4.00	3.52	4.18	5.00	21-Nov	4.85	3.99	3.65	6.60	6.65
7-Oct	5.15	4.00	3.52	4.11	4.90	22-Nov	4.82	3.99	3.61	6.60	6.65
8-Oct	4.99	4.00	3.52	4.05	4.85	23-Nov	5.05	3.99	3.61	6.60	6.65
9-Oct	4.88	4.00	3.52	4.00	4.78	24-Nov	5.10	3.95	3.75	6.55	6.72
10-Oct	4.70	4.00	3.69	4.02	4.65	25-Nov	5.12	3.95	3.75	6.50	6.80
11-Oct	4.60	4.00	3.69	4.08	4.50	26-Nov	5.13	3.95	3.80	6.53	6.95
12-Oct	4.49	4.00	3.55	4.10	4.45	27-Nov	5.15	4.10	3.80	6.61	6.98

13-Oct	4.39	4.00	3.55	4.09	4.20		28-Nov	5.18	4.10	3.81	6.69	7.08
14-Oct	4.29	3.80	3.52	4.03	4.09		29-Nov	5.15	4.15	3.81	6.75	7.05
15-Oct	4.19	3.80	3.50	4.00	4.04		30-Nov	5.10	4.40	3.80	6.80	7.00
16-Oct	4.20	3.80	3.50	4.05	4.09							

7.2.5.2.1.2 Docks and Beaches

Dale Jellison of the Green Lake Association (GLA) sent a survey out to the GLA members requesting information on dock locations, types and elevation and /or depth of the docks. Also included in the survey were questions regarding the lake recreational usage and the effects of the fall drawdown.

The survey resulted in 85 responses.

7.2.5.2.1.2.1 The location of the docks on the impoundment.

The information provided by GLA included the address of each dock on the lake. Using Google Maps the locations of the docks were mapped on the lake and the GPS coordinates were noted.

By way of comparison, the location of all docks visible on the lake using Google Maps was drawn separately. The GPS coordinates of the docks found was noted. There are 218 docks represented in the Google Maps dock search.

This data shows that the docks included in the survey account for about 40% of the docks visible on the lake in the Google Maps search.

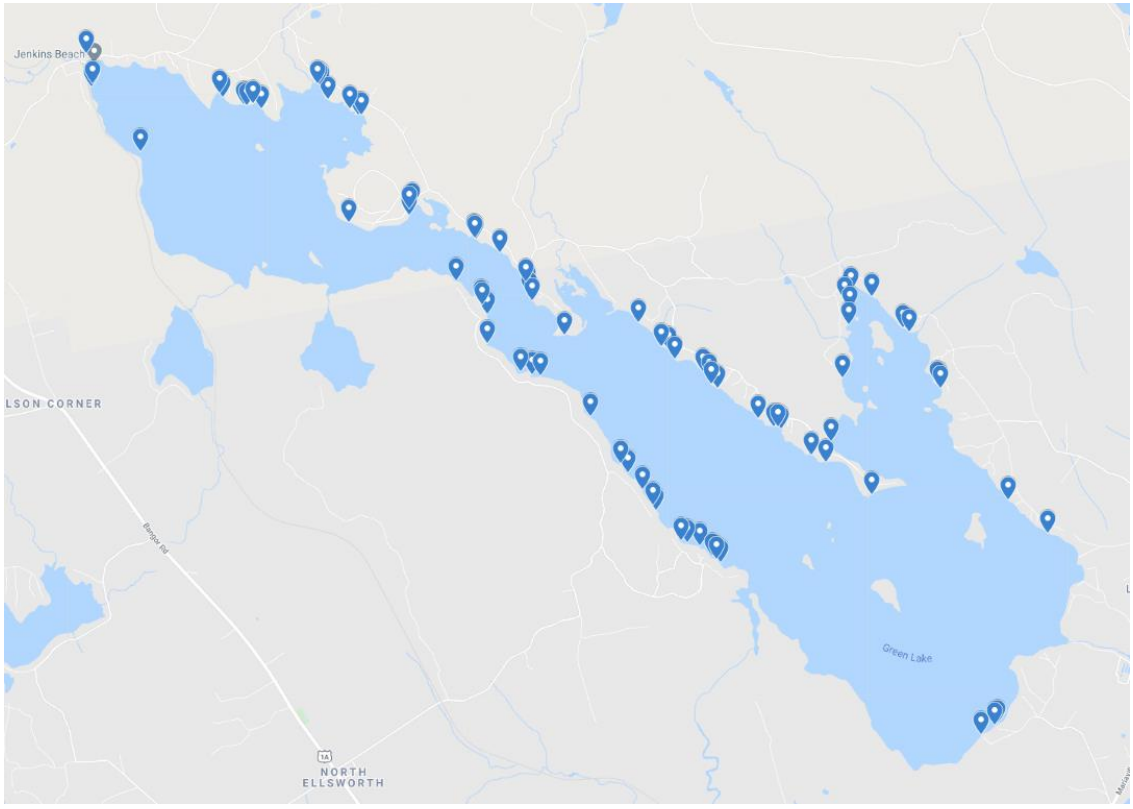


Figure 7-15 – Location of Docks included in the GLA Survey data

Figure 7-16 – Location of Docks included in the Google Maps survey

7.2.5.2.1.2.2 The type of docks

Some docks are made up of sections with more than one type. Of a total of 85 docks, 15 are either totally permanent, or have a permanent section, and 76 have 1 piece or more that are taken out for the winter.

Total Responses	Permanent	Floating	Lift Out	Removed for Winter
85	**15**	**38**	**53**	**76**

7.2.5.2.1.2.3 The elevation and/or depth of the dock, taken at its end.

1' or less	**> 1' <= 2'**	**> 2' <= 3'**	**> 3' <= 4'**	**> 4' <= 5'**	**> 5' <= 6'**	**> 6' <=7'**	**> 7' <= 8'**	**> 8' <= 9'**	**> 9'**
7	6	9	11	7	16	5	9	1	15

7.2.5.2.1.2.4 Additional survey data

The GLA Survey asked about extending the summer level. As was discussed in the Scoping Meeting, last June, a number of people indicated that they would be interested in extending the summer period. There were also several people who believe that the current drawdown is fine. The responses to this, including any comments, are in the Initial Study Report

7.2.5.2.1.3 BEACHES

Audrey Tunney – Green Lake Association President – surveyed the lake for private beaches – this is her report:

"On Saturday, September 5th I toured the perimeter of Green Lake in an effort to count the number of beaches along the lake. A couple of matters to note. I did not count Jenkins Beach as it is open to the public and not associated with a private dwelling. I also did not count the beach at the Ellsworth public landing. I did count the beach at Violettes Landing, as it is now privately owned and provides beach access to three dwellings. Lastly I did not venture in to Boggy Brook as many rocks revealed by the low water made access for my boat impossible. The same is true for the far end of Northeast Cove, Great Brook and Mann Brook. In total I counted 145 beaches associated with dwellings along the lake."

7.2.6 References

The Study Results above contain data from the following reports:

20210211-5007 – Initial Study Report

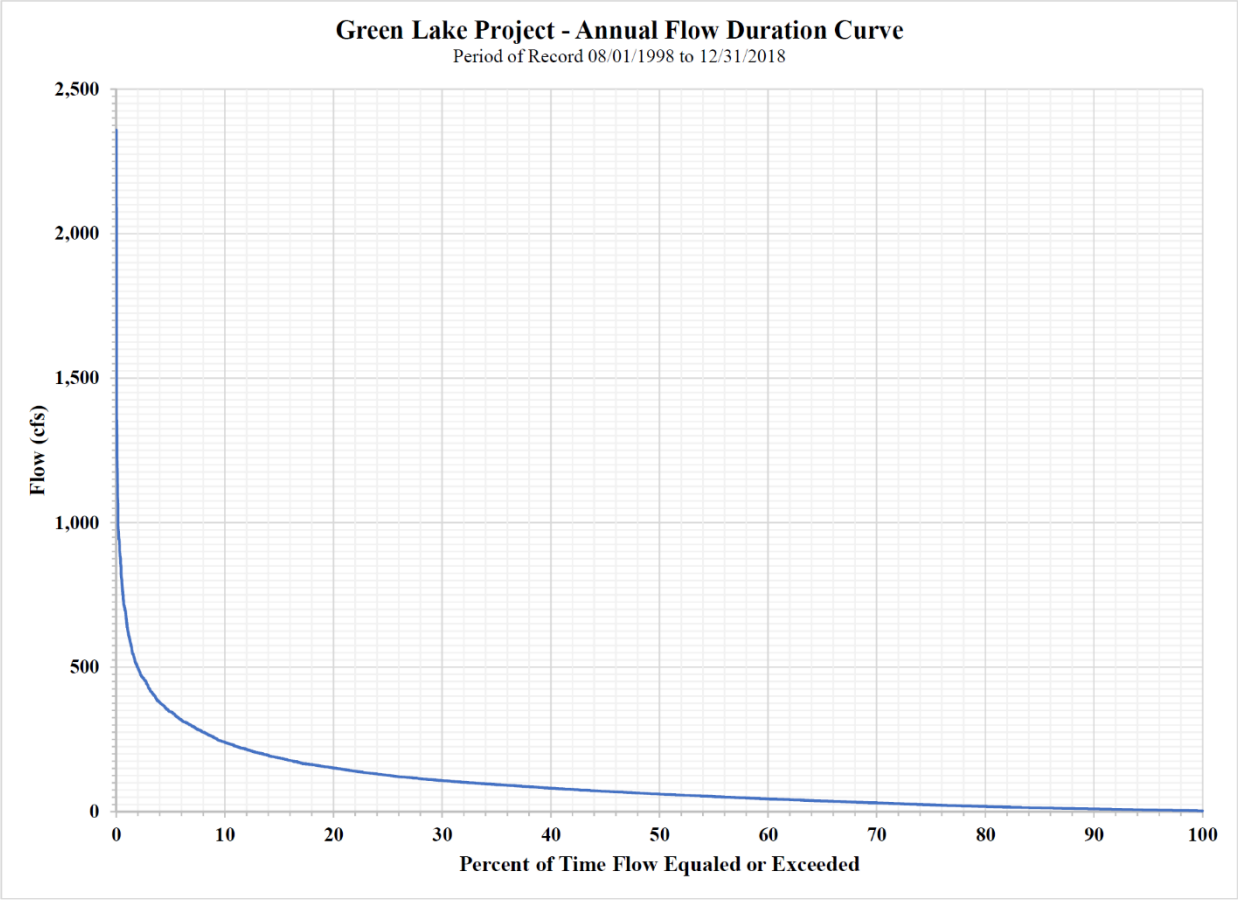
20210311-5107 – Initial Study Report Meeting Summary

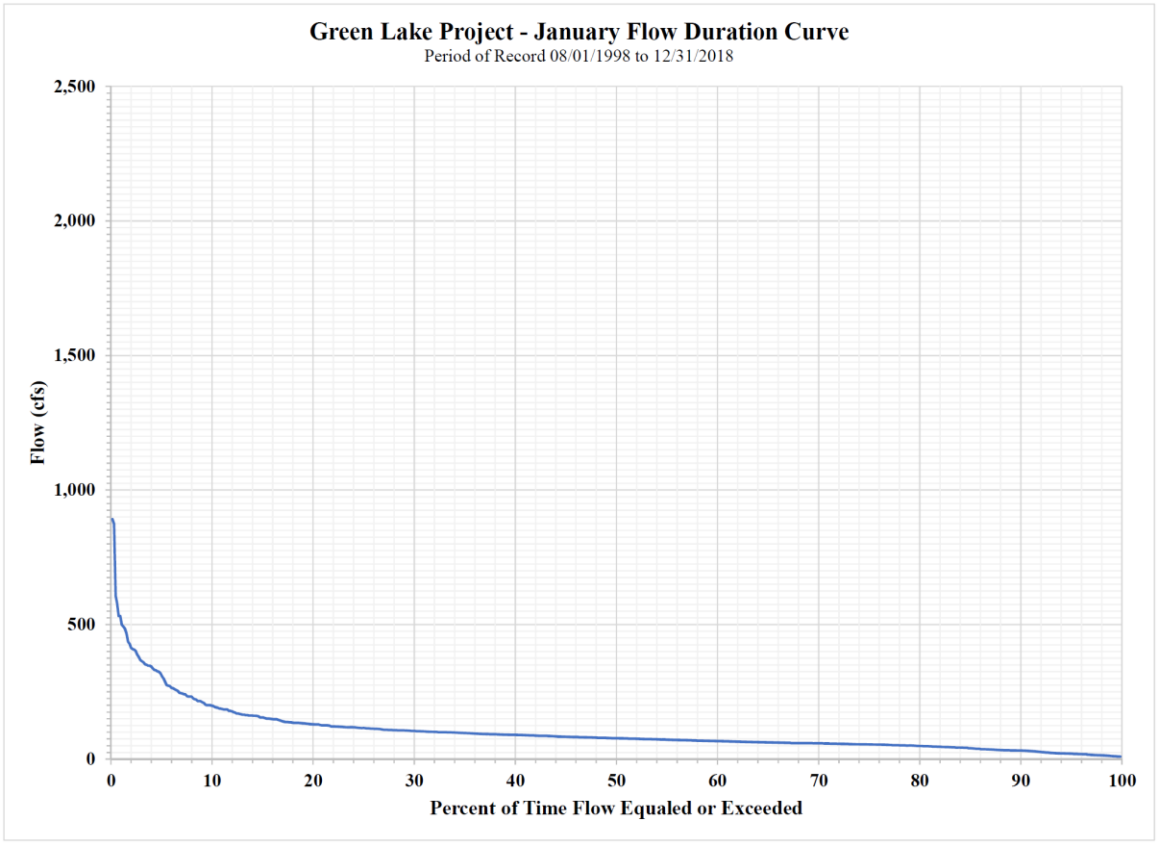
20210318-5028 – Supplement to Initial Study Report

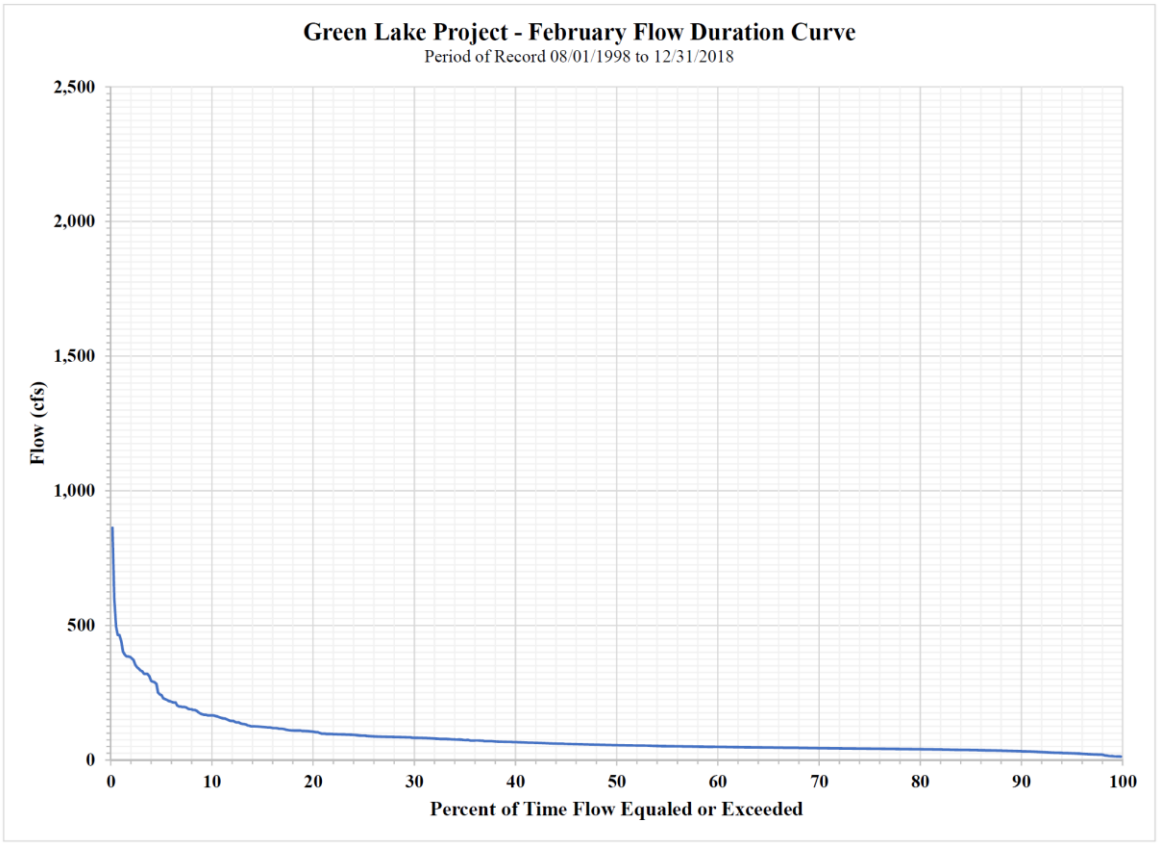
20210510-5015 – Response to Comments on the ISR Meeting Summary and Supplemental Reports

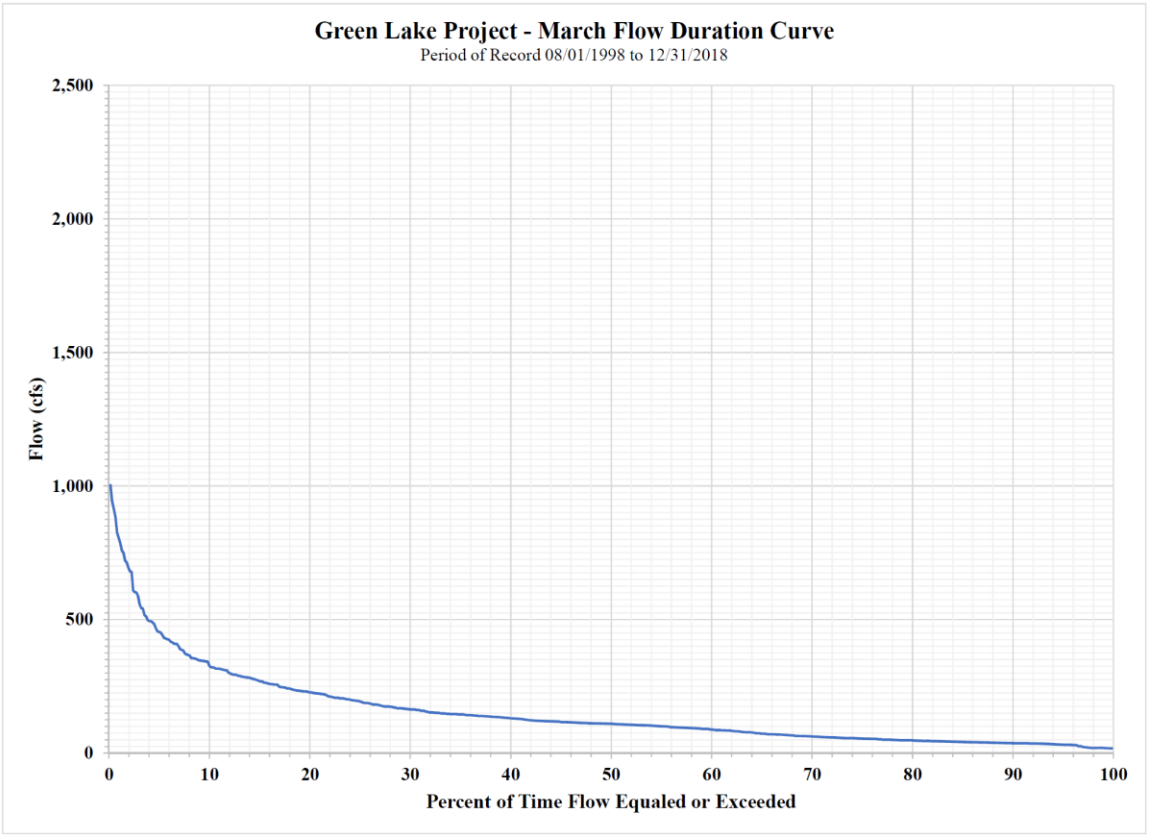
These reports are filed with the Federal Energy Regulatory Commission (FERC) and available on their website at https://elibrary.ferc.gov/eLibrary/search under Docket Number P-7189-014

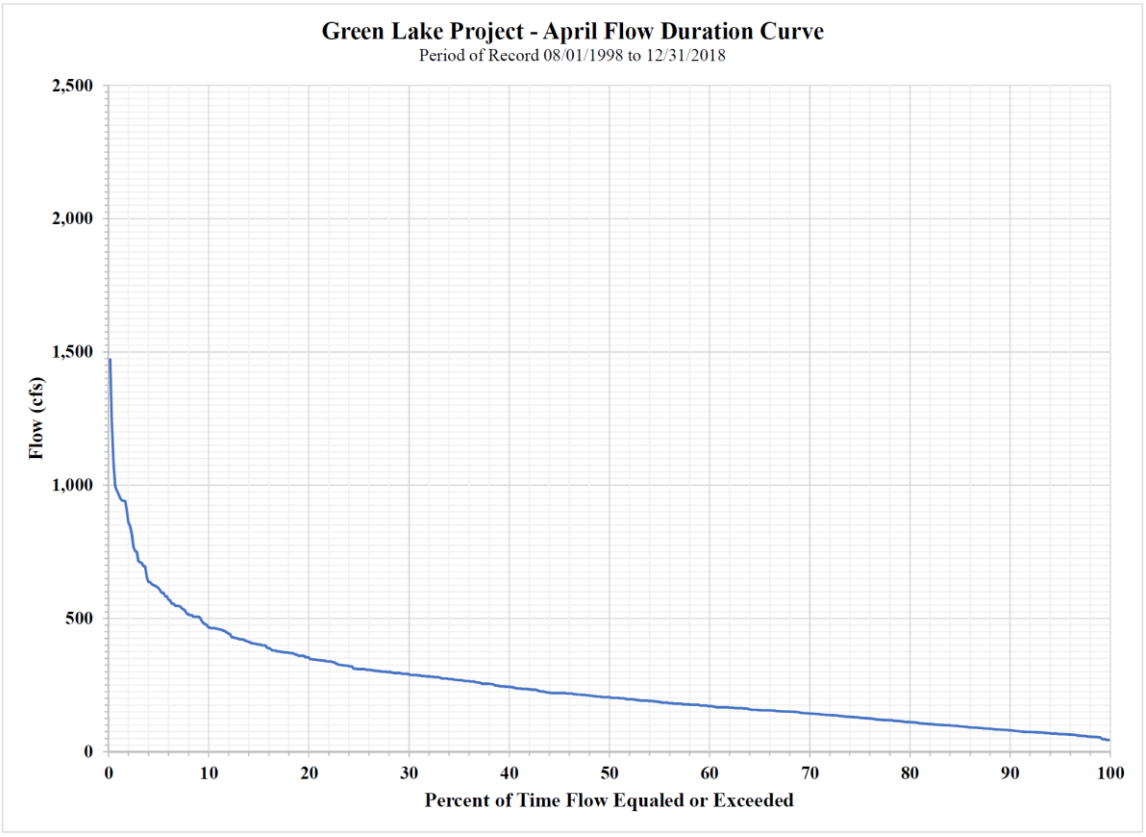
8.0 FLOW DURATION CURVES

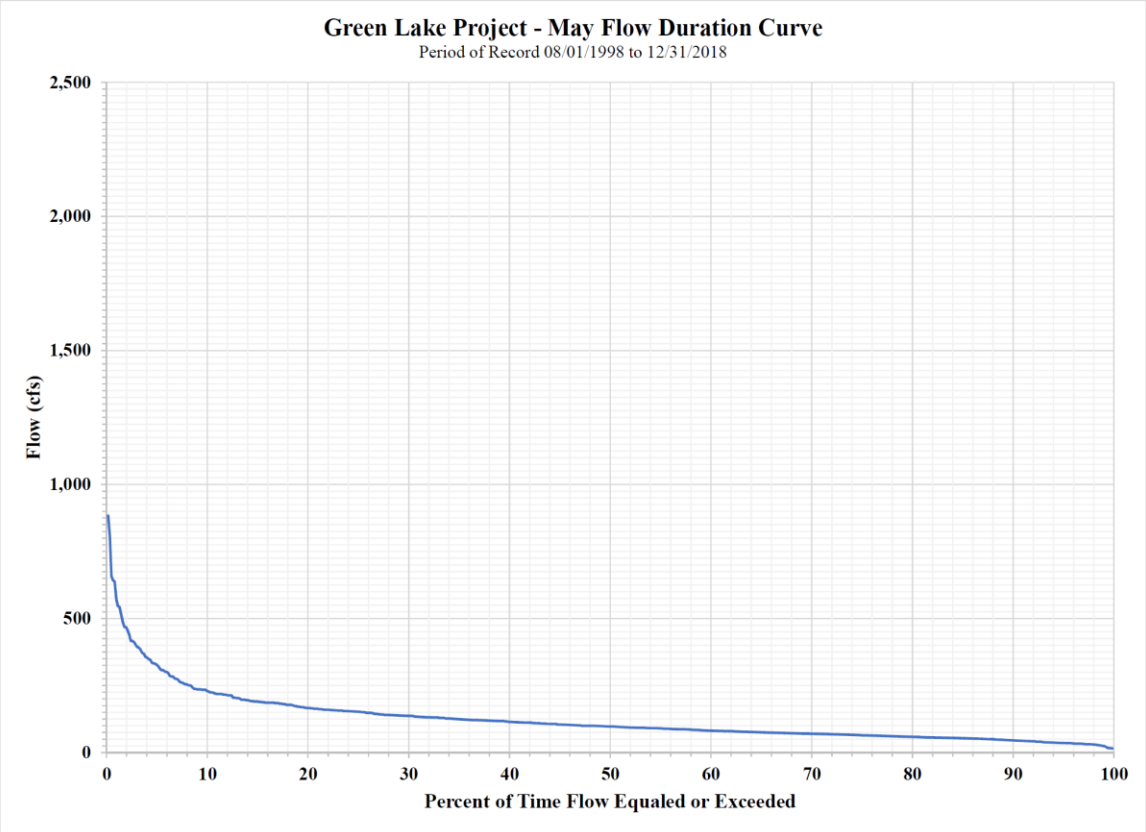


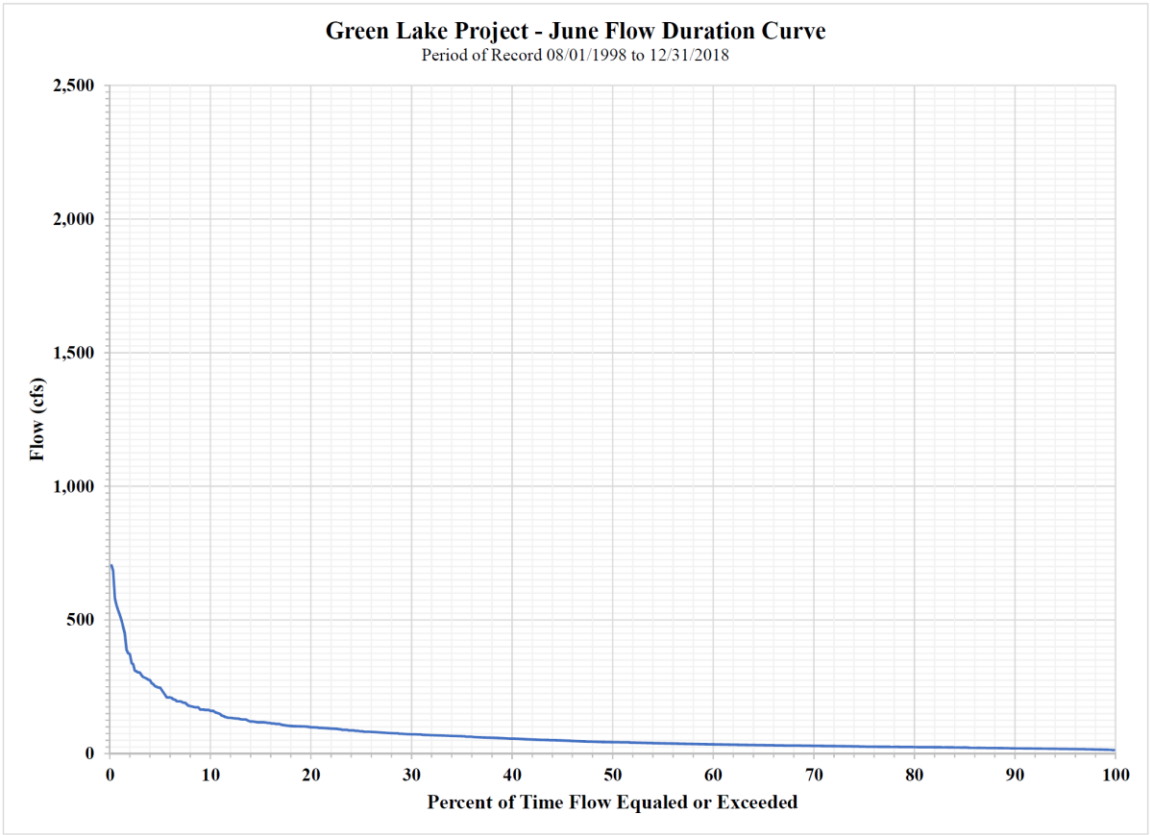

Green Lake Project - January Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

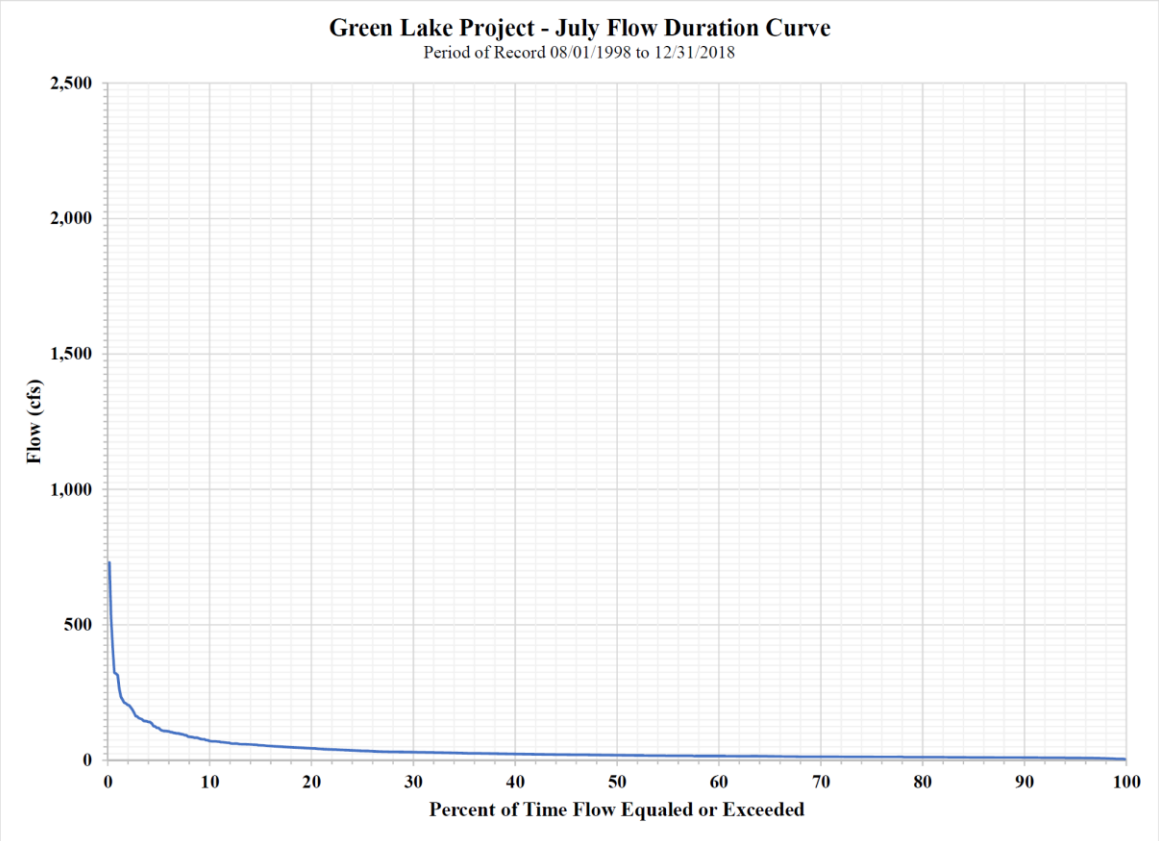

Green Lake Project - February Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

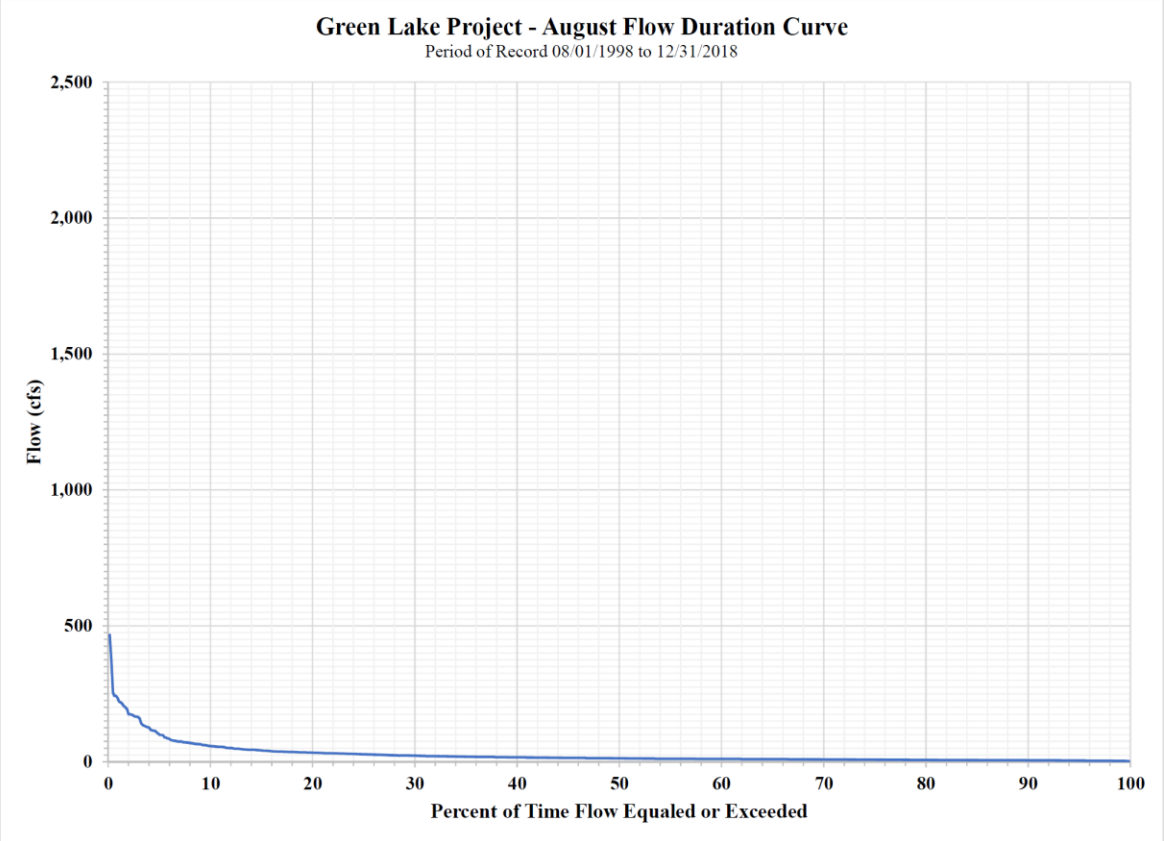

Green Lake Project - March Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

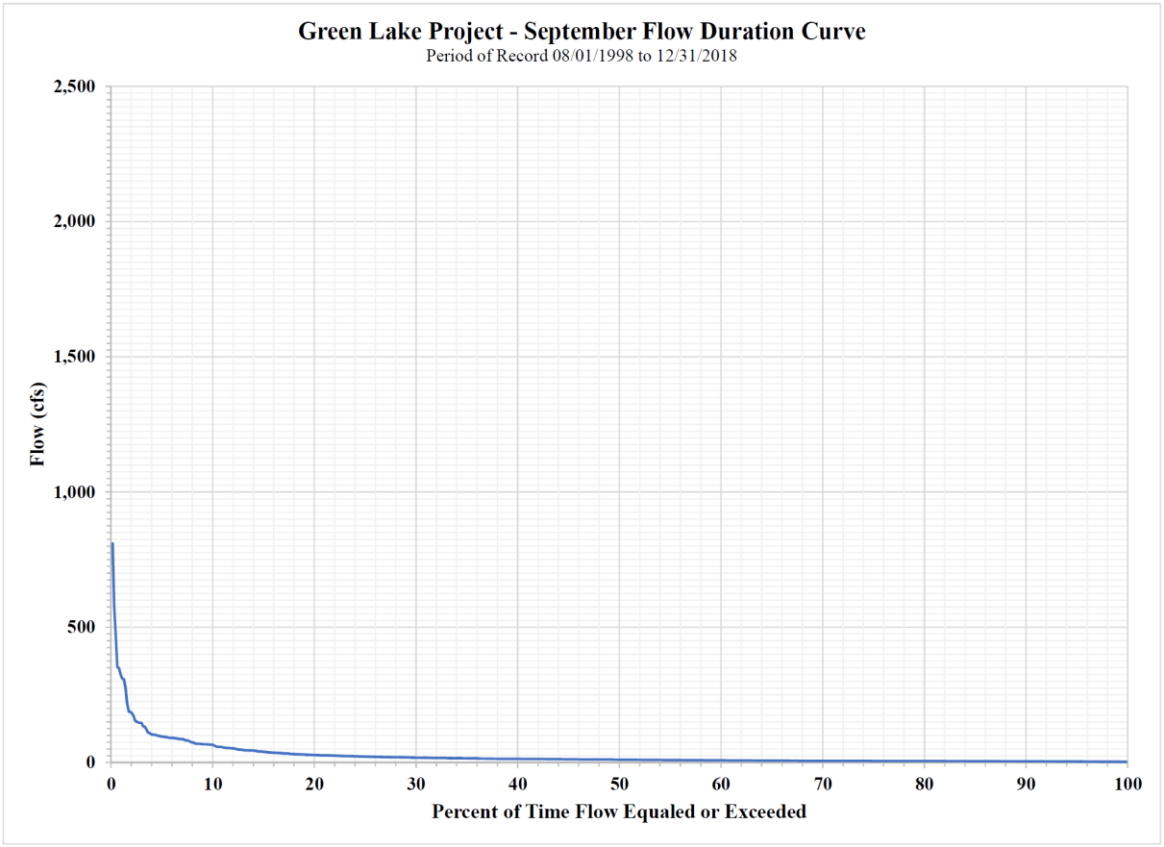

Green Lake Project - April Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

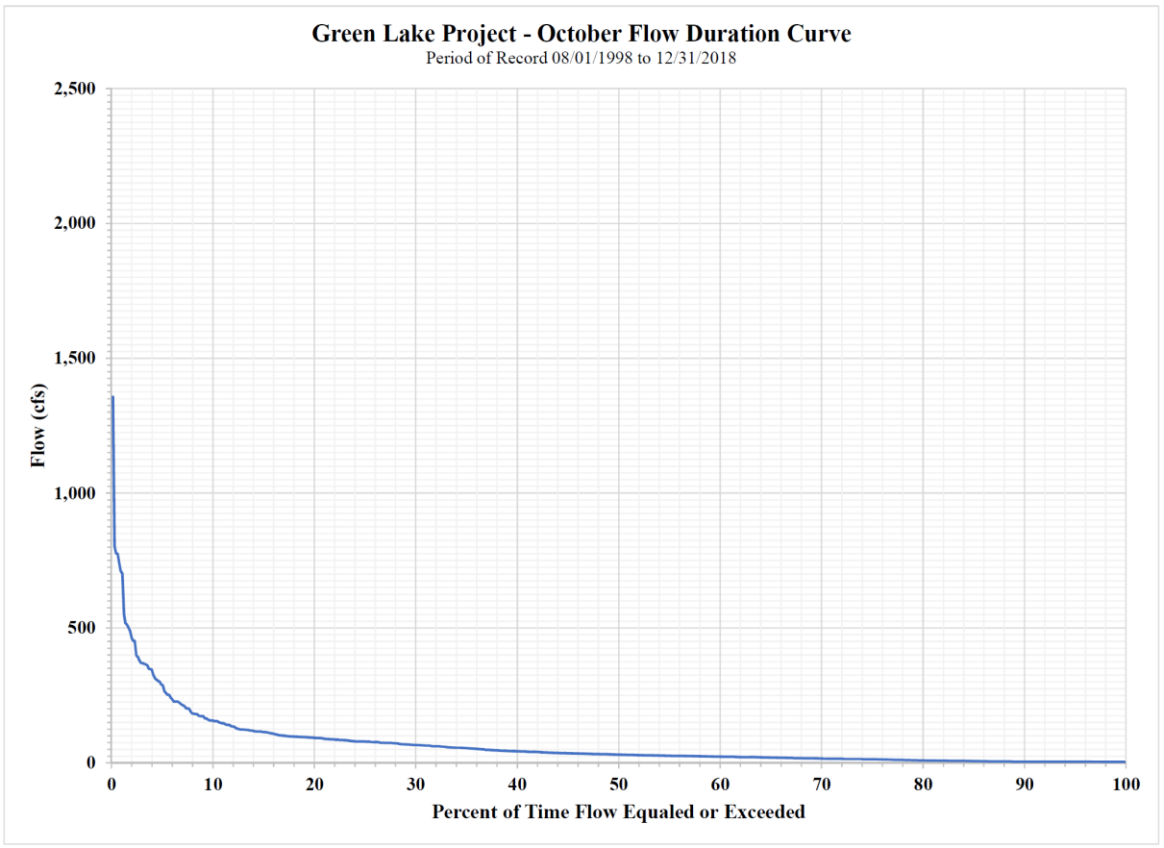

Green Lake Project - May Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

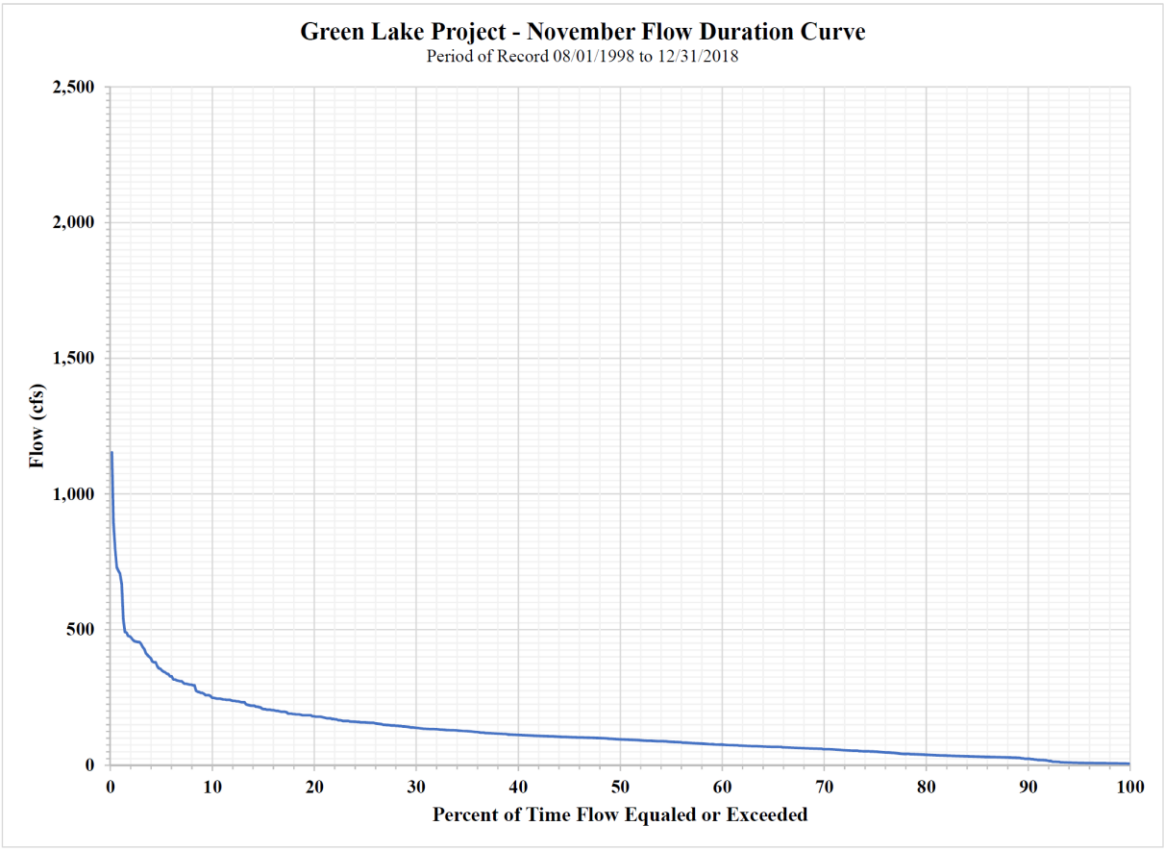

Green Lake Project - June Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded

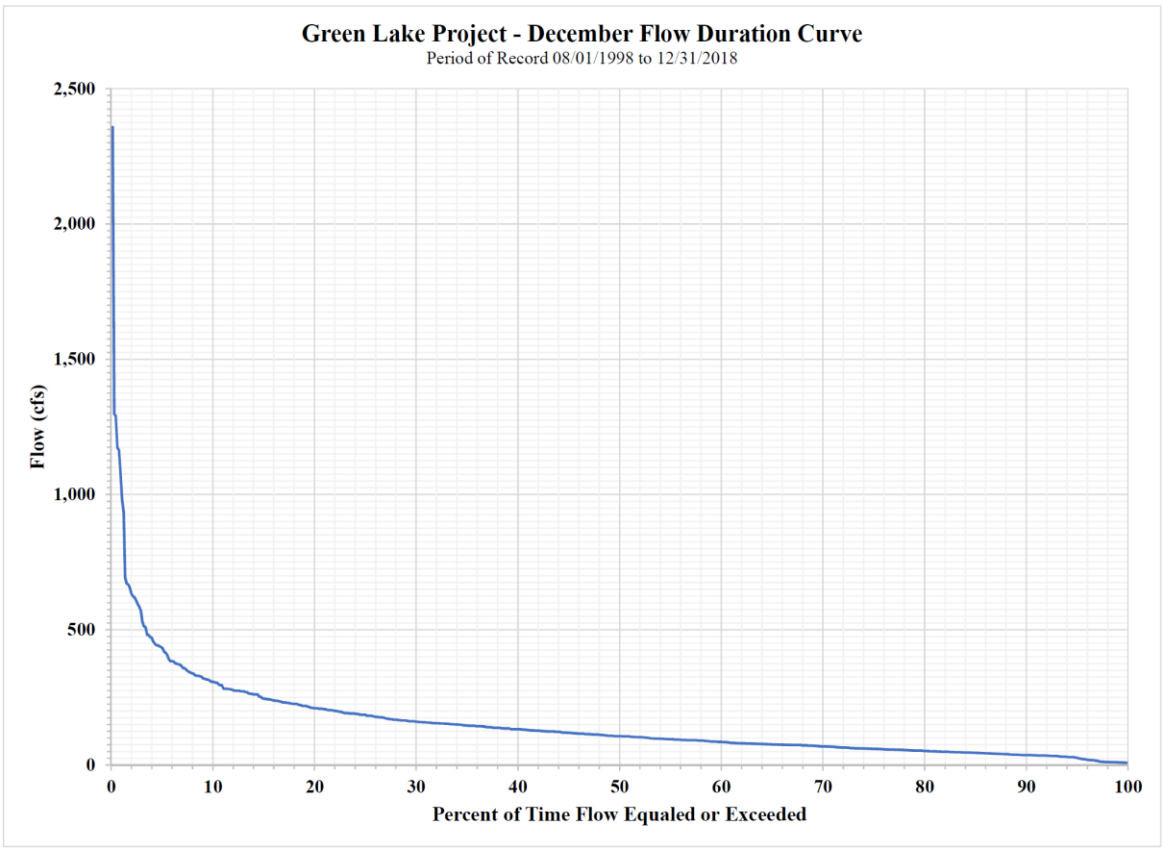

Green Lake Project - July Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded


Green Lake Project - August Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded


Green Lake Project - September Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded


Green Lake Project - October Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded


Green Lake Project - November Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
2,500
2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded


Green Lake Project - December Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018
Flow (cfs)
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2,000
1,500
1,000
500
0
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Flow Equaled or Exceeded