

Via eFile

May 29, 2025

Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

**Subject: Ripogenus Hydroelectric Project (FERC No. 2572-141)
Penobscot Mills Hydroelectric Project (FERC No. 2458-273)
Response to Additional Information Requests on the Final License Application**

Dear Secretary Reese:

Great Lakes Hydro America, LLC (GLHA) herein files with the Federal Energy Regulatory Commission (FERC) responses to the FERC-issued Additional Information Requests (AIRs) on the Final License Applications for the Ripogenus Hydroelectric Project (FERC No. 2572) and the Penobscot Mills Hydroelectric Project (FERC No. 2458) (collectively referred to as the “Projects”), located on the West Branch of the Penobscot River and Millinocket Stream in Piscataquis and Penobscot Counties, Maine.

GLHA is pursuing new separate licenses from FERC for the continued operation and maintenance of the Projects. On September 30, 2024, GLHA filed with FERC the Final License Applications in support of obtaining new licenses for the Projects pursuant to the Commission’s regulations at 18 Code of Federal Regulations §5.17.

On February 28, 2025, FERC issued a request for additional information on the Final License Applications with responses provided within 90 days (by May 29, 2025) unless otherwise indicated.

Concurrent with this filing, GLHA is providing a copy of this letter to all parties listed on the enclosed distribution list.

If you have any questions regarding this letter, please contact me by phone at (315) 566-0197 or by email at michael.scarzello@brookfieldrenewable.com.

Sincerely,



Michael Scarzello
Manager, Licensing
Brookfield Renewable U.S.

cc: Relicensing Distribution List

Enclosure: Responses to Additional Information Requests for the Final License Applications

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Federal Agencies

Glori James-Suarez
Realty Specialist
Northeastern States
Bureau of Land Management
250 E. Wisconsin Avenue, STE 1100
Milwaukee, WI 53202

Jarrett Devine
Deputy Administrator
Region 1
Federal Emergency Management Agency
PO Box 10055
Hyattsville, MD 20782-8055

Lori A. Ehrlich
Region 1 Administrator
Region 1
Federal Emergency Management Agency
PO Box 10055
Hyattsville, MD 20782-8055

Debbie-Anne A. Reese
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

John Spain
Regional Engineer
Division of Dam Safety and Inspections
New York Regional Office
Federal Energy Regulatory Commission
19 West 34th Street, Suite 400
New York, NY 10001-3006

Christopher Boelke
Chief, New England Branch
Habitat and Ecosystem Division
National Oceanic and Atmospheric
Administration
55 Great Republic Drive
Gloucester, MA 01930

Donald Dow
Maine Field Office
National Marine Fisheries Service
National Oceanic and Atmospheric
Administration
17 Godfrey Drive, Suite 1
Orono, ME 04473

Jon Hare
Director, Northeast Region
Northeast Fisheries Science Center
National Oceanic and Atmospheric
Administration
166 Water Street
Woods Hole, MA 02543-1026

Dan Kircheis
Penobscot Bay Salmon Recovery Coordinator
National Marine Fisheries Service
National Oceanic and Atmospheric
Administration
55 Great Republic Drive
Gloucester, MA 01930

Jeff Murphy
Maine Field Office
National Marine Fisheries Service
National Oceanic and Atmospheric
Administration
17 Godfrey Drive, Suite 1
Orono, ME 04473

Michael Pentony
Regional Administrator
National Marine Fisheries Service
National Oceanic and Atmospheric
Administration
55 Great Republic Drive
Gloucester, MA 01930

Kevin Mendik
Hydro Program Manager
Northeast Region
National Park Service
15 State Street
Boston, MA 02109

Jana Jacobson
U.S. Army Corps of Engineers
442 Civic Center Drive, Suite 350
Augusta, ME 04330

Richard Kristoff
New England District
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Maine Project Office
U.S. Army Corps of Engineers
442 Civic Center Drive, Suite 350
Augusta, ME 04330

Marchelle Foster
Hydroelectric Power Program Manager
U.S. Bureau of Indian Affairs
NW Regional Office
911 NE 11th Avenue
Portland, OR 97232-4169

Darryl Lacounte
Director
U.S. Bureau of Indian Affairs
MS 4606 MIB
1849 C Street NW
Washington, DC, 20240

Harold Peterson
Natural Resources Officer
U.S. Bureau of Indian Affairs
545 Marriott Drive, Suite 700
Nashville, TN 37214

Leonard Rawlings
FERC Coordinator
Eastern Region
U.S. Bureau of Indian Affairs
545 Marriott Drive, Suite 700
Nashville, TN 37214

David Bernhardt
Secretary
U.S. Department of Interior
1849 C Street, NW
Washington, DC 20240

Andrew Raddant
Regional Environmental Officer
Office of Environmental Policy & Compliance
U.S. Department of Interior
15 State Street, Suite 400
Boston, MA 02109

Office of the Solicitor, Northeast Region
U.S. Department of Interior
15 State Street, 8th Floor
Boston, MA 02109-3502

Joseph Bishop
Water Division Hydro Coordinator
New England Region
U.S. Environmental Protection Agency
5 Post Office Square
Boston, MA 02109

Karen McGuire
New England Region 1
Deputy Regional Administrator
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Timothy Timmermann
New England Region 1
NEPA Director
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code 06-3
Boston, MA 02109-3912

Patrick Dockens
Hydropower Coordinator
Maine Field Office
U.S. Fish and Wildlife Service
306 Hatchery Road
East Orland, ME 04431

Bryan Sojkowski
Civil Engineer
Northeast Region
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9587

Nick Stasulis
Data Section Chief
U.S. Geological Survey
196 Whitten Road
Augusta, ME 04333

Melissa Flye
Hydropower Coordinator
Maine Ecological Services Field Office
U.S. Fish and Wildlife Service
306 Hatchery Road
East Orland, ME 04431

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

State Agencies

Ryan Gordon
State Geologist, MGS Director
Maine Geological Survey
Maine Department of Agriculture, Conservation,
and Forestry
93 State House Station
17 Elkins Lane
Augusta, ME 04333-0022

Lisa St. Hilaire
Information Manager
Maine Natural Areas Program
Maine Department of Agriculture, Conservation,
and Forestry
177 State House Station
Augusta, ME 04333

James Vogel
Senior Planner
Bureau of Parks and Lands
Maine Department of Agriculture, Conservation,
and Forestry
22 State House Station
18 Elkins Lane
Augusta, ME 04333-0022

Heather Johnson
Commissioner
Maine Department of Economic Community
Development
59 State House Station
Augusta, ME 04333-0059

Laura Paye
Hydropower Coordinator
Bureau of Land and Water Quality
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

Mark Caron
Regional Wildlife Biologist
Region F Penobscot Region
Maine Department of Inland Fisheries and
Wildlife
16 Cobb Road
Enfield, ME 04493

Kevin Dunham
Regional Fisheries Biologist
Region F Penobscot Region
Maine Department of Inland Fisheries and
Wildlife
16 Cobb Road
Enfield, ME 04493

Douglas Kane
Regional Wildlife Biologist
Region E Moosehead Region
Maine Department of Inland Fisheries and
Wildlife
PO Box 551
Greenville, ME 04441

Tim Obrey
Regional Fisheries Biologist
Region E Moosehead Region
Maine Department of Inland Fisheries and
Wildlife
PO Box 551
Greenville, ME 04441

John Perry
Environmental Review Coordinator
Maine Department of Inland Fisheries and
Wildlife
41 State House Station
Augusta, ME 04333-0041

Casey Clark
Resource Coordinator
Maine Department of Marine Resources
32 Blossom Lane
Augusta, ME 04330

Sean Ledwin
Maine Department of Marine Resources
21 State House Station
Augusta, ME 04333-0021

Erin Wilson
Coastal Policy Specialist
Maine Coastal Program
Maine Department of Marine Resources
21 State House Station
Augusta, ME 04333-0021

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Lars Hammer
Resource Management Coordinator
Maine Department of Marine Resources
21 State House Station
Augusta, ME 04333-0021

Kirk Mohney
Director and State Historic Preservation Officer
Maine Historic Preservation Commission
55 Capitol Street
65 State House Station
Augusta, ME 04333

Megan Rideout
Review & Compliance / CLG Coordinator
Maine Historic Preservation Commission
55 Capitol Street
65 State House Station
Augusta, ME 04333

Dr. Arthur Spiess
Chief Historic Preservationist, Prehistoric
Archaeology
Maine Historic Preservation Commission
55 Capitol Street
65 State House Station
Augusta, ME 04333

Maine Public Utilities Commission
18 State House Station
Augusta, ME 04333-0018

Municipalities and Government Officials

Janet Mills
Governor of Maine
Office of the Governor
1 State House Station
Augusta, ME 04333-0001

Board of County Commissioners
Penobscot County
97 Hammond Street
Bangor, ME 04401-4913

Amy Polyot
District Manager
Penobscot County Soil & Water Conservation
District
1423 Broadway, Suite 2
Bangor, ME 04401

Board of County Commissioners
Piscataquis County
163 E. Main Street
Dover-Foxcroft, ME 04426

Kacey Weber
Interim Executive Director
Piscataquis County Soil & Water Conservation
District
USDA Service Center
42 Engdahl Drive
Dover-Foxcroft, ME 04426

Clint Linscott
Chairman
Town of East Millinocket
53 Main Street
East Millinocket, ME 04430

Peter Jamieson
Town Manager
Town of Millinocket
197 Penobscot Avenue
Millinocket, ME 04462

Jared Golden
U.S. Representative
U.S. House of Representatives
6 State Street, Suite 101
Bangor, ME 04401

Susan Collins
U.S. Senator
U.S. Senate
68 Sewall Street, Room 507
Augusta, ME 04330

Angus King
U.S. Senator
U.S. Senate
40 Western Avenue
E.S. Muskie Federal Building, Room 412
Augusta, ME 04330

Stacey Guerin
State Senator
3 State House Station
Augusta, ME 04333

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Kathy Irene Javner
State Representative
House Minority Office
Room 332, State House
2 State House Station
Augusta, Maine 04333

Trey Stewart
State Senator
3 State House Station
Augusta, ME 04333

James Lee White
State Representative
House Minority Office
Room 332, State House
2 State House Station
Augusta, ME 04333-0002

Native American Tribes

Edward Peter Paul
Chief
Aroostook Band of Micmacs
Educational Center
7 Northern Road
Presque Isle, ME 04769

Clarissa Sabattis
Chief
Houlton Band of Maliseet Indians
88 Bell Road
Littleton, ME 04730

Isaac St. John
Tribal Historic Preservation Officer
Houlton Band of Maliseet Indians
88 Bell Road
Littleton, ME 04730

Rena Newell
Chief
Passamaquoddy Tribe
Pleasant Point
PO Box 343
Perry, ME 04667

William Nicholas
Chief
Passamaquoddy Tribe
Indian Township
PO Box 301
Princeton, ME 04668

Donald Soctomah
Tribal Historic Preservation Officer
Passamaquoddy Tribe
PO Box 159
Princeton, ME 04668

Kirk Francis
Chief
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Chuck Loring
Director
Natural Resources Department
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Dan McCaw
Fisheries Biologist
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Chris Sockalexis
Tribal Historic Preservation Officer
Cultural and Historic Preservation Program
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Dan Kusnierz
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Additional Parties

Dr. Andrew Fisk
Northeast Regional Director
American Rivers

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Kevin Richard Colburn
National Stewardship Director
American Whitewater
1035 Van Buren Street
Missoula, MT 59802

Robert Nasdor
Northeast Stewardship & Legal Director
American Whitewater
65 Blueberry Hill Lane
Sudbury, MA 01776

Mark Zakutansky
Director of Conservation Policy Engagement
Appalachian Mountain Club
45 Jordan Road
Albrightsville, PA 18210-0527

John R. J. Burrows
Director of New England Programs
Atlantic Salmon Federation
Fort Andross, Suite 202
14 Main Street
Brunswick, ME 04011

Sarah Sindo
Site Manager
Big Eddy Campground

Jeff Russell
Bloomer Russell Beaupain
175 Exchange Street, Suite 200
Bangor, ME 04401

Bill Houston
Spokesperson
Caribou and Chesuncook Lake Camp Owners
Association and Chesuncook Dam Camp
Owners Association
PO Box 145
Kingfield, ME 04947

Stephen Perry
Representative
Carpenters Health and Safety Fund

Sean Mahoney
Conservation Law Foundation
53 Exchange Street
Portland, ME 04101

Lee Umphrey
CEO & President
Eastern Maine Development Corporation
40 Harlow Street
Bangor, ME 04401

P. Andrew Hamilton
Shareholder & Chair
Eaton Peabody, PA.
80 Exchange Street
Bangor, ME 04401

Brian Olas
Sales Executive
Exterus
82 Hanover Street, Suite 4
Portland, ME 04101

Bryant Davis
President
Fin and Feather Club of Maine
PO Box 123
Millinocket, ME 04462-0123

Vernon Haines
Fin and Feather Club of Maine
PO Box 123
Millinocket, ME 04462-0123

Marvin Waldrep
Senior Counsel
Georgia-Pacific, Inc.
PO Box 105605
Atlanta, GA 30348-5605

John O'Leary
Great Bay Hydroelectric Associates
76 Thatcher Street
Westwood, MA 02090-2527

Kevin Bernier
Senior Compliance Specialist
Great Lakes Hydro America LLC
1024 Central Street
Millinocket, ME 04462

Jesika Lucarelli
Great Mountain Guide Service

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Mark Nadeau
International Association of Machinists
245 Pamola Park
Millinocket, ME 04462

Rick LeVasseur
Katahdin Region Tourism Council
46 Marina Drive
South Twin Lake
Millinocket, ME 04462

Andrew Beahm
Executive Director
Maine Audubon Society
20 Gilsland Farm Road
Falmouth, ME 04105-2100

Patrick McTeague
McTeague, Higbee, Case, Cohen, Whitney &
Toker, P.A.
Maine Building Trades Council
PO Box 5000
Topsham, ME 04086-5000

Erich Veyhl
Analyst
Maine Conservation Rights Institute
24 Orchard Road
Concord, MA 01742-3202

Robert Voight
Maine Conservation Rights Institute
24 Orchard Road
Concord, MA 01742-3202

Steven Tuckerman
Maine Flow
67 Litchfield Avenue
Rutland, VT 05701-3511

Richard Hill
Maine Professional Guides Association
55 Morrison Hill Road
Wilton, ME 04294-4040

Arthur Dickey
Maine Rafting Expeditions

Landis Hudson
Executive Director
Maine Rivers
PO Box 782
Yarmouth, ME 04096

Chuck Verrill
President
Maine Rivers
PO Box 782
Yarmouth, ME 04096

Mary Haley
CEO
MXH Marketing

Matt Polstein
New England Outdoor Center

Jim Murton
North Country Rivers

Jeremy Hargreaves
Northeast Whitewater

Derek Heady
Northeast Whitewater

Suzie Hockmeyer
Co-founder
Northern Outdoors, Inc.
1771 US Rt 201
The Forks, ME 04985

Emily Yearwood
Northern Outdoors, Inc.
1771 US Rt 201
The Forks, ME 04985

Michael Smith
Outdoor Sport Institute
176 Highland Ave
Millinocket, ME 04462

Kenny DeCoster
Vice President
Penobscot Paddle and Chowder Society

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Peter Pray
President
Pray's Big Eddy Campground, Inc.
PO Box 548
Millinocket, ME 04462-0548

Amanda Williams
Representative for Allagash Gateway
Campground
Rudman Winchell
84 Harlow Street, PO Box 1401
Bangor, ME 04402

Matthew Streeter
Sebago TU Chapter
66 Quebec Street, Apt 2
Portland, ME 04101

Tom Tyler
President
Sportsman's Alliance of Maine
205 Church Hill Road
Augusta, ME 04330

Jimmy Doria
Three Rivers Whitewater

Neil Hagstrom
Trout Unlimited

Stephen Heinz
FERC Coordinator
Trout Unlimited
3 Spruce Lane
Cumberland Foreside, ME 04110

Fred Miller
President
United Plant Guard Workers of America
119 Wheaton Road
Dover Foxcroft, ME 04426

Sharon Klein
Associate Professor, School of Economics
University of Maine, Orono,

Dean Beaupain

Arthur Dickey

Jeff Fayle

Curt & Emelie Ferland
81 Oak Grove Road
Vassalboro, ME 04989

George Forgette

Peter Forti

Owen Genest
13 Maplewood Drive
Sandford, ME 04073

N. Stuart Harris

Kathleen Houston
PO Box 145
Kingfield, ME 04947

Christopher Howe

Michael Hudson
618 S Clary Road
Jefferson, ME 04348

Philip Hulbert
895 Brickhouse Hill Rd
East Meredith, NY 13757

Tom Janelle
41 Hadlock Road
Falmouth, ME 04105

Paul Johnson
35 Hammond Drive, PO Box 512
Oakland, ME 04963

John Kirk
1062 Ocean Avenue
Portland, ME 04103

James Lepage
101 Bradley Drive
Bennigton, VT 05201

Jim Murton

Charles Paone

Richard Parkes

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)
Distribution List

Edward Spear
307 Mt. Hope Avenue
Bangor, ME 04401

Robert Vadas
2909 Boulevard Road SE
Olympia, WA 98501-3971

Robert Van Deventer

Wes Zemrak
2 Brookside Drive
Falmouth, ME 04105

Schedule A
Response to Schedule A
Additional Information Requests

Schedule A

Request for Additional Information

General Comments

1. Section 1.1, Purpose of Exhibit E, of Exhibit E of the final license applications (FLA) for the Ripogenus Hydroelectric Project (Ripogenus Project) and Penobscot Mills Hydroelectric Project (Penobscot Mills Project) (collectively, the Projects) states that Great Lakes Hydro American, LLC (GLHA) has not completed certain studies, as of the filing of the FLA. These studies include: (1) Benthic Macroinvertebrate Assessment (Penobscot Mills Project areas); (2) McKay Station Fish Stranding Mitigation Study; (3) Whitewater Boating Assessment Study; and (4) Historic Architecture Survey. While Table 1.1-1, of Exhibit E, indicates that the results of these reports have been incorporated in the FLA, except for the McKay Station Fish Stranding Mitigation Study, the final study reports for the studies identified above, should be filed to the record, as well. Therefore, please file the remaining study reports (i.e., benthic macroinvertebrate assessment/water quality study, fish stranding mitigation study, and the historic architecture survey/cultural resources study) to complete the record for the Projects' FLA.¹ Any proposed protection, mitigation, and enhancement (PM&E) measures developed as a result of the completed reports (e.g., McKay Station Fish Mitigation Study Report) should be filed with the draft plans identified in AIR #3.

GLHA Response:

Benthic macroinvertebrate samples were collected in the vicinity of the Projects as part of the Water Quality Study, and results were provided in the Water Quality Study Report in the Initial Study Report (ISR) filed with FERC on April 24, 2023, and in the Updated Study Report (USR) filed with FERC on April 22, 2024. Additional benthic macroinvertebrate samples were collected from the North Twin impoundment as well as within the West Branch of the Penobscot River and Millinocket Stream downstream of the Projects' developments. The North Twin impoundment macroinvertebrate sample results were submitted to the Maine Department of Environmental Protection (MDEP) for their analysis using their linear discriminant model (LDM) to determine whether structure and function of the resident biological community is maintained and whether surface water quality classifications are attained. The North Twin impoundment macroinvertebrate sample results, including the MDEP LDM analyses, are provided herein in Appendix A. The initial results from the additional macroinvertebrate samples collected from the West Branch of the Penobscot River and Millinocket Stream are provided herein in Appendix B; however, the MDEP analyses of the samples using their LDM are in progress and will be filed with FERC once provided by the MDEP.

The McKay Station Fish Stranding Mitigation Study Report is provided herein in Appendix C.

¹ On November 13, 2024, GLHA filed the *Level 2 Whitewater Boating Study Report*.

As noted by FERC, GLHA filed the Level 2 Whitewater Boating Assessment Study Report with FERC on November 13, 2024; therefore, it is not being filed again as part of this AIR response.

The Historic Architecture Survey Report was filed with FERC in the ISR on April 24, 2024. After filing the ISR, the Maine Historic Preservation Commission (MHPC) provided comments on the report, which required additional field survey and updates to the report. GLHA performed the additional field survey activities in 2024 and subsequently updated the report. The updated Historic Architecture Survey Report was provided to MHPC on May 21, 2025, and it is currently under review by the MHPC. Upon receipt of MHPC's comments or approval of the survey report, GLHA will file the report and associated correspondences with FERC.

Protection, Mitigation, and Enhancement Measures

2. In section 3.1, *Ripogenus Project – Proposed Operations during Mean, High, and Low Water Years*, of Exhibit B of the FLA, GLHA proposes to coordinate with the appropriate agencies (e.g., the Maine Department of Environmental Protection, the Maine Department of Inland Fisheries and Wildlife (Maine DIFW), the Maine Land Use Regulatory Commission, and the U.S. Fish and Wildlife Service (FWS)) to modify the downstream flow requirements during low water years and droughts. In its response to Maine DIFW's August 1, 2024, and the Maine Bureau of Parks and Land's July 31, 2024, comments on the draft license applications,² GLHA proposes to develop and implement a low inflow protocol for the Projects to guide project operations during periods of low inflow. Section 3.1 of Exhibit B does not describe the proposal in detail. Moreover, there is no mention of the proposal in section 5.2, *Proposed Project Operations*, or section 5.3, *Proposed PM&E Measures*, of Exhibit E of the FLA. To ensure that all the PM&E measures are available for Commission staff and stakeholder review, and that staff has sufficient information to inform an environmental analysis of the proposed low-inflow protocol, please clarify GLHA's intent with regard to a low inflow protocol for the Projects. If GLHA is proposing such a protocol, please include it as a component of a proposed Project Operations and Compliance Monitoring Plan that GLHA files with the draft plans identified in AIR #3.

GLHA Response:

As indicated in Section 3.1 of Exhibit B, GLHA understands that during sustained adverse or low water years/conditions, modifications to the proposed minimum flows at the Ripogenus Project and/or the Penobscot Mills Project may be required to balance resource interests upstream and downstream of the Projects. Accordingly, GLHA proposes to develop a Low Inflow Protocol (LIP) to establish the protocols by which operational modifications will be implemented during sustained adverse or low water years/conditions. GLHA will file the LIP with FERC by July 28, 2025, in response to AIR #3.

3. Section 5.3, *Proposed Environmental Measures*, of Exhibit E of the FLA states that GLHA proposes to file, within 1 year of filing the FLA, draft Recreation Management Plans for the Projects, a draft updated Loon Management Plan for the Ripogenus Project, a draft updated Wildlife Management Plan for the Penobscot Mills Project, and draft Historic Properties Management Plans for the Projects. In

² See Appendix E.2 of the FLA (volume 3) at E.2-4 and E.2-15.

addition, GLHA proposes to file updated Shoreline Management Plans for the Projects within 2 years of license issuance. Finally, GLHA proposes upstream and downstream eel passage measures, including monitoring and a fishway operation and maintenance plan, at the East Millinocket, Dolby, and Millinocket Lake Storage Developments of the Penobscot Mills Project. However, the FLA does not contain, except for recreation measures, detailed descriptions or detailed elements of the proposed plans or any details associated with the eel passage measures. To ensure that all of the proposed PM&E measures are available for Commission staff and stakeholder review, and that staff has sufficient information to inform an environmental analysis for each of the proposed plans, please file the proposed draft plans, after agency and stakeholder consultation,³ including a draft plan for eel passage at the Penobscot Mills Project (i.e., structures, monitoring, operations and maintenance plan, and schedule), within **150 days** from the date of this letter.

GLHA Response:

GLHA is in the process of developing the following management and operating plans for the Projects in consultation with relevant resource agencies and stakeholders. GLHA anticipates filing of the following plans with FERC by July 28, 2025.

- Recreation Management Plan
- Historic Properties Management Plan
- Loon Management Plan
- Wildlife Management Plan
- Shoreline Management Plan
- Upstream and Downstream Eel Passage Plan
- Fishway Operation and Maintenance Plan
- Operations Compliance Monitoring Plan (including Low Inflow Protocol)

4. Table 5.3-2, in section 5.3.2, *Penobscot Mills Project*, of Exhibit E of the FLA, indicates that GLHA is proposing to release a year-round minimum flow of 200 cubic feet per second (cfs) in the West Branch of the Penobscot River (West Branch) downstream from Stone Dam. However, there is no explanation of how the flows would be released or monitored. To ensure that all of the PM&E measures are available for Commission staff and stakeholder review, and that staff has sufficient information to inform an environmental analysis of the proposed minimum flow release, please provide a detailed description of: (1) the mechanism by which GLHA proposes to release the minimum flow; (2) the location of the minimum flow release; and (3) how the minimum flow would be monitored. Please file this information with the draft plans identified in AIR #3.

³ For each plan, as appropriate, the consulting entities should include FWS, the National Maine Fisheries Service, Maine DIFW, the Maine Department of Marine Resources, the Maine Bureau of Parks and Lands, the Maine Council of Trout Unlimited, American Whitewater, and the Caribou and Chesuncook Lake Camp Associations.

GLHA Response:

GLHA will provide the requested information in the draft Operations Compliance Monitoring Plan to be filed with FERC by July 28, 2025.

5. On September 14, 2024, the Caribou and Chesuncook Lake Camp Associations (Camp Associations) requested an additional CHEOPS⁴ Operations Model run for the Projects.⁵ The Camp Associations specifically requested a “Scenario 3,” which involves: (1) monthly target elevations for Ripogenus impoundment, including a target full pool elevation set at 940.1 feet National Geodetic Vertical Datum of 1929; NGVD 29) on May 15 and June 1; (2) monthly target elevations for the North Twin impoundment, including a reduced winter drawdown; and (3) a North Twin discharge of 3,000 cfs from August 22 through October 15, provided the North Twin elevation is greater than 488.42 feet NGVD 29 and the Ripogenus impoundment level is at the target elevations referenced in Item 1 above, and a minimum discharge from North Twin impoundment of 1,500 cfs through the remainder of the year. Appendix E.5, *Operations Model Run Results*, of the FLA (Volume 3) includes the results of three modeling alternatives, including two scenarios requested by the Camp Associations in an August 9, 2024 letter to GLHA and one alternative that reflects GLHA’s proposed operations. However, the appendix does not include the results of the Camp Association’s requested Scenario 3, nor have the results for this scenario been filed subsequent to the filing of the FLA.

To ensure that a range of project operational alternatives has been modeled, and that Commission staff has sufficient information to inform an environmental analysis of the Projects’ operations, please run the Camp Associations’ Scenario 3, and file the results as an amendment to Appendix E.5. Scenario 3 should be modeled with: (1) the generating and minimum flow assumptions used to model the Camp Association’s Scenarios 1 and 2; and (2) the generating and minimum flows proposed by GLHA.

GLHA Response:

Based on the timing of the Camp Associations’ request for additional model runs (i.e., 2 weeks prior to the filing of the FLA), there was insufficient time to model the requested scenario and include the results in the FLA, which was filed on September 29, 2024.

As requested by FERC, GLHA evaluated the Camp Associations’ requested operating scenario and has provided the model run results herein in Appendix D.

Exhibit B

6. In section 3.1, *Ripogenus Project – Proposed Operations during Mean, High, and Low Water Years*, of Exhibit B of the FLA, GLHA proposes to use a gate at Ripogenus Dam to provide flow to the West Branch during unit or station outages at McKay Station. However, GLHA does not specify which

⁴ Computer Hydro-Electric Operations and Planning Software.

⁵ On November 6, 2024, the Camp Associations filed a second request for its model run; and on January 23, 2025, American Whitewater, the Maine Council of Trout Unlimited, the Camp Associations, and the Appalachian Mountain Club, collectively, also requested that Scenario 3 be modeled, and that the results be filed to the record.

gate would be used. To ensure that Commission staff has sufficient information to inform an environmental analysis of Ripogenus Project operations, please identify which gate(s) would be used to release flows from the dam.

GLHA Response:

Ripogenus Dam is comprised of two spillway sections, an intake structure, a gate section, and an earth section. The spillway section includes 22 stoplog bays (14 of which are equipped with trippable stanchions to ensure rapid water release during a severe flood event, and 8 that require a remote crane for operation) and two steel crest gates. The two steel crest gates were installed to reduce the need to release the stoplog sections during an extreme high-water condition. The gated sluice section contains a surface log sluice section and four deep waste gates that are controlled by a deep gate operator placed on rails to power the lifting mechanisms.

Current and proposed minimum flows into the Upper Gorge (West Branch downstream of Ripogenus Dam) are provided via the surface log sluice section. In the event that additional flows are required to be released from the dam (i.e., during an extended unit or station outage), GLHA would likely utilize the steel crest gates (with a sill elevation of 929.59 feet); however, depending on the impoundment elevation, inflows to the Project, and necessary flow releases from the dam, GLHA may utilize different and/or additional gates, as deemed necessary.

Exhibit D

7. In Table 4.2.1, in Exhibit D of the FLA, GLHA provides capital and annual costs for the proposed measures at the Ripogenus Project. Two proposed measures in this table would likely result in changes in generation which are not identified in the table. Section 9.0, *Average Annual Increase or Decrease in Generation due to Change in Project Operations*, of Exhibit D, states that the proposed operational measures at the Ripogenus Project would result in a 3,285-MWh increase in generation. To the extent practical, please identify the change in this generation increase that would be attributed to: (1) the 1,700-cfs minimum flow from McKay Station; and (2) target boating flows downstream of McKay Station.

GLHA Response:

The proposed 1,700 cfs minimum flow from McKay Station accounts for approximately 3,234 MWh of the overall 3,285 MWh increase in the average annual generation of the Ripogenus Project, while the remaining increase of 51 MWh is attributed to the proposed target boating flows from McKay Station.

8. In Table 4.2.2, in Exhibit D of the FLA, GLHA provides capital and annual costs for the proposed measures at the Penobscot Mills Project. Two proposed measures in this table would likely result in changes in generation which are not identified in this table. Section 9.0, *Average Annual Increase or Decrease in Generation due to Change in Project Operations*, of Exhibit D, states that the proposed operational measures at the Penobscot Mills Project would result in an 8,798-MWh decrease in generation. To the extent practical, please identify the change in this generation decrease attributed to: the 200-cfs minimum flow from Stone Dam; and (2) the 600-cfs boating flow from Millinocket Lake Storage Dam.

GLHA Response:

The proposed 200 cfs minimum flow from Stone Dam results in a decrease in average annual generation of approximately 9,246 MWh for the Millinocket Development of the Penobscot Mills Project. The proposed 600 cfs boating flow from the Millinocket Lake Storage Dam results in an increase in average annual generation of approximately 15 MWh, as this additional flow from the Millinocket Lake Storage Development will subsequently flow through powerhouses at the Dolby and East Millinocket Developments. Additionally, the proposed flows from the Ripogenus Project will result in an increase in average annual generation at the Penobscot Mills Project of approximately 433 MWh, as additional flow from the Ripogenus Project will result in added flow through the powerhouses at the Penobscot Mills Project.

9. Section 9.0, *Average Annual Increase or Decrease in Generation due to Change in Project Operations*, of Exhibit D of the FLA states that the proposed operational measures at the Penobscot Mills Project would result in an 8,798-MWh decrease in generation. However, according to the text in section 9, generation at the Millinocket Development would be reduced by 8,915 MWh, which is greater than the total generation losses estimated for the Penobscot Mills Project. Please clarify this discrepancy.

GLHA Response:

The operations model evaluates the difference in generation (megawatt hours [MWh]) from the Baseline Scenario to the Proposed Scenario for each development of the Penobscot Mills Project and Ripogenus Project. As indicated in the generation summary provided in Appendix E.5 of the FLA, the GLHA Proposed Scenario (FLA Proposal) resulted in an increase in generation at the North Twin Development of 41 MWh, a decrease in generation at the Millinocket Development of 8,915 MWh⁶, an increase in generation at the Dolby Development of 43 MWh, and an increase in generation at the East Millinocket Development of 33 MWh. Therefore, the total change in generation for the Penobscot Mills Project is 8,798 MWh (the sum of the change in generation for all developments in the Project).

10. Table 4.2-2, in Exhibit D of the FLA, GLHA provides capital and annual costs associated with its proposed American eel passage measures. However, no costs are given for the proposed downstream eel passage measures at the East Millinocket and Dolby Developments. In section 6.6.2.2, *Environmental Analysis – Penobscot Mills Project*,⁷ of Exhibit E of the FLA, GLHA states that downstream passage measures for eel could include operational changes (e.g., nighttime shut-downs), engineered protection measures, fish-friendly turbine runner replacements, or other measures. To ensure that all the PM&E measures are available for Commission staff and stakeholder review, and that staff has sufficient information to inform an environmental analysis of the proposed downstream eel passage measures, please provide the estimated capital and annual costs for the downstream eel passage measures mentioned

⁶ The FLA Proposal Scenario results in an overall decrease in generation at the Millinocket Development of 8,915 MWh, which is different than the decrease in generation indicated in the response to AIR #8, which is specific to the effect on generation for the proposed 200 cfs minimum flow from Stone Dam. The overall decrease for the FLA Proposal Scenario includes the decrease in generation for the 200 cfs minimum flow from Stone Dam as well as other proposed operational aspects that increase generation at the Millinocket Development.

⁷ See effects discussion in Downstream American Eel Passage section on page E-348 of Exhibit E.

in section 6.6.2.2. These costs may be provided with the draft plan for American eel passage that GLHA files in response to AIR #3.

GLHA Response:

To the extent possible, GLHA will provide estimated costs for capital and annual costs for downstream eel passage measures proposed in the draft Upstream and Downstream Eel Passage Plan to be filed with FERC by July 28, 2025.

11. In Tables 4.2.1 and 4.2.2 in Exhibit D of the FLA, GLHA provides capital and annual costs for the proposed measures at the Ripogenus Project and the Penobscot Mills Project. To the extent practical, for any new measures recommended by the stakeholders that result in a change in generation, please estimate the increase or decrease in generation associated with that measure.

GLHA Response:

Between March 2024 and September 2024, stakeholders requested various alternative operating scenarios for the Projects, the majority of which were evaluated by the GLHA-developed operations model. Model run results for the stakeholder-requested alternative operating scenarios include the impact on generation for each development associated with the Projects. To date, operations model run results indicating impacts to generation have been filed with FERC on June 28, 2024; July 22, 2024; September 30, 2024; and in Appendix D of this filing.

Exhibit E

Water and Aquatic Resources

12. Table 5.3-1, in section 5.3.2, *Penobscot Mills Project*, of Exhibit E of the FLA, includes a proposal to provide target boating flows of 600 cfs from Millinocket Lake Storage Dam to Millinocket Stream from June through September. However, section 6.5.3, *Water Resources – Proposed Environmental Measures*, of Exhibit E does not include this proposal for the Penobscot Mills Project. Please clarify this discrepancy.

GLHA Response:

Table 5.3-2 in Section 5.3.2 of Exhibit E of the FLA provides a list of the existing and proposed protection, mitigation, and enhancement (PM&E) measures for the term of a new license for the Penobscot Mills Project, which includes a recreation PM&E measure to provide a target boating flow from Millinocket Lake Storage Dam. The proposed recreation boating flow is included in Section 6.10.3 of the Recreation and Land Use Section in Exhibit E of the FLA as it relates to recreational boating. Section 6.5.3 in the Water Resources Section of Exhibit E of the FLA provides a list of proposed PM&E measures specific only to water quantity and water quality; therefore, the proposed recreation boating flow is not specifically included in the Water Resources Section. However, there would be no expected impacts to water quality associated with the proposed periodic releases of recreational boating flows.

13. Section 5.3.2, *West Branch at Big Eddy*, of the *McKay Station Ramping Study Report*,⁸ states that 228 organisms were observed in the Big Eddy study reach during both operational scenarios (i.e., 3 units to 1 unit; and 3 units to 2 units to 1 unit); 208 were alive and 10 were mortalities, leaving 10 organisms unaccounted for. Table 11, cited in the text, documents 228 organisms observed during the study, of which 218 were alive and 10 were mortalities. Please clarify the discrepancy regarding the number of alive organisms observed at the Big Eddy study reach.

GLHA Response:

The reference to 208 organisms alive is an error. The correct text should indicate the following:

“During Scenario 1 and Scenario 2, water levels in the West Branch at Big Eddy began to drop within 20 minutes and stabilized within 65 minutes after the operational changes, resulting in exposed boulder, cobble, and gravel bars along the shoreline (Photo 7 through Photo 11). Most of the West Branch remained wetted with ample water for fish and macroinvertebrates. In total, 228 stranded organisms were observed in the Big Eddy study reach during both scenarios, of which 218 were alive and 10 were mortalities (Table 11). Fewer organisms were observed stranded during Scenario 2 (Table 11). GLHA observed 24 fish at this site, 14 of which were alive.”

14. Section 6.6.1.1, *Fish and Aquatic Resources – Affected Environment*, of Exhibit E of the FLA,⁹ describes the aquatic habitat within the first 1,000 feet downstream from McKay Station as a set of deep, swift pools and rapids, within a confined gorge. There is no description of the West Branch beyond the project boundary. To ensure that Commission staff has sufficient information to inform an environmental analysis of the existing and proposed minimum flows in the West Branch, please provide a general description of the aquatic habitat in the West Branch downstream from the project boundary through the area just downstream from the Holbrook Side Channel.

GLHA Response:

The West Branch of the Penobscot River downstream of McKay Station includes a set of deep, swift pools and rapids, within a confined gorge for approximately 0.5 mile. Following the reach in the confined gorge, the river widens slightly to include riverine pools and runs interspersed with high gradient rapids over the next 0.5 river mile to just downstream of the Holbrook Side Channel. This reach includes shorelines with riparian vegetation along with a mix of large boulder and cobble substrates with occasional gravel bars as documented just upstream of the Holbrook Side Channel.

Aquatic habitat in the McKay Station tailwater is a set of deep, swift pools and rapids. The river channel is wetted from bank to bank at the existing minimum flow of 1,000 cfs. The riverbanks are steep with no definable bankfull condition. The channel is wetted to within a few feet of the riparian vegetation at the toe of each riverbank. Approximately 750 feet downstream of McKay Station, the river enters a steep canyon.

⁸ See Appendix E.6 in Volume 3 of the FLA (pdf pages 379-380).

⁹ See Exhibit E in Volume 3 of the FLA at E-201.

From the McKay Station tailwater downstream to Little Eddy, the West Branch is bordered by steep cliffs and the river is mostly whitewater with large boulder substrate. The West Branch then flows into Little Eddy pool, which has a considerable amount of ledge substrate interspersed with hard-packed cobble. From Little Eddy to Holbrook Pool, the West Branch is whitewater with some small, sheltered backwater pools. Holbrook Pool, a popular fishing location, has depths typically ranging from 4 to 6 feet with gravel substrate.

Photo 1. West Branch of the Penobscot River at the Holbrook Side Channel at a river flow of approximately 1,000 cfs



Photo 2. West Branch of the Penobscot River at the Holbrook Side Channel at a river flow of approximately 3,600 cfs



Photo 3. West Branch of the Penobscot River at the Holbrook Side Channel at a river flow of approximately 1,035 cfs



15. Section 6.6.1.1, *Fish and Aquatic Resources – Affected Environment*, of Exhibit E of the FLA,¹⁰ describes the percent of littoral zone area and volume that is maintained in the Millinocket Lake Storage Dam impoundment based on historical minimum lake elevations. A similar analysis is provided for the North Twin impoundment, but it also includes an analysis based on an 11-year average minimum lake elevation. To ensure that Commission staff has sufficient information to inform an environmental analysis of the existing and proposed lake level fluctuations in the Millinocket Lake Storage Dam impoundment, please update the analysis for the Millinocket Lake Storage Dam impoundment to also include an analysis based on the 11-year average (2011-2021) minimum lake elevation.

GLHA Response:

A detailed description of the results from the impoundment aquatic habitat analysis completed for the Millinocket Lake Storage impoundment and the North Twin impoundment is included in Section 6.5.1.2 (page E-126) of Exhibit E of the FLA, with the results presented in Tables 6.5-15 and 6.5-16. Based on the 11-year (2011-2021) average minimum elevation of Millinocket Lake Storage impoundment (476.58 feet), 74 percent of the littoral zone surface area is maintained and 83 percent of the littoral zone volume is maintained.

16. Section 6.6.1.1, *Fish and Aquatic Resources – Affected Environment*, of Exhibit E of the FLA,¹¹ describes the 2023 Angler Flow Evaluation Study of the West Branch downstream from Stone Dam. In describing the study methodology, GLHA explains that the casting limit for the study was set at 30 feet, which was based on the average casting distance observed during the study. As noted in the Updated Study Report (USR) Meeting Summary,¹² and in subsequent comments on the USR and meeting summary,¹³ there is concern that the 30-foot casting limit is a shortened distance that reduces the useable/castable area by 50 percent. To ensure that Commission staff has sufficient information to inform an environmental analysis of the existing and proposed minimum flows in the West Branch downstream from Stone Dam, please update the angling flow analysis to include a casting limit of 60 feet and file this information as an amendment to the *Angler Flow Evaluation Study Report*.

GLHA Response:

Based on observations of volunteer anglers fishing in the West Branch downstream of Stone Dam, GLHA estimated that a 30-foot casting distance was a reasonable distance to be used for graphical purposes to demonstrate whether suitable adult brook trout habitat would be accessible by anglers based on the mean depth and water velocity measurements identified by volunteer anglers and recorded by field biologists.

While the 30-foot casting distance was marked on figures provided in the study report depicting angler wading suitability and subsequently overlaid onto figures of adult brook trout habitat suitability, the casting distance metric was not used to determine the wading suitability index that was ultimately entered into the existing PHABSIM model to create the weighted usable area

¹⁰ *Id.* at E-210 and E-211.

¹¹ *Id.* at E-224 to E-230.

¹² GLHA's May 31, 2024 Updated Study Report Meeting Summary at 5.

¹³ Maine TU's July 1, 2024 USR Comments at 7.

(WUA) curve for wading conditions in Study Area 2. Therefore, changing the casting distance from 30 feet to 60 feet yields no change in the calculations of suitable wading area or maximum wading distance from the river right bank and water's edge. Incorporating a 60-foot casting distance into the Angler Flow Evaluation Study only alters Figure 5-4 and Figure 5-5. Updated versions of these figures are provided below, which incorporate both a 30-foot and 60-foot casting distance.

The Angler Flow Evaluation Study Report states, "At flows higher than 300 cfs, wadability starts to become restricted to the river right bank, and casting access to fish lies starts to diminish." This statement remains true with either a 30-foot or 60-foot casting distance, as the adult brook trout habitat suitability for the areas between 30 and 60 feet from the extent of wadable area generally holds very few brook trout lies above 300 cfs.

Figure 5.4. Adult Brook Trout habitat suitability and wading/angling limits at 50, 100, 236, and 300 cfs.

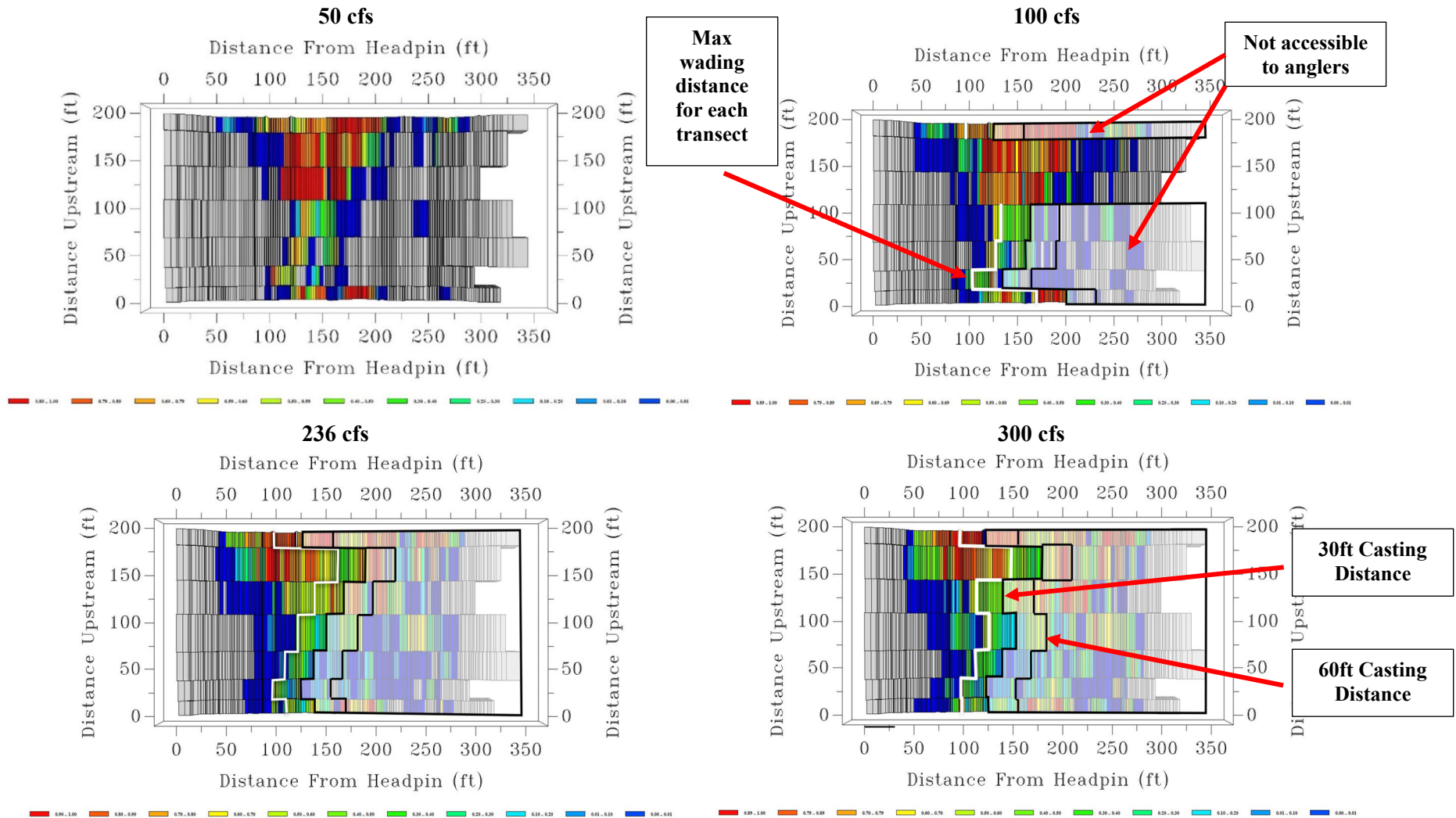
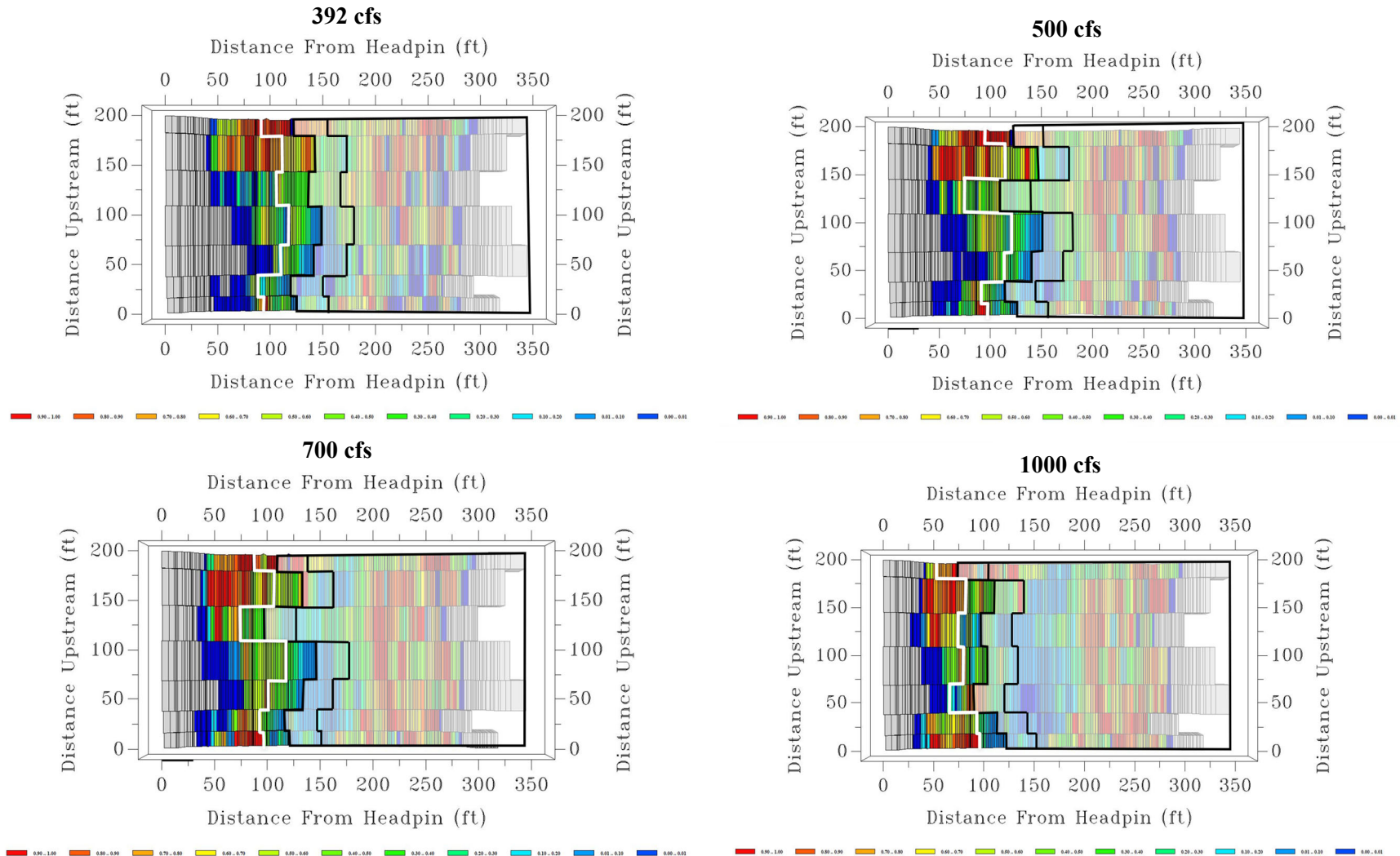


Figure 5.5. Adult Brook Trout habitat suitability and wading/angling limits at 392, 500, 700, and 1000 cfs.



* Red cells are the most suitable adult Brook Trout habitat; blue cells are the least suitable adult Brook Trout habitat.

17. Section 6.6.1.1, *Fish and Aquatic Resources – Affected Environment*, of Exhibit E of the FLA,¹⁴ describes the 2024 McKay Station Ramping Study. GLHA indicates that a drone was used during the study to take geo-referenced, high-resolution video and still photographs for the study. To ensure that Commission staff has sufficient information to inform an environmental analysis of the existing and proposed minimum flows in the West Branch downstream from McKay Station, please file the relevant video and still photographs to the record.

GLHA Response:

A summary of the available videos of flows in the West Branch obtained via drone during the McKay Station Ramping Study is provided below, and the videos are being filed with FERC on CD due to the large file sizes that cannot be eFiled with FERC. Available photos are being eFiled with FERC with this submittal.

SUMMARY OF DRONE FLIGHTS DOCUMENTING FLOWS IN THE WEST BRANCH BELOW MCKAY STATION DURING THE MCKAY STATION RAMPING STUDY ON JULY 24, 2024.

Site Name	No. of Units Operating at McKay Station	Flight Start Time (EDT)	MP4 File Name(s)
Big Eddy (lower)	3	13:20:57	DJI_0017 lower big eddy.MP4
Big Eddy (upper)	3	13:32:15	DJI_0021 upper big eddy.MP4 DJI_0022 upper big eddy.MP4
Holbrook	3	13:45:21	DJI_0025 holbrook.MP4 DJI_0029 holbrook.MP4
Holbrook	2	14:39:49	DJI_0030 holbrook.MP4
Big Eddy (lower)	2	14:53:48	DJI_0031 lower big eddy.MP4
Big Eddy (upper)	2	15:05:54	DJI_0007 upper big eddy.MP4
Holbrook	1	15:37:01	DJI_0010 Holbrook.MP4 DJI_0011 Holbrook.MP4
Big Eddy (upper)	1	16:12:00	DJI_0013 upper big eddy.MP4
Big Eddy (lower)	1	16:20:07	DJI_0014 Lower Big eddy.MP4 DJI_0015 lower Big Eddy.MP4 DJI_0016 lower Big Eddy.MP4
Little A	1	16:40:47	DJI_0018 Little A.MP4

Note: There were no safe and suitable locations to launch a drone for flights at Little A during operation of two and three units at McKay Station during the study.

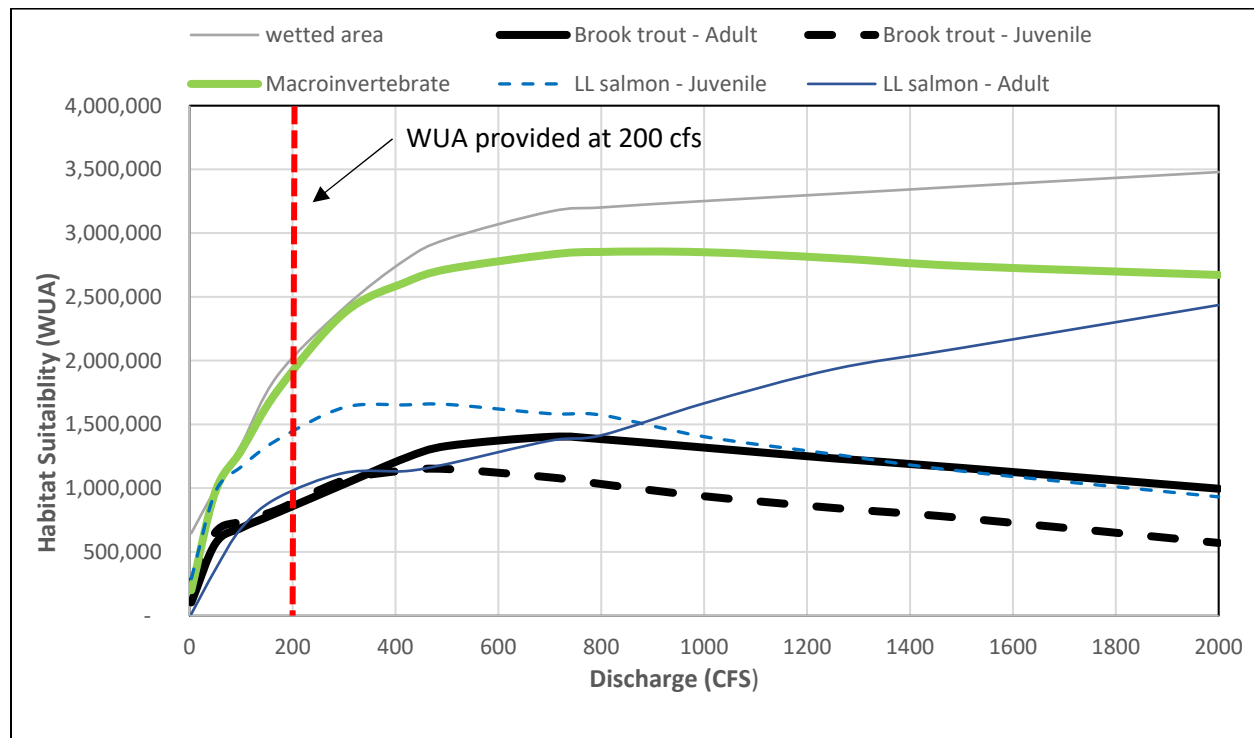
18. Figure 6.6-24, on page E-345 of Exhibit E (Volume 3 of the FLA), graphically presents adult brook trout habitat suitability and wetted area information for the West Branch downstream from Stone Dam, for flows between leakage and 2,000 cfs. The legend for this figure identifies the curves for wetted area, as well as habitat for adult and juvenile brook trout. However, there are three additional curves on that figure that are not defined/labeled. Please provide an updated figure 6.6-24 with a legend that defines all curves represented in the figure.

¹⁴ See Exhibit E in Volume 3 of the FLA at E-266 to E-272.

GLHA Response:

A revised Figure 6.6-24 is included below with an updated legend to define the three additional curves including habitat suitability for macroinvertebrates as well as adult and juvenile landlocked salmon. This figure was developed using the 1989 Instream Flow Study that was conducted for this reach during the previous relicensing (NAI 1989¹⁵).

FIGURE ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.-1 HABITAT SUITABILITY AND WETTED AREA IN THE WEST BRANCH DOWNSTREAM OF STONE DAM BETWEEN LEAKAGE AND 2,000 CFS.



19. In responding to FWS's comments on the *Updated Fish Assemblage Study Report*,¹⁶ GLHA indicates that Maine DIFW conducted smelt drift surveys in the West Branch downstream from McKay Station in 2021 (data included in the updated *Fish Assemblage Study Report*) and 2022 (data not yet available). To ensure that Commission staff has sufficient information to inform an environmental analysis of the Ripogenus Project's operation, please consult with Maine DIFW regarding obtaining the

¹⁵ NAI 1989. Penobscot Mills Project. FERC No. 2458. Instream Flow Studies. Prepared for Great Norther Paper, Millinocket, ME. Prepared by Normandeau Associates, Bedford, NH. R-589. August 1989. 28 pp. plus appendices.

¹⁶ See Appendix E.7 in Volume 3 of the FLA at pdf page 538.

2022 smelt drift data and file that data as an amendment to Appendix E.7, *Updated Fish Assemblage Study Report*.

GLHA Response:

In response to FWS's comments on the Updated Fish Assemblage Study Report, GLHA indicated that Maine DIFW conducted smelt drift surveys in the West Branch downstream of McKay Station in 2022. However, in their March 31, 2025, correspondence to GLHA, Maine DIFW stated that the 2022 smelt drift surveys in the West Branch downstream of McKay Station were planned but cancelled due to lack of staffing.

20. Appendix E.7, *Updated Fish Assemblage Study Report*, states that data on fish populations and the fishery collected by Maine DIFW for the Ripogenus impoundment and the West Branch downstream from McKay Station was obtained and summarized in the report.¹⁷ While the report provides a summary of this data, it provides little insight into trends in the fishery over time, specifically during the existing license term. Therefore, please file, as an amendment to the *Updated Fish Assemblage Study Report*: (1) the raw data obtained from Maine DIFW in April and December of 2022; (2) any updated data Maine DIFW has available since that time; and (3) graphical and/or tabular summaries of the data, on an annual basis, by species.

GLHA Response:

In their March 31, 2025 correspondence to GLHA, Maine DIFW stated that there are no updated data from angler census boxes in the West Branch downstream of McKay Station since 2022. In their May 19, 2025 correspondence to GLHA, Maine DIFW provided updated winter clerk survey data from Chesuncook Lake collected in 2025 as well as a summary figure and table (provided below in Figure 7 and Table 7). Raw data obtained from Maine DIFW are provided in Appendix E, and updated summaries of the data are provided below. Copies of correspondence with Maine DIFW are also provided in Appendix E.

Table 1 and 2 show a summary of Maine DIFW Chesuncook Lake clerk surveys and volunteer logbook data available from 1996 through 2025. Table 3 and 4 show landlocked salmon catch metrics from Chesuncook Lake for both clerk surveys and volunteer logbook data. All of the catch metrics are provided per angler hours recorded in each survey to standardize catch rates to observed fishing effort. Tables 5 through 9 provide age, length, weight, and condition factor metrics for five species recorded during clerk surveys (landlocked salmon, brook trout, lake trout, cusk, splake). Table 10 provides a summary of gut content information recorded from fish during Chesuncook Lake clerk surveys.

Table 11 and Figure 1 were provided to GLHA by MDIFW. Table 11 shows fishing regulations for landlocked salmon in Chesuncook Lake from 1978 to 2025 and the associated catch rate of all landlocked salmon per angler hour observed under each regulation time period. Figure 1 shows the percentage of landlocked salmon catch in Chesuncook Lake that exceeded 16 or 18 inches from 1978 through 2025. MDIFW provided the following explanation of the data shown in Table

¹⁷ *Id.*, at pdf pages 457 to 460.

11 and Figure 1: “This shows the increased number of salmon in the lake after the more restrictive regulations were implemented in 1992. Catch rates increase because there were too many salmon and growth crashed. Catch rates are now (2018 - present) dropping back after new liberal regulations were adopted in 2018. We are thinning the population, and the number of larger fish is increasing.” (Personal communication; Tim Obrey, Fisheries Supervisor, MDIFW, with Matt Brewer, Staff Scientist, Kleinschmidt Associates, via email on May 19, 2025.)

Table 1. Summary of Maine DIFW Chesuncook Lake clerk surveys by year and season (1996 through 2025).

Year	Season	N Surveys	Total Parties	Total Anglers	Total Angler Hours	Mean Party Size
2025	Winter	2	46	146	1130.00	3.17
2021	Summer	8	240	720	4248.00	3.00
2021	Winter	10	480	1480	10030.00	3.08
2020	Summer	8	352	832	4278.00	2.36
2020	Winter	10	310	970	6150.00	3.13
2018	Summer	8	256	632	2930.64	2.47
2018	Winter	10	310	1210	6655.00	3.90
2014	Winter	10	580	2320	11072.50	4.00
2010	Winter	10	390	1210	7195.00	3.10
2006	Winter	10	850	3220	18747.50	3.79
2004	Winter	10	380	1230	8480.00	3.24
1998	Winter	10	250	830	4955.00	3.32
1996	Summer	8	1000	2408	13468.00	2.41

Table 2. Summary of Maine DIFW Chesuncook Lake volunteer logbook surveys by year and season (1996 through 2021).

Year	Season	N Surveys	Total Parties	Total Anglers	Total Angler Hours	Mean Party Size
2021	Winter	9	36	117	648.0	3.25
2020	Summer	7	105	238	1781.5	2.27
2020	Winter	9	36	108	535.5	3.00
2017	Summer	7	182	280	959.0	1.54
2017	Winter	9	81	288	1890.0	3.56
2016	Summer	7	42	70	292.2	1.67
2016	Winter	9	72	270	1597.5	3.75
2015	Summer	7	140	294	1683.5	2.10

Year	Season	N Surveys	Total Parties	Total Anglers	Total Angler Hours	Mean Party Size
2015	Winter	9	27	72	333.0	2.67
2014	Summer	7	140	301	2122.8	2.15
2014	Winter	9	36	90	423.0	2.50
2013	Summer	7	14	21	133.0	1.50
2013	Winter	9	54	171	954.0	3.17
2012	Summer	7	203	469	2829.8	2.31
2012	Winter	9	45	180	1044.0	4.00
2011	Summer	7	210	483	3034.5	2.30
2011	Winter	9	9	36	252.0	4.00
2010	Summer	7	308	763	4282.2	2.48
2010	Winter	9	90	612	3780.0	6.80
2009	Summer	7	385	868	4887.8	2.25
2009	Winter	9	18	63	477.0	3.50
2008	Summer	7	371	763	3636.5	2.06
2008	Winter	9	18	54	418.5	3.00
2007	Summer	7	392	868	3680.2	2.21
2007	Winter	9	72	225	1633.5	3.13
2006	Summer	7	294	686	3531.5	2.33
2006	Winter	9	207	828	5602.5	4.00
2005	Summer	7	357	833	4005.8	2.33
2005	Winter	9	207	792	5377.5	3.83
2004	Summer	7	504	1113	5775.0	2.21
2004	Winter	9	81	216	1129.5	2.67
2003	Summer	7	406	1036	4907.0	2.55
2003	Winter	9	81	216	972.0	2.67
2002	Summer	7	364	840	4893.0	2.31
2002	Winter	9	36	90	360.0	2.50
2001	Summer	7	217	539	3081.8	2.48
2001	Winter	9	90	261	1620.0	2.90
2000	Summer	7	315	805	4273.5	2.56
2000	Winter	9	99	306	1822.5	3.09
1999	Summer	7	203	679	3384.5	3.34
1999	Winter	9	81	405	2758.5	5.00
1998	Summer	7	441	1029	5416.2	2.33
1998	Winter	9	144	612	4378.5	4.25

Year	Season	N Surveys	Total Parties	Total Anglers	Total Angler Hours	Mean Party Size
1997	Summer	7	273	644	3718.8	2.36
1997	Winter	9	63	171	1190.2	2.71
1996	Summer	7	273	721	4103.8	2.64
1996	Winter	9	108	369	2261.2	3.42

Table 3. Landlocked salmon catch per total angler hours from Maine DIFW Chesuncook Lake clerk surveys by year and season (1996 through 2025).

Year	Season	Kept	Released	Sub-Legal Length	Successful Anglers
2025	Winter	0.13	0.01	0.00	-
2021	Summer	0.27	0.02	0.00	0.11
2021	Winter	0.10	0.01	0.00	0.07
2020	Summer	0.13	0.13	0.00	0.11
2020	Winter	0.17	0.01	0.00	0.08
2018	Summer	0.02	0.09	0.09	0.08
2018	Winter	0.12	0.05	0.00	0.11
2014	Winter	0.07	0.09	0.13	0.10
2010	Winter	0.07	0.02	0.08	0.08
2006	Winter	0.05	0.02	0.06	0.05
2004	Winter	0.07	0.10	0.07	0.09
1998	Winter	0.04	0.06	0.21	0.07
1996	Summer	0.03	0.04	0.13	0.05

Table 4. Landlocked salmon catch per total angler hours from Maine DIFW Chesuncook Lake volunteer logbook surveys by year and season (1996 through 2021).

Year	Season	Kept	Released	Sub-Legal Length	Successful Anglers
2021	Winter	0.35	0.01	0.00	0.14
2020	Summer	0.16	0.32	0.00	0.12
2020	Winter	0.27	0.03	0.00	0.20
2017	Summer	0.04	0.21	0.18	0.15
2017	Winter	0.14	0.11	0.29	0.13
2016	Summer	0.00	0.22	1.49	0.14
2016	Winter	0.08	0.00	0.16	0.08
2015	Summer	0.04	0.15	0.66	0.09
2015	Winter	0.19	0.03	0.14	0.16
2014	Summer	0.02	0.12	0.52	0.07
2014	Winter	0.28	0.00	0.32	0.21

Year	Season	Kept	Released	Sub-Legal Length	Successful Anglers
2013	Summer	0.05	0.11	0.05	0.11
2013	Winter	0.21	0.10	0.27	0.15
2012	Summer	0.02	0.10	0.21	0.07
2012	Winter	0.12	0.00	0.28	0.11
2011	Summer	0.02	0.15	0.23	0.08
2011	Winter	0.04	0.00	0.21	0.04
2010	Summer	0.04	0.12	0.33	0.09
2010	Winter	0.08	0.00	0.04	0.08
2009	Summer	0.04	0.08	0.13	0.09
2009	Winter	0.06	0.00	0.15	0.06
2008	Summer	0.02	0.09	0.22	0.08
2008	Winter	0.13	0.00	0.00	0.11
2007	Summer	0.08	0.16	0.41	0.15
2007	Winter	0.12	0.07	0.07	0.10
2006	Summer	0.04	0.08	0.13	0.09
2006	Winter	0.05	0.02	0.05	0.06
2005	Summer	0.04	0.14	0.36	0.10
2005	Winter	0.09	0.00	0.08	0.08
2004	Summer	0.11	0.21	0.39	0.15
2004	Winter	0.10	0.00	0.06	0.09
2003	Summer	0.04	0.20	0.48	0.13
2003	Winter	0.23	0.05	0.06	0.16
2002	Summer	0.05	0.10	0.21	0.09
2002	Winter	0.22	0.00	0.20	0.15
2001	Summer	0.05	0.15	0.15	0.12
2001	Winter	0.12	0.21	0.08	0.16
2000	Summer	0.04	0.11	0.14	0.10
2000	Winter	0.14	0.13	0.12	0.09
1999	Summer	0.02	0.10	0.20	0.09
1999	Winter	0.06	0.15	0.05	0.08
1998	Summer	0.01	0.07	0.38	0.05
1998	Winter	0.03	0.07	0.21	0.09
1997	Summer	0.01	0.07	0.37	0.07
1997	Winter	0.06	0.15	0.22	0.13
1996	Summer	0.02	0.08	0.24	0.07
1996	Winter	0.04	0.14	0.46	0.08

Table 5. Summary of landlocked salmon data from Maine DIFW Chesuncook Lake clerk surveys.

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K ¹⁸)	Max Condition Factor (K)	Min Condition Factor (K)
1996	LLS	17	4.6	7	4	470.5	557	429	981.1	1320	780	0.9	1.1	0.8
1998	LLS	11	4.9	6	3	449.9	491	370	748.9	1120	490	0.8	1.1	0.7
2004	LLS	58	4.9	7	3	418.9	541	342	665.1	1320	360	0.9	1.2	0.6
2006	LLS	92	4.7	6	4	418.4	531	355	578.5	1110	270	0.8	1.0	0.5
2010	LLS	68	4.9	7	4	404.5	520	356	494.4	1150	310	0.8	1.0	0.5
2014	LLS	71	5.5	8	4	404.5	537	345	499.6	1000	300	0.7	0.9	0.5
2015	LLS	1	5.0	5	5	402.0	402	402	460.0	460	460	0.7	0.7	0.7
2017	LLS	8	4.8	6	4	433.2	490	358	567.5	830	400	0.9	1.0	0.8
2020	LLS	50	4.4	7	3	356.2	498	277	391.1	1060	150	0.8	1.0	0.6
2021	LLS	52	4.8	7	3	378.8	560	262	465.0	1130	160	0.7	1.0	0.5

¹⁸ Condition factor calculated using Fulton's Condition Factor (K) with the following equation: $K = (W/L^3) * 100,000$. Where W is the weight (g), L is the length (mm), and 100,000 is a scaling constant.

Table 6. Summary of brook trout data from Maine DIFW Chesuncook Lake clerk surveys.

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K)	Max Condition Factor (K)	Min Condition Factor (K)
1998	BKT	1	6.0	6	6	505.0	505	505	1350	1350	1350	1.0	1.0	1.0
2004	BKT	2	2.5	3	2	263.5	293	234	155	200	110	0.8	0.9	0.8
2006	BKT	1	4.0	4	4	375.0	375	375	455	455	455	0.9	0.9	0.9

Table 7. Summary of lake trout data from Maine DIFW Chesuncook Lake clerk surveys.

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K)	Max Condition Factor (K)	Min Condition Factor (K)
1996	LKT	2	8	8	8	662.0	669	655	-	-	-	-	-	-
1998	LKT	2	10	10	10	624.5	676	573	2287.5	2375	2200	1.0	1.2	0.8
2006	LKT	3	17	17	17	801.3	864	715	4500.0	5700	3300	0.9	1.0	0.7

Table 8. Summary of splake data from Maine DIFW Chesuncook Lake clerk surveys.

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K)	Max Condition Factor (K)	Min Condition Factor (K)
2004	SPK	6	4.0	5	3	409.5	523	315	710.0	1420	310	1.0	1.1	1.0
2006	SPK	4	-	-	-	438.2	534	376	707.5	820	595	0.9	0.9	0.9
2010	SPK	1	6.0	6	6	419.0	419	419	-	-	-	-	-	-

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K)	Max Condition Factor (K)	Min Condition Factor (K)
2014	SPK	8	3.2	4	3	407.0	431	379	565.0	700	425	0.9	1.1	0.7

Table 9. Summary of cusk (burbot) data from Maine DIFW Chesuncook Lake clerk surveys.

Year	Species	Count	Mean Age	Max Age	Min Age	Mean Length (mm)	Max Length (mm)	Min Length (mm)	Mean Weight (g)	Max Weight (g)	Min Weight (g)	Mean Condition Factor (K)	Max Condition Factor (K)	Min Condition Factor (K)
2004	CSK	3	-	-	-	399.3	428	350	403.3	480	280	0.6	0.7	0.6
2006	CSK	4	-	-	-	439.0	513	365	557.5	880	280	0.6	0.7	0.6
2010	CSK	7	-	-	-	559.4	735	430	1201.4	2100	490	0.7	0.8	0.5
2014	CSK	3	-	-	-	547.3	680	447	1286.7	2340	630	0.7	0.7	0.7

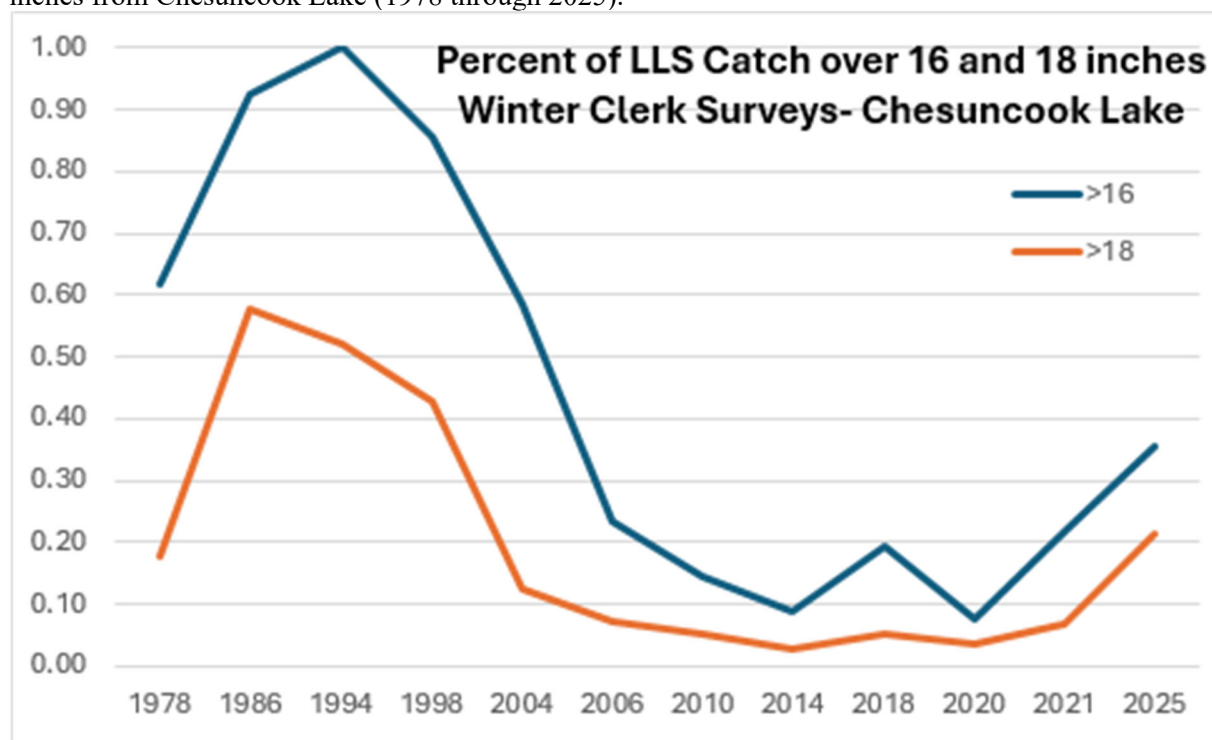
Table 10. Summary of Maine DIFW Chesuncook Lake clerk surveys gut contents data.

Species	Total Stomachs Examined	Stomachs With Food	Mean Volume/Smelt	Mean Smelts/Stomach With Smelts	Mean Smelts/Stomach With Food
BKT	4	2	1.17	1.50	1.50
LKT	16	16	2.21	5.60	5.25
LLS	376	301	3.35	2.47	1.68
SPK	7	6	6.63	2.67	1.33

Table 11. Maine DIFW-provided table of landlocked salmon catch per hour by fishing regulations and time periods from Chesuncook Lake.

Regulations	Years	All LLS/Hr
2 FISH/14"	1978-1991	0.166
1 FISH/16"	1992-1998	0.227
2 FISH/14"	1999-2005	0.354
3 FISH 14" min only 1 OVER 18"	2006-2014	0.232
no size bag under 16"/1 over 16"	2018-present	0.172

Figure 1. Maine DIFW-provided figure displaying percentage of landlocked salmon catch over 16 and 18 inches from Chesuncook Lake (1978 through 2025).



Terrestrial Resources

21. Section 6.7.1, *Wildlife and Botanical Resources*, of Exhibit E of the FLA, includes a map of the existing Wildlife Management Area at the Millinocket Development of the Penobscot Mills Project from the 1997 Wildlife Management Plan (*see* figure 6.7-1). The map provided is difficult to read and interpret. Therefore, to: (a) facilitate Commission staff and stakeholder review of the wildlife management area and the management plan's measures, and (b) ensure that staff has sufficient information about the status of management in the area to inform an environmental analysis for the plan, please provide an updated, more legible, map of the management area with the Wildlife Management Plan filed in accordance with AIR #3.

GLHA Response:

GLHA created an updated, more legible map of the Wildlife Management Area, which will be provided in the updated Wildlife Management Area Management Plan to be filed with FERC by July 28, 2025.

Threatened and Endangered Species

22. In our July 31, 2024 comments on the draft license application, Commission staff requested that the FLA include a discussion on the proposed endangered tricolored bat¹⁹ in the *Rare, Threatened, and Endangered Species* section. While the FLA provides a brief description of the tricolored bat, it does not include a discussion of potential project effects to bats, or procedures (e.g., time of year restrictions) for managing vegetation in sensitive habitats such as wetlands, riparian areas during the tricolor bat's active season, or the active season for the endangered northern long-eared bat. To ensure that Commission staff has sufficient information to inform an environmental analysis of the Projects' potential effects on federally listed bats, please provide the following information along with any PM&E measures for bats likely to occur in the Projects' areas. This information may be provided with the draft plans that GLHA files in accordance with AIR #3, and should include:

- (A) a discussion of the potential project-related effects (i.e., seasonal vegetation management including transmission line right of way maintenance, use of pesticides; and project-related recreation activities) on the tricolored bat;
- (B) a description of any existing or proposed tree removal activities, which includes cutting down, harvesting, destroying, trimming, or manipulating of trees, saplings, snags, or any other form of woody vegetation likely to be used as summer roosting and foraging habitat within the projects' boundaries;
- (C) a description of any known hibernacula or maternity roost trees within or adjacent to the project boundaries; and
- (D) any measures that would be implemented for the protection of all listed bats in the project boundary.

¹⁹ 87 Fed. Reg. 56,381-56,393 (September 14, 2022).

GLHA Response:

As described in Section 6.7 Wildlife and Botanical Resources of Exhibit E of the FLA, vegetation maintenance is performed, as needed, within the terrestrial areas of the Projects' boundaries in support of dam safety-related activities/requirements around Project facilities, in support of maintaining the Project recreation sites, within the Projects' transmission line corridors, and for general maintenance in the vicinity of Project facilities as further described below.

Vegetation trimming and mowing around Project facilities and/or recreation sites are typically performed during the growing season between May 1 and September 30. Mowing is typically performed 1-2 times per month, and vegetation trimming is performed, when necessary, based on growing conditions, but is typically performed 1-2 times during the growing season. Mowing and vegetation trimming is limited to mowing of grassy areas and trimming of small branches or other small vegetation to allow for pedestrian access to Project facilities and/or recreation sites; therefore, these activities are anticipated to have no adverse effect on bats.

Vegetation maintenance along the Projects' transmission line corridors is typically conducted annually between June 1 and September 30 via mechanical trimming and/or back-pack or truck-mounted herbicide sprayers in selected areas. Application of herbicides in support of vegetation maintenance is performed by qualified applicators and in accordance with the manufacturer's instructions. GLHA does not perform aerial spray on the transmission line corridors.

Hazard/danger tree removal is performed when necessary. Prior to vegetation maintenance activities or tree removal, the area is inspected for avian species or other wildlife. Although it has not been required to date at the Projects, if a nest of a protected species (e.g., bald eagle) or protected habitat is identified in an area requiring maintenance, GLHA consults with the applicable resource agencies and employs best practices (e.g., relocation of the nest or identifies an alternative means of vegetation management) prior to performing the work.

Within the 2,300-acre Wildlife Management Area (WMA) within the Penobscot Mills Project boundary, the area is managed by GLHA to enhance habitat diversity and value to wildlife, and timber harvesting in this area occurs during the winter months (inactive season) when the northern long-eared bat (NLEB), tricolored bat (TCB), or other bats that could potentially be present have migrated for hibernation. Therefore, management within the WMA is expected to continue to have a beneficial effect on terrestrial habitat and wildlife and is anticipated to have no adverse effect on bats due to the timing of timber harvesting in this area.

As described above, within the transmission line corridors within the Projects' boundaries, GLHA performs vegetation maintenance as needed during the growing season to maintain the area as primarily shrub/scrub or grassland/herbaceous cover types. Although vegetation is managed to maintain conditions necessary for providing reliable energy to the region within the transmission line corridors, these habitat types are known to support a diverse range of mammal species and have very little effect on the overall terrestrial habitat, wildlife, and habitat connectivity in the area. Suitable foraging and potential roosting habitats for bats, including the endangered NLEB and proposed endangered TCB, are likely common in the area of the Projects, which supports a broad range of upland, riparian, wetland, and open water habitats. As identified in the FLA and the Terrestrial, Wildlife, and Botanical Resources Study Report, the Projects' areas are within

known seasonal movement distances of summer and winter habitat locations for the NLEB, and likely for the TCB.

Continued operation and maintenance of the Projects is not expected to affect the endangered NLEB, proposed endangered TCB, or other bats that could potentially be present. Terrestrial, wetland, and riparian habitats within the Projects' boundaries will continue to provide potentially suitable habitat for the NLEB, TCB, and other bat species. Vegetative community types providing suitable habitat within the Projects' boundaries are interspersed throughout the approximately 71,097-acre area associated with the Projects' boundaries. The occurrence and distribution of terrestrial wildlife resources in the Projects' areas is generally unrelated to operation of the Projects. GLHA proposes to continue to maintain the 2,300-acre WMA surrounding the West Branch downstream of Stone Dam, which is managed to protect and enhance upland, wetland, and riparian habitat diversity and value to wildlife in this area, which will also mitigate for potential effects to protected species from vegetation management activities within the approximately 680 acres of land within the Projects' transmission line corridors. Therefore, the continued operation of the Projects as proposed by GLHA is not expected to have an adverse effect on the NLEB, TCB, or other bats that could potentially be present.

While the proposed relicensing of the Projects does not have any identified impacts to NLEB or TCB, day-to-day operational activities, such as removal of a hazard tree within the transmission corridor, could cause a local indirect effect on a NLEB or TCB if occupying said tree. Therefore, GLHA has developed and proposes to implement measures to further manage vegetation and conduct operations and maintenance activities within the Projects' boundaries over the new license term to protect potential NLEB and TCB habitat as described below.

NLEB and TCB Management Measures

On January 20, 2023, Maine DIFW provided information on the NLEB, which indicated that there are no known NLEB maternity roosts in the Projects' areas. However, the information provided by Maine DIFW indicated that NLEBs have been documented in the Projects' areas during the maternity season. Additionally, Maine DIFW stated that the closest known NLEB hibernaculum in the vicinity of the Projects is located approximately 10.5 miles northwest of the Ripogenus Project²⁰. If a roost tree or hibernaculum is discovered within or immediately adjacent to the Projects' boundaries, GLHA will notify the Maine DIFW and USFWS within seventy-two (72) hours of the discovery.

Prior to any tree clearing between April 15 and September 30 within the Projects' boundaries or areas immediately adjacent to the Projects' boundaries by GLHA or its contractors, GLHA will observe the area to be cleared for suitable maternity roost trees, roosting trees, sloughing bark, live and dead leaf clusters of live and recently dead deciduous trees, or dead limbs that can provide NLEB and TCB habitat. If such habitats are discovered, the Maine DIFW and the

²⁰ No other known hibernacula or maternity roost tree information was provided for any other bat species by MDIFW.

USFWS will be consulted prior to tree-clearing activities. In addition, GLHA proposes to follow the tree clearing guidelines described below, as applicable.

GLHA may remove hazard trees that it believes pose a material threat to human life or property at any time without prior consultation with Maine DIFW and USFWS and will inform the Maine DIFW and the USFWS if any bats are observed after felling such trees.

GLHA may remove any trees <3 inches diameter at breast height (dbh) at any time, so long as their removal will not damage any adjacent trees that are larger in size.

GLHA may remove suitable roost trees ≥ 3 inches dbh between October 1 and April 14.

Should GLHA find it necessary to remove or be required by FERC to remove suitable roost trees ≥ 3 inches dbh between April 15 and September 30, GLHA will consult with the FWS pursuant to the Endangered Species Act (ESA) and with the Maine DIFW pursuant to the Maine Endangered Species Act (MESA). Additionally, GLHA will also consult with the FWS (and with the Maine DIFW as appropriate) and may request a determination as to whether a proposed activity is likely to result in the “take” or “taking” of listed bat species and/or may require an application for an incidental take permit.

It is not the intent of these proposed measures to hold GLHA to a higher standard than the applicable laws surrounding these species. Accordingly, these measures are subject to change to be consistent with any changes in applicable law or with any change in the listing status of the NLEB or the TCB that would cause the tree clearing guidelines identified above to be modified.

Recreation Resources

23. Table 6.10-26, on page E-571 of Exhibit E of the FLA, shows statistics on the monthly, recreation season, and annual flows for the West Branch downstream from Stone Dam. To assist the Commission in evaluating the recreational benefits of spill flows in the reach downstream from Stone Dam, please provide an update of table 6.10-26 that includes columns for the percentage of time that 700 cfs and 2,000 cfs are exceeded on a monthly, recreation season, and annual basis.

GLHA Response:

An updated version of Table 6.10-26 including the percentages of time that 700 cfs and 2,000 cfs were exceeded from 2010 – 2022 is provided below.

**TABLE ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.-1
 MONTHLY, RECREATION SEASON, AND ANNUAL STATISTICS (CFS)
 FOR ESTIMATED FLOW IN THE WEST BRANCH DOWNSTREAM OF STONE DAM,
 2010-2022.**

Month	Minimum*	Maximum	Average	Median	Percent of time 700 cfs Exceeded	Percent of time 2,000 cfs Exceeded
January	17	3,267	1,191	1,105	63	22
February	17	3,592	1,167	824	55	25
March	17	4,422	1,221	667	53	34
April	17	10,544	1,223	422	47	27
May	17	20,848	2,666	958	59	42
June	17	11,212	1,263	738	52	19
July	17	6,514	977	554	44	13
August	17	4,522	621	447	33	3
September	17	8,791	1,017	799	54	9
October	17	5,483	822	426	30	9
November	17	3,942	820	515	37	3
December	17	6,512	1,292	949	56	13
Recreation Season (May-October)	17	20,848	1,249	616	43	15
Annual	17	20,848	1,202	666	49	18

*Leakage was estimated to be approximately 17 cfs after the flashboards were resealed in October 2021.

Exhibit F – Supporting Design Report

24. Exhibit H of the application includes a Supporting Design Report (SDR) for the East Millinocket Development of the Penobscot Mills Project but does not include an SDR for the remaining four developments. So that staff can assess whether existing and proposed project structures are safe and adequate to fulfill their stated functions, please provide an SDR for the four remaining developments (North Twin, Millinocket, Dolby, and the Millinocket Lake Storage Developments) within **150 days** of this letter, which, at minimum, includes the following supporting information:

- (A) An assessment of the suitability of the site and the reservoir rim stability based on geological and subsurface investigations, including investigations of soils and rock borings and tests for the evaluation of all foundations and construction materials sufficient to determine the location and type of dam structures suitable for the dam site;
- (B) Copies of all boring logs, geology reports and laboratory tests reports;
- (C) An identification of all barrow areas and quarry sites and an estimate of required quantities and suitable construction material;
- (D) Stability and stress analyses for all major structures and critical abutment slopes under all probable loading conditions, including seismic and hydrostatic forces induced by water loads up to the Probable Maximum Flood as appropriate; and

- (E) The basis for determination of seismic loading and the Spillway Design Flood in sufficient detail to permit independent staff evaluation.

If the report contains preliminary drawings, it must be designated a “Preliminary Supporting Exhibit Report.”

GLHA Response:

As indicated in the FLA, the Ripogenus Project and the Millinocket Lake Storage, North Twin, Millinocket, and Dolby Developments of the Penobscot Mills Project are all subject to 18 Code of Federal Regulations (CFR) Part 12D of the Commission’s regulations, which require Periodic Inspections and Comprehensive Assessments of the Projects as well as development and maintenance of a Supporting Technical Information Document (STID). The STID serves as a compendium of knowledge and information about a development/project and is essential for the review and evaluation of the safety and performance of project works by licensees, consultants, and FERC. The STID is an organized summary of pertinent project information that is useful for reference to gain an understanding of project features, potential failure modes, construction, design basis, surveillance and monitoring, and analyses. The STID includes sufficient information to understand the design and current engineering analyses for the Project. The information required to be provided in a SDR (18 CFR §4.41(g)(3)(4)) is duplicative with the information that is provided in the STID and is periodically reviewed/evaluated by Comprehensive Assessments and Periodic Inspections. For this reason, it should be unnecessary to file an SDR for the Ripogenus Project or the Millinocket Lake Storage, North Twin, Millinocket, and Dolby Developments of the Penobscot Mills Project.

The East Millinocket Development of the Penobscot Mills Project is classified as Low Hazard and not subject to 18 CFR Part 12D of the Commission’s regulations. Therefore, GLHA developed, and filed with the FLA, an SDR specific to the East Millinocket Development of the Penobscot Mills Project.

Appendix A

2023 North Twin Impoundment Macroinvertebrate Sampling Results with MDEP LDM Analyses

Water Quality Study Report Addendum

2023 North Twin Impoundment Macroinvertebrate Sampling

1.0 Introduction and Background

Great Lakes Hydro America, LLC (“GLHA” or “Licensee”) is the Licensee of the Penobscot Mills Hydroelectric Project (FERC No. 2458) (Project) located on the West Branch of the Penobscot River (West Branch) and Millinocket Stream in Penobscot and Piscataquis counties, Maine.

In accordance with 18 Code of Federal Regulations (CFR) §5.15, GLHA conducted studies pursuant to GLHA’s March 23, 2022, Revised Study Plan (RSP), as modified and approved in the Federal Energy Regulatory Commission’s (“FERC” or “Commission”) May 13, 2022, Study Plan Determination (SPD). In addition to the studies proposed in the RSP, GLHA voluntarily conducted additional benthic macroinvertebrate sampling in the North Twin impoundment in 2023. This report describes the methods and results of the benthic macroinvertebrate sampling in the North Twin impoundment.

1.1 Water Quality Classification and Standards

The current water quality classification of the North Twin impoundment is Class GPA. The aquatic life standard for the North Twin impoundment is defined under 38 Maine Revised Statutes (MRS) §464-9(D), which states that the existing impoundment is deemed to have met the habitat characteristics and aquatic life criteria if the existing impounded waters are able to support all species of fish indigenous to those waters and the “structure and function” of the resident biological community in the impounded waters is maintained. As the Maine Department of Environmental Protection (MDEP) does not have a standard for evaluating the aquatic macroinvertebrate community in impoundments, GLHA conducted an assessment that would produce data sufficient to qualitatively assess the structure, function, and integrity of the resident biological community, consistent with the aquatic life standard for the North Twin impoundment defined in 38 MRS §464-9(D) which states:

“Other than those described in paragraphs A, B, and C, all hydropower projects with impoundments in existence on June 30, 1992 that remain classified under section 465-A after June 30, 1992 and that do not attain the habitat and aquatic life criteria of that section

must, at a minimum, satisfy the aquatic life criteria contained in section 465, subsection 4, paragraph C.”

Section 465, subsection 4, paragraph C refers to water quality standards for waters classified as Class C waters. More specifically, 38 MRS §465 (4)(C) states:

“Discharges to Class C waters may cause some changes to aquatic life, except that the receiving waters must be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community...”

1.2 Project Operations

The Penobscot Mills Project is operated for hydroelectric generation and to support West Branch storage operations. The North Twin Development is operated for both generation and storage. Storage operation of the North Twin impoundment is done in coordination with the Millinocket Lake Storage Development impoundment, the Ripogenus impoundment (Ripogenus Project (FERC No. 2572), and the upstream Storage Project (FERC No 2634) to manage water levels and flows throughout the West Branch and the mainstem of the Penobscot River.

The North Twin impoundment is generally operated on an annual storage cycle. Flows from the Ripogenus Project enter the West Branch and subsequently flow approximately 21 miles before entering the Ambajejus Lake basin of the North Twin impoundment. The normal full pond elevation of the North Twin impoundment is 491.92 feet. Under the current license, the North Twin impoundment is operated to maintain the impoundment elevation within approximately 3.5 feet of normal full pond elevation from spring freshet through October 15. From October 16 to the start of the spring freshet, the impoundment elevation is gradually reduced to a lower target elevation of 479.42 feet (12 feet from normal full pond elevation) to provide storage for winter thaw and spring flows. However, at times (particularly during periods of anticipated high inflows), GLHA utilizes greater than 12 feet of storage in the North Twin impoundment to store flows from the upstream inflows to protect downstream areas and resources from flooding.

2.0 Goals and Objectives

The goals and objectives of the study were to determine the composition and status of the North Twin impoundment benthic macroinvertebrate community and determine if the community demonstrates that applicable aquatic life standards are being met.

3.0 Study Area

The study area included the Ambajejus Lake subbasin, North Twin Lake subbasin, South Twin Lake subbasin, and Pemadumcook Lake subbasin within the North Twin impoundment.

4.0 Methodology

The benthic macroinvertebrate community was sampled at eight locations in the North Twin impoundment, two each within the South Twin, North Twin, Pemadumcook, and Ambajejus subbasins (Table 4-1, Figure 4-1). Sampling was conducted on August 15 (Pemadumcook and Ambajejus Lake subbasins) and August 16 (North Twin and South Twin Lake subbasins), 2023. Sampling targeted two general substrates, coarse (i.e., cobble and gravel) and fine (i.e., mud and sand). A Surber sampler was used to collect samples from coarse substrates with few or no aquatic vascular plants and in areas generally exposed to wind, wave, and ice action. Kick samples were collected from areas of fine substrates which contained aquatic vascular plant growth. Sampling occurred during early August when impoundment levels were relatively stable and representative of conditions during the growing season. The sampling sites were within the impoundment's littoral zone at depths that typically would remain watered during the growing season, but which would typically be exposed during the winter drawdown.

For each of the eight coarse substrate sampling locations, three replicate samples were collected using a square foot Surber sampler that was placed on the substrate in water depths between 0.5 and 2 feet. A grain scoop was used to excavate the substrate within the sampler to a depth of about 5 inches. The contents of the scoops were placed in the Surber collection bag. The remaining substrate was agitated, and then the Surber was retrieved. The contents of each replicate Surber sample were washed in a 500-micron sieve bucket to remove fine-grained material, placed in a labeled sample jar, and preserved with 10 percent formalin for laboratory processing.

Sampling at the eight locations characterized by fine substrates was conducted with three replicate samples at each station using an aquatic, 500-micron, D-frame, kick net. Each replicate was collected by dragging the kick net in a straight line for three feet with the handle held perpendicular to the bottom. The contents of each replicate kick net sample were washed in a 500-micron sieve bucket to remove fine-grained material, placed in a labeled sample jar, and preserved with 10 percent formalin for laboratory processing.

Information related to sample depth and substrate composition at each collection location (Surber and kick samples) were recorded along with a set of water quality parameters at the time of sampling (water temperature, dissolved oxygen, pH, specific conductance (SPC), and total dissolved solids (TDS)).

All collected samples were sent to Normandeau Associates, Inc.'s benthic taxonomy laboratory located in Stowe, Pennsylvania. Taxonomists sorted, identified, and enumerated the full contents of each rock basket sampler. Samples were analyzed using stereo-zoom and compound microscopes. Organisms were identified and enumerated to the lowest practical taxon, generally genus and species, dependent on their age and condition using published taxonomic keys. Chironomidae (midges) larvae were slide-mounted after being prepared in a cleaning solution and identified using a compound microscope. Worms were also slide-mounted and identified using a compound microscope.

Upon completion of the taxonomic analysis, the data were condensed into the following set of ecological metrics calculated using genus (unless otherwise noted) as the phylogenetic endpoint:

- **Total Number of Individuals:** Count of all specimens collected.
- **Community Density (number/m²):** The number of specimens per square meter of habitat calculated for quantitative samples (i.e., Surber samples).
- **Total Number of Taxa (Richness):** Number of distinct taxa at a genus level representing the diversity within a sample. Increased diversity correlates with increasing health of the assemblage, while decreased richness would be the expected response to increasing habitat degradation or perturbation.

- **Number of EPT Taxa:** Number of taxa in the insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), collectively referred to as the “EPT” taxa. Species in these orders are generally considered sensitive to perturbation, and the number of taxa will generally decrease with increasing perturbation.
- **Percent Dominant Taxon:** The percent abundance of the single most numerous taxa within a sample. This metric often is a measure of redundancy in that a sample dominated by a single, pollution-tolerant taxon will also have a lower diversity (taxa richness) and tends to increase with habitat degradation or perturbation.
- **Shannon Diversity (base e):** This metric compares the distribution of individuals among all taxa present in a sample. Shannon Diversity (H) is calculated as $H = \sum (p_i * \ln(p_i))$, where p_i is the proportion of the total number of individuals occurring in taxon i . Maximum diversity is obtained when the numbers of individuals are equally distributed among taxa. A value near zero indicates community dominance by a small number of taxa. Higher values indicate that the numbers of individuals are evenly distributed.

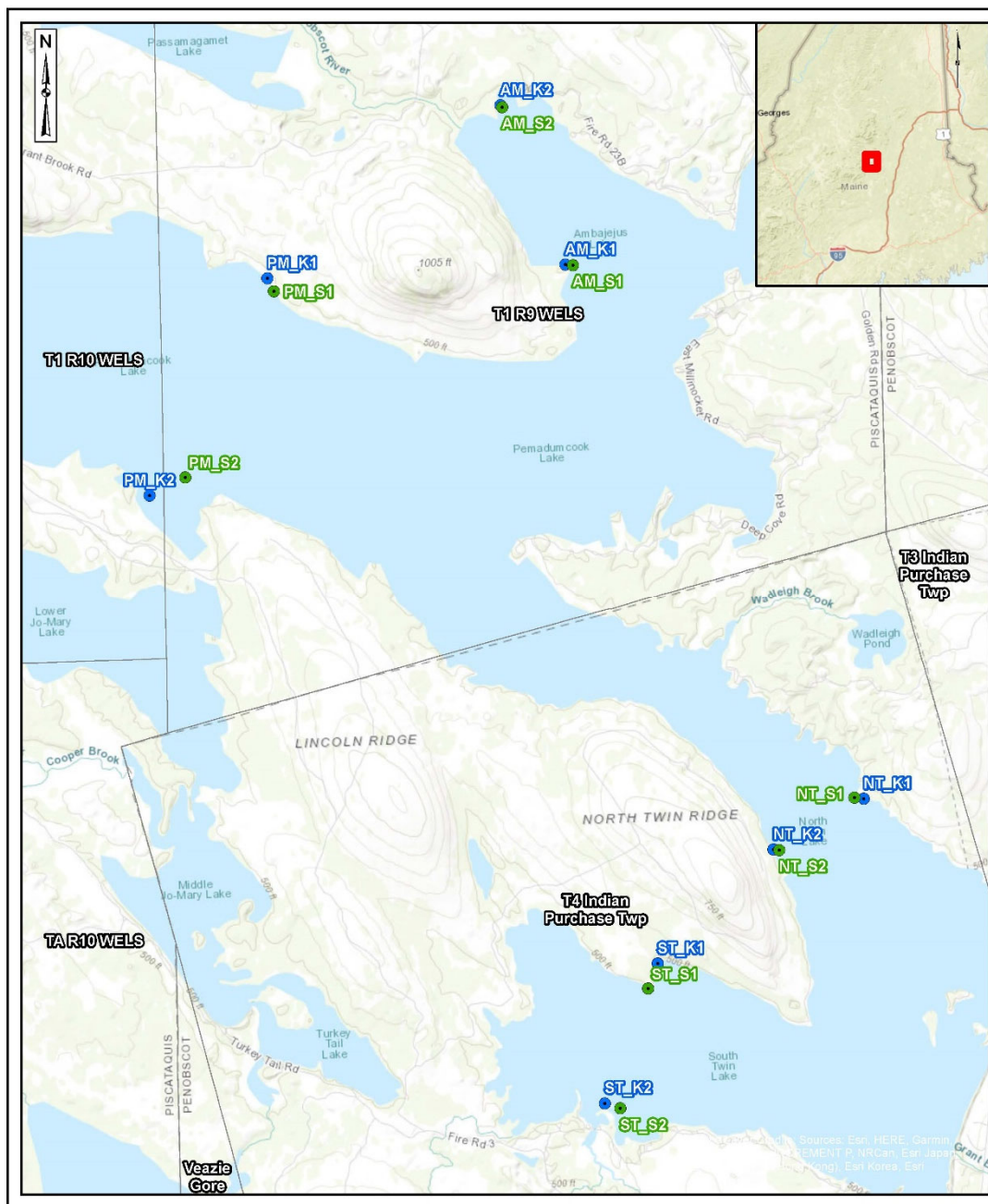
Upon completion of the taxonomic analysis, the data were entered into an Excel data base and provided to MDEP for their evaluation.

Table 4-1. North Twin Impoundment Benthic Macroinvertebrate Community Collection Locations

Sub-Basin	Sample Type	Station ID	Sample Date-Time	Coordinates	
Ambajejus	Kick	AM_K1	8/15/2023 12:56	45.7182287	-68.8802530
Ambajejus	Kick	AM_K2	8/15/2023 14:33	45.7376123	-68.8903948
Ambajejus	Surber	AM_S1	8/15/2023 13:42	45.7181276	-68.8789582
Ambajejus	Surber	AM_S2	8/15/2023 15:05	45.7373725	-68.8901031
Pemadumcook	Kick	PM_K1	8/15/2023 08:38	45.7178174	-68.9312686
Pemadumcook	Kick	PM_K2	8/15/2023 10:43	45.6922650	-68.9526053
Pemadumcook	Surber	PM_S1	8/15/2023 09:25	45.7162493	-68.9301780
Pemadumcook	Surber	PM_S2	8/15/2023 11:35	45.6943160	-68.9464225
North Twin	Kick	NT_K1	8/16/2023 07:28	45.6528826	-68.8325157
North Twin	Kick	NT_K2	8/16/2023 09:09	45.6471944	-68.8482093
North Twin	Surber	NT_S1	8/16/2023 08:01	45.6530379	-68.8340845
North Twin	Surber	NT_S2	8/16/2023 09:13	45.6471088	-68.8472313
South Twin	Kick	ST_K1	8/16/2023 10:53	45.6340378	-68.8686347
South Twin	Kick	ST_K2	8/16/2023 12:27	45.6175148	-68.8785243

Sub-Basin	Sample Type	Station ID	Sample Date-Time	Coordinates	
South Twin	Surber	ST_S1	8/16/2023 11:30	45.6310637	-68.8704489
South Twin	Surber	ST_S2	8/16/2023 12:54	45.6168427	-68.8758753

Figure 4-1. North Twin Impoundment Macroinvertebrate Community Sampling Locations



5.0 Results

A summary of the substrate composition and water quality at each of the benthic macroinvertebrate sampling locations at the time of sample collection is provided in Tables 5-1 and 5-2. Substrate types at the locations identified for Surber sampling were predominantly coarse substrates such as boulder, cobble, and gravel. Conversely, sample locations identified for kick sample collections were predominantly fine substrates such as sand and/or mud with submerged or emergent aquatic vegetation present.

Table 5-1. Substrate Characteristics for Benthic Macroinvertebrate Community Collection Locations Sampled Within the North Twin Impoundment During Summer, 2023

Sub-Basin	Sample Type	Station ID	Depth (ft)	Percent Composition					
				Boulder	Cobble	Gravel	Sand	Mud	Detritus
Ambajejus	Kick	AM_K1	1	20	0	30	30	0	20
Ambajejus	Kick	AM_K2	1	0	5	5	80	0	10
Ambajejus	Surber	AM_S1	1	50	40	0	10	0	0
Ambajejus	Surber	AM_S2	1	40	50	10	0	0	0
Pemadumcook	Kick	PM_K1	2	20	5	10	60	5	0
Pemadumcook	Kick	PM_K2	1.5	25	10	0	0	60	0
Pemadumcook	Surber	PM_S1	0.75	30	50	20	0	0	0
Pemadumcook	Surber	PM_S2	1.5	60	40	0	0	0	0
North Twin	Kick	NT_K1	1	20	10	10	0	60	0
North Twin	Kick	NT_K2	1	30	15	0	50	5	0
North Twin	Surber	NT_S1	1	30	60	10	0	0	0
North Twin	Surber	NT_S2	0.75	30	50	20	0	0	0
South Twin	Kick	ST_K1	1.25	10	10	10	60	10	0
South Twin	Kick	ST_K2	1.25	20	20	0	30	30	0
South Twin	Surber	ST_S1	0.75	45	40	5	10	0	0
South Twin	Surber	ST_S2	0.25	60	10	30	0	0	0

Table 5-2. Water Quality Parameters for Benthic Macroinvertebrate Community Collection Locations Sampled Within the North Twin Impoundment During Summer, 2023

Sub-Basin	Sample Type	Station ID	Temp (°C)	DO (mg/L)	SPC (µs/cm)	pH	TDS (mg/L)
Ambajejus	Kick	AM_K1	21.7	10.34	26	7.0	17
Ambajejus	Kick	AM_K2	22.7	9.07	26	6.8	17
Ambajejus	Surber	AM_S1	21.2	9.69	26	7.0	17
Ambajejus	Surber	AM_S2	23.2	9.21	27	7.0	17
Pemadumcook	Kick	PM_K1	19.8	8.70	26	6.9	17
Pemadumcook	Kick	PM_K2	21.8	9.33	21	6.8	14
Pemadumcook	Surber	PM_S1	20.4	9.29	26	7.0	17
Pemadumcook	Surber	PM_S2	21.3	9.45	24	7.0	15
North Twin	Kick	NT_K1	20.9	7.91	28	6.7	18
North Twin	Kick	NT_K2	21.6	8.72	25	7.0	16
North Twin	Surber	NT_S1	20.8	8.22	25	6.9	16
North Twin	Surber	NT_S2	21.9	8.59	25	7.0	17
South Twin	Kick	ST_K1	22.1	8.74	25	6.9	16
South Twin	Kick	ST_K2	22.3	9.24	23	7.0	15
South Twin	Surber	ST_S1	22.2	8.82	24	6.9	16
South Twin	Surber	ST_S2	22.7	9.09	24	7.1	15

Temperature = degrees Celsius (°C); DO = dissolved oxygen; SPC=specific conductance; TDS=total dissolved solids.

5.1 Surber Sampling

The total number of individuals enumerated from Surber samples (all three replicates pooled) ranged from 134 individuals to 1,042 individuals (Table -3). Summarized metrics for each of the individual Surber sample locations by replicate are provided in Attachment 1. Taxa richness ranged from 28 to 45, reflecting a diverse and rich community. The observed number of genera classified as Ephemeroptera, Plecoptera, and Trichoptera (EPT) ranged from 6 to 13, demonstrating that sensitive, stress-intolerant genera were observed throughout the various sub-basins of the North Twin impoundment.

At each of the eight coarse substrate sample locations, the dominant taxon produced among all three replicates represented less than or approximately one third of the total number of specimens (Table 5-3). The oligochaetes *Stylaria lacustris* and *Nais* (sp.) were the most frequently observed taxa at both Ambajejus subbasin locations (i.e., Stations AM_S1 and AM_S2), a single South Twin subbasin location (i.e., Station ST_S1), and a single North Twin subbasin location (i.e., NT_S1). The most frequently encountered taxa at the other coarse substrate stations included the gastropod

taxa *Fossaria* sp. (Stations PM_S1 and PM_S2 in the Pemadumcook subbasin), the amphipod *Hyalella Azteca* gr. (Station ST_S2 in the South Twin subbasin), and the chironomid *Tanytarsus* sp (Station NT_S2 in the North Twin subbasin). The Shannon Diversity index scores calculated for the coarse substrate sample locations within the North Twin impoundment ranged from 2.09 to 2.87 with Stations AM_S1 and ST_S1 generally exhibiting a lower balance within the distribution of individuals among taxa present than other stations.

Table 5-3. Summary of Benthic Macroinvertebrate Community Metrics for Surber Sampling Locations Within Ambajejus, Pemadumcook, North Twin, and South Twin Lakes

Community Metric	AM_S1	AM_S2	PM_S1	PM_S2	NT_S1	NT_S2	ST_S1	ST_S2
Total Number of Individuals	1,042	287	219	254	366	477	257	134
Community Density (no./square meter)	3,775	1,040	793	920	1,326	1,728	931	486
Total Number of Taxa (genus level)	45	33	33	33	43	36	31	28
Number of EPT Taxa (genus level)	13	9	10	8	13	12	9	6
Percent Dominant Taxon (genus level)	29.8%	14.6%	29.2%	19.7%	19.9%	23.1%	32.3%	25.4%
Shannon Diversity (base e)	2.30	2.77	2.72	2.87	2.75	2.52	2.09	2.71

5.2 Kick Sampling

The total number of individuals enumerated from kick samples (all three replicates pooled) ranged from 365 to 1,197 individuals (Table 5-4). Taxa richness ranged from 32 to 70 genera, reflecting a diverse and rich community. The observed number of genera classified as EPT ranged from 4 to 10 at the eight sampling locations, demonstrating that sensitive genera were observed throughout the North Twin impoundment.

Across seven of the eight kick sample locations, the dominant taxon represented between 25-35 percent of individuals collected. An oligochaete (*Stylaria lacustris*) was the most frequently observed taxa at both Ambajejus subbasin locations (i.e., Stations AM_K1 and AM_K2). At four sampling locations within the North Twin impoundment, the amphipod *Hyalella azteca* gr. was the most numerous taxa (Station PM_K2 in the Pemadumcook subbasin, Station NT-K2 in the North Twin subbasin, and Stations ST_K1 and ST_K2 in the South Twin subbasin). Station NT_K1 in the North Twin subbasin was unique in that the amphipod *Hyalella Azteca* gr. represented over 65 percent of all specimens collected. This dominance of a single taxa impacted the Shannon Diversity index value for that station (1.57), suggesting a trend towards an imbalance in the distribution of individuals among all taxa present. The Shannon Diversity index scores

calculated for the other fine substrate sample locations within the North Twin impoundment ranged from 2.36 to 2.79, with the majority of the scores indicative of greater balance within the distribution (or structure) of individuals among all taxa present.

Table 5-4. Summary of Benthic Macroinvertebrate Community Metrics for Kick Sampling Locations Within Ambajejus, Pemadumcook, North Twin and South Twin Lakes

Community Metric	AM_K1	AM_K2	PM_K1	PM_K2	NT_K1	NT_K2	ST_K1	ST_K2
Total Number of Individuals	522	1,116	365	547	478	457	590	1,197
Total Number of Taxa (genus level)	47	53	34	50	32	34	50	70
Number of EPT Taxa (genus level)	7	9	8	9	4	5	8	10
Percent Dominant Taxon (genus level)	30.5%	34.6%	26.6%	33.6%	65.5%	31.3%	26.8%	30.0%
Shannon Diversity (base e)	2.56	2.61	2.53	2.68	1.57	2.36	2.56	2.79

5.3 Macroinvertebrate Community

The full set of benthic macroinvertebrate sample collections (i.e., kick net and Surber samples) conducted within the Ambajejus, Pemadumcook, North Twin, and South Twin subbasins of the North Twin Impoundment during summer 2023 is summarized in Table 5-5. When all locations and sampling methodologies are considered, a total of 8,308 benthic macroinvertebrates were collected and identified to the lowest possible taxonomic designation (typically genus or genus sp.) representing 160 unique taxa. Taxa from the sensitive, stress-intolerant Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) represented 24 percent (39 out of the 160) of the species richness. Among all sampled benthic macroinvertebrates, the dominant taxon was an amphipod, *Hyallella Azteca* gr., which represented 19.9 percent of all individuals collected. *Hyallella Azteca* gr. was identified at all 16 sampling locations and was the dominant taxa at six locations.

Table 5-5. Summary of Pooled Benthic Macroinvertebrate Community Metrics for the North Twin Impoundment

Community Metric	North Twin Impoundment
Total Number of Individuals	8,308
Total Number of Taxa (genus level)	160
Number of EPT Taxa (genus level)	39
Percent Dominant Taxon (genus level)	19.9%
Shannon Diversity (base e)	3.12

5.4 Functional Feeding Groups

Macroinvertebrate functional feeding groups is a classification approach that is based on morpho-behavioral mechanisms of food acquisition rather than taxonomic group. Benthic macroinvertebrate species collected at the kick net and Surber sample locations within the North Twin impoundment were classified into the following functional feeding groups:

- **Collector-Filterer:** benthic macroinvertebrate species which collect fine particulate organic matter (FPOM) from the water column with a variety of filtering mechanisms.
- **Collector-Gatherer:** benthic macroinvertebrate species which collect FPOM from bottom habitat (sediments).
- **Predators:** benthic macroinvertebrate species which prey on other consumers.
- **Scrapers:** benthic macroinvertebrate species which obtain food through actively ‘scraping’ algae and other growth from available bottom substrates (e.g., cobble) or litter (e.g., leaves, twigs).
- **Shredders:** benthic macroinvertebrate species which ‘shred’ or break down leaf litter or other coarse particulate organic matter (CPOM) to obtain nutrients.

The occurrence of benthic macroinvertebrate taxa among the five functional feeding groups is summarized in Table 5-6. When both sampling methodologies are considered across each of the 16 sampling locations within the North Twin impoundment, Collector-Gatherers were the most abundant (74.3% of the sampled community) followed by Collector-Filterers (8.9% of the sampled community). Among the five functional feeding groups, Shredders (1.6% of the sampled community) were the least represented while the percentage of Predators and Scrapers were comparable to that of Collector-Filterers. The existence of different feeding groups demonstrates that the community function is maintained.

Table 5-6. Benthic Macroinvertebrate Functional Groups within the North Twin Impoundment

Functional Feeding Group	Surber Samples	Kick Samples	Combined
Collector-Filterers	8.0%	10.7%	8.9%
Collector-Gatherers	80.5%	63.2%	74.3%
Predator	6.5%	10.9%	8.1%
Scraper	3.2%	14.2%	7.1%
Shredder	1.9%	1.0%	1.6%

5.5 Maine Department of Environmental Protection (MDEP) Review

Via email dated September 11, 2024, GLHA provided the North Twin impoundment benthic macroinvertebrate data set to the MDEP for analysis. Via email dated January 7, 2025, the MDEP provided GLHA with the results of its analysis in the form of sheets summarizing the results and their final determination of the aquatic life standard (Attachment 2). In a follow up email dated January 31, 2025, MDEP stated that best professional judgement was used to determine that the structure and function of the aquatic communities are maintained and that surface water quality standards are met in the North Twin impoundment. The evaluation/determination sheets provided by the MDEP are attached, and a summary of the results is provided in Table 5-7. Correspondence with MDEP is provided in Attachment 3.

Table 5-7. Summary of MDEP Wetland Aquatic Life Classification Attainment Reports for the North Twin Impoundment

Subbasin	Station ID	Sample Date	Sample Type	Substrate	MDEP Station ID	MDEP Sample ID	MDEP Wetland Model Result	MDEP Professional Judgement Used	MDEP Final Aquatic Life Standard Determination
Ambajejus	AM-K1	8/15/2023	KQ-Kick/Qualitative	boulder, detritus, gravel, sand	W-396	KQ-2023-396	C	yes; structure & function	C
Ambajejus	AM-S1	8/15/2023	SB-Surber	boulder, rubble/cobble, sand	W-397	SB-2023-397	B	yes; structure & function	C
Ambajejus	AM-K2	8/15/2023	KQ-Kick/Qualitative	detritus, gravel, rubble/cobble, sand	W-398	KQ-2023-398	B	yes; structure & function	C
Ambajejus	AM-S2	8/15/2023	SB-Surber	boulder, gravel, rubble/cobble	W-399	SB-2023-399	B	yes; structure & function	C
North Twin	NT-K1	8/16/2023	KQ-Kick/Qualitative	boulder, gravel, rubble/cobble, silt, clay/muck	W-400	KQ-2023-400	B	yes; structure & function	C
North Twin	NT-S1	8/16/2023	SB-Surber	boulder, gravel, rubble/cobble	W-401	SB-2023-401	B	yes; structure & function	C
North Twin	NT-K2	8/16/2023	KQ-Kick/Qualitative	boulder, cobble, sand, silt/muck	W-402	KQ-2023-402	B	yes; structure & function	C
North Twin	NT-S2	8/16/2023	SB-Surber	boulder, gravel, rubble/cobble	W-403	SB-2023-403	B	yes; structure & function	C
Pemadumcook	PE-K1	8/15/2023	KQ-Kick/Qualitative	boulder, gravel, rubble/cobble, sand, silt	W-404	KQ-2023-404	A	yes; structure & function	C
Pemadumcook	PE-S1	8/15/2023	SB-Surber	boulder, gravel, rubble/cobble	W-405	SB-2023-405	B	yes; structure & function	C
Pemadumcook	PE-K2	8/15/2023	KQ-Kick/Qualitative	boulder, clay, rubble/cobble, silt/muck, detritus	W-406	KQ-2023-406	A	yes; structure & function	C
Pemadumcook	PE-S2	8/15/2023	SB-Surber	boulder, rubble/cobble	W-407	SB-2023-407	B	yes; structure & function	C
South Twin	ST-K1	8/16/2023	KQ-Kick/Qualitative	boulder, gravel, rubble/cobble, sand, silt	W-408	KQ-2023-408	A	yes; structure & function	C
South Twin	ST-S1	8/16/2023	SB-Surber	boulder, gravel, rubble/cobble, sand	W-409	SB-2023-409	B	yes; structure & function	C
South Twin	ST-K2	8/16/2023	KQ-Kick/Qualitative	boulder, rubble/cobble, sand, silt, clay	W-410	KQ-2023-410	A	yes; structure & function	C
South Twin	ST-S2	8/16/2023	SB-Surber	boulder, gravel, rubble/cobble	W-411	SB-2023-411	I	yes; structure & function	C

6.0 Summary

GLHA completed benthic macroinvertebrate community sampling at eight sites throughout the North Twin impoundment in August 2023 to collect additional information sufficient to assess attainment with aquatic life and surface water quality standards. The results indicated that the benthic macroinvertebrates represented a diverse and rich community containing sensitive, stress-intolerant genera demonstrating that community structure is maintained throughout the various sub-basins. The presence of different feeding groups throughout the impoundment demonstrates that community function is maintained. Based on best professional judgement, MDEP concluded that structure and function of the resident aquatic community in the North Twin impoundment is maintained, and water quality standards are met (see January 31, 2025 email from MDEP provided in Attachment 3).

7.0 Correspondence and Consultation

Via email dated September 11, 2024, GLHA provided the 2023 North Twin benthic macroinvertebrate data to the MDEP. Via email dated January 7, 2025, and January 31, 2025, the MDEP provided GLHA with the results of their evaluation of the benthic macroinvertebrate data. Copies of this correspondence are provided in Attachment 3.

Attachment 1

North Twin Impoundment Benthic Macroinvertebrate Tables

Ambajejus: Station AM K1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	203	176	143	522
Total Number of Taxa (genus level)	31	24	20	47
Number of EPT Taxa (genus level)	6	4	3	7
Number of Ephemeroptera Taxa (genus level)	3	2	1	4
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	3	2	2	3
Percent EPT Specimens	5.9%	4.5%	6.3%	5.6%
Percent Ephemeroptera Specimens	3.0%	1.7%	2.1%	2.3%
Number of Intolerant Taxa (genus level)	6	2	3	9
Percent Tolerant Organisms	43.3%	38.6%	41.3%	41.2%
Percent Dominant Taxon (genus level)	26.1%	40.3%	28.0%	30.5%
Hilsenhoff Biotic Index	7.13	7.43	5.97	6.84
Shannon Diversity (base e)	2.58	2.00	2.30	2.56

Ambajejus: Station AM K2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	445	188	483	1,116
Total Number of Taxa (genus level)	30	28	34	53
Number of EPT Taxa (genus level)	5	7	4	9
Number of Ephemeroptera Taxa (genus level)	3	4	1	5
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	2	3	3	4
Percent EPT Specimens	4.5%	8.5%	4.3%	5.1%
Percent Ephemeroptera Specimens	1.3%	4.8%	1.2%	1.9%
Number of Intolerant Taxa (genus level)	4	6	2	9
Percent Tolerant Organisms	23.6%	32.4%	30.8%	28.2%
Percent Dominant Taxon (genus level)	48.3%	20.7%	28.4%	34.6%
Hilsenhoff Biotic Index	6.69	6.71	7.33	6.96
Shannon Diversity (base e)	2.12	2.66	2.55	2.61

Ambajejus: Station AM S1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	330	491	221	1,042
Community Density (no./square meter)	3587	5337	2402	3775
Total Number of Taxa (genus level)	23	26	29	45
Number of EPT Taxa (genus level)	6	7	7	13
Number of Ephemeroptera Taxa (genus level)	3	6	4	7
Number of Plecoptera Taxa (genus level)	2	1	0	2
Number of Trichoptera Taxa (genus level)	1	0	3	4
Percent EPT Specimens	4.2%	5.3%	5.9%	5.1%
Percent Ephemeroptera Specimens	3.3%	4.9%	3.2%	4.0%
Number of Intolerant Taxa (genus level)	4	6	6	10
Percent Tolerant Organisms	3.9%	7.9%	14.5%	8.1%
Percent Dominant Taxon (genus level)	38.5%	37.1%	27.1%	29.8%
Hilsenhoff Biotic Index	5.63	5.87	6.05	5.86
Shannon Diversity (base e)	1.92	2.05	2.56	2.30

Ambajejus: Station AM S2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	156	66	65	287
Community Density (no./square meter)	1696	717	707	1040
Total Number of Taxa (genus level)	26	15	12	33
Number of EPT Taxa (genus level)	7	5	3	9
Number of Ephemeroptera Taxa (genus level)	5	3	2	5
Number of Plecoptera Taxa (genus level)	0	1	1	1
Number of Trichoptera Taxa (genus level)	2	1	0	3
Percent EPT Specimens	16.7%	33.3%	46.2%	27.2%
Percent Ephemeroptera Specimens	14.7%	28.8%	43.1%	24.4%
Number of Intolerant Taxa (genus level)	3	3	1	5
Percent Tolerant Organisms	7.1%	4.5%	6.2%	6.3%
Percent Dominant Taxon (genus level)	14.1%	13.6%	24.6%	14.6%
Hilsenhoff Biotic Index	5.37	4.16	4.31	4.74
Shannon Diversity (base e)	2.72	2.41	2.03	2.77

North Twin: Station NT K1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	161	193	124	478
Total Number of Taxa (genus level)	12	24	18	32
Number of EPT Taxa (genus level)	1	2	2	4
Number of Ephemeroptera Taxa (genus level)	1	1	2	3
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	0	1	0	1
Percent EPT Specimens	0.6%	1.0%	1.6%	1.0%
Percent Ephemeroptera Specimens	0.6%	0.5%	1.6%	0.8%
Number of Intolerant Taxa (genus level)	2	2	1	4
Percent Tolerant Organisms	83.9%	71.5%	75.0%	76.6%
Percent Dominant Taxon (genus level)	72.7%	57.5%	68.5%	65.5%
Hilsenhoff Biotic Index	7.89	7.80	7.81	7.83
Shannon Diversity (base e)	1.19	1.71	1.35	1.57

North Twin: Station NT K2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	148	130	179	457
Total Number of Taxa (genus level)	15	14	28	34
Number of EPT Taxa (genus level)	3	2	4	5
Number of Ephemeroptera Taxa (genus level)	3	1	2	3
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	0	1	2	2
Percent EPT Specimens	2.7%	2.3%	2.2%	2.4%
Percent Ephemeroptera Specimens	2.7%	0.8%	1.1%	1.5%
Number of Intolerant Taxa (genus level)	1	2	5	5
Percent Tolerant Organisms	80.4%	68.5%	22.9%	54.5%
Percent Dominant Taxon (genus level)	47.3%	46.9%	27.4%	31.3%
Hilsenhoff Biotic Index	7.74	7.74	6.51	7.40
Shannon Diversity (base e)	1.60	1.78	2.65	2.36

North Twin: Station NT S1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	161	78	127	366
Community Density (no./square meter)	1750	848	1380	1326
Total Number of Taxa (genus level)	24	22	22	43
Number of EPT Taxa (genus level)	8	8	5	13
Number of Ephemeroptera Taxa (genus level)	5	5	3	6
Number of Plecoptera Taxa (genus level)	1	0	0	1
Number of Trichoptera Taxa (genus level)	2	3	2	6
Percent EPT Specimens	13.7%	21.8%	17.3%	16.7%
Percent Ephemeroptera Specimens	11.8%	17.9%	13.4%	13.7%
Number of Intolerant Taxa (genus level)	5	6	3	10
Percent Tolerant Organisms	32.3%	21.8%	13.4%	23.5%
Percent Dominant Taxon (genus level)	24.2%	16.7%	22.0%	19.9%
Hilsenhoff Biotic Index	6.14	4.91	5.43	5.62
Shannon Diversity (base e)	2.28	2.64	2.54	2.75

North Twin: Station NT S2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	69	244	164	477
Community Density (no./square meter)	750	2652	1783	1728
Total Number of Taxa (genus level)	17	22	20	36
Number of EPT Taxa (genus level)	5	6	5	12
Number of Ephemeroptera Taxa (genus level)	4	2	3	5
Number of Plecoptera Taxa (genus level)	0	0	1	1
Number of Trichoptera Taxa (genus level)	1	4	1	6
Percent EPT Specimens	11.6%	7.0%	7.3%	7.8%
Percent Ephemeroptera Specimens	8.7%	4.9%	6.1%	5.9%
Number of Intolerant Taxa (genus level)	4	4	4	10
Percent Tolerant Organisms	26.1%	12.3%	15.9%	15.5%
Percent Dominant Taxon (genus level)	18.8%	31.1%	19.5%	23.1%
Hilsenhoff Biotic Index	6.14	6.06	5.98	6.05
Shannon Diversity (base e)	2.43	2.24	2.40	2.52

Pemadumcook: Station PM_K1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	137	120	108	365
Total Number of Taxa (genus level)	23	16	20	34
Number of EPT Taxa (genus level)	6	3	4	8
Number of Ephemeroptera Taxa (genus level)	2	0	2	4
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	4	3	2	4
Percent EPT Specimens	8.8%	12.5%	10.2%	10.4%
Percent Ephemeroptera Specimens	1.5%	0.0%	2.8%	1.4%
Number of Intolerant Taxa (genus level)	4	1	3	5
Percent Tolerant Organisms	26.3%	20.0%	38.9%	27.9%
Percent Dominant Taxon (genus level)	32.1%	32.5%	24.1%	26.6%
Hilsenhoff Biotic Index	6.59	6.20	6.87	6.56
Shannon Diversity (base e)	2.44	2.15	2.47	2.53

Pemadumcook: Station PM_K2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	200	149	198	547
Total Number of Taxa (genus level)	26	32	33	50
Number of EPT Taxa (genus level)	6	8	5	9
Number of Ephemeroptera Taxa (genus level)	4	4	3	5
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	2	4	2	4
Percent EPT Specimens	18.0%	12.1%	12.1%	14.3%
Percent Ephemeroptera Specimens	4.0%	6.7%	6.1%	5.5%
Number of Intolerant Taxa (genus level)	5	5	2	7
Percent Tolerant Organisms	48.5%	53.0%	49.5%	50.1%
Percent Dominant Taxon (genus level)	38.0%	30.2%	31.8%	33.6%
Hilsenhoff Biotic Index	6.67	7.21	8.83	7.51
Shannon Diversity (base e)	2.15	2.74	2.54	2.68

Pemadumcook: Station PM_S1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	69	69	81	219
Community Density (no./square meter)	750	750	880	793
Total Number of Taxa (genus level)	20	16	20	33
Number of EPT Taxa (genus level)	6	4	6	10
Number of Ephemeroptera Taxa (genus level)	3	2	2	5
Number of Plecoptera Taxa (genus level)	1	1	1	1
Number of Trichoptera Taxa (genus level)	2	1	3	4
Percent EPT Specimens	34.8%	14.5%	11.1%	19.6%
Percent Ephemeroptera Specimens	30.4%	7.2%	4.9%	13.7%
Number of Intolerant Taxa (genus level)	4	2	5	8
Percent Tolerant Organisms	8.7%	21.7%	9.9%	13.2%
Percent Dominant Taxon (genus level)	20.3%	37.7%	37.0%	29.2%
Hilsenhoff Biotic Index	4.39	5.83	5.38	5.09
Shannon Diversity (base e)	2.64	2.15	2.24	2.72

Pemadumcook: Station PM_S2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	21	129	104	254
Community Density (no./square meter)	228	1402	1130	920
Total Number of Taxa (genus level)	16	19	21	33
Number of EPT Taxa (genus level)	2	5	5	8
Number of Ephemeroptera Taxa (genus level)	0	3	3	4
Number of Plecoptera Taxa (genus level)	1	1	0	1
Number of Trichoptera Taxa (genus level)	1	1	2	3
Percent EPT Specimens	9.5%	10.9%	22.1%	15.4%
Percent Ephemeroptera Specimens	0.0%	7.8%	17.3%	11.0%
Number of Intolerant Taxa (genus level)	3	3	4	7
Percent Tolerant Organisms	19.0%	16.3%	14.4%	15.7%
Percent Dominant Taxon (genus level)	14.3%	28.7%	20.2%	19.7%
Hilsenhoff Biotic Index	5.70	6.10	5.42	5.72
Shannon Diversity (base e)	2.69	2.42	2.73	2.87

South Twin: Station ST K1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	182	158	250	590
Total Number of Taxa (genus level)	27	22	33	50
Number of EPT Taxa (genus level)	4	4	5	8
Number of Ephemeroptera Taxa (genus level)	2	1	3	4
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	2	3	2	4
Percent EPT Specimens	3.8%	3.2%	5.6%	4.4%
Percent Ephemeroptera Specimens	1.1%	0.6%	3.2%	1.9%
Number of Intolerant Taxa (genus level)	3	2	6	9
Percent Tolerant Organisms	30.2%	35.4%	37.2%	34.6%
Percent Dominant Taxon (genus level)	30.2%	27.2%	27.6%	26.8%
Hilsenhoff Biotic Index	7.31	7.39	7.18	7.14
Shannon Diversity (base e)	2.21	2.32	2.45	2.56

South Twin: Station ST K2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	264	594	339	1,197
Total Number of Taxa (genus level)	34	38	40	70
Number of EPT Taxa (genus level)	4	6	8	10
Number of Ephemeroptera Taxa (genus level)	1	4	4	6
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	3	2	4	4
Percent EPT Specimens	1.9%	2.2%	8.3%	3.8%
Percent Ephemeroptera Specimens	0.4%	1.0%	1.5%	1.0%
Number of Intolerant Taxa (genus level)	3	5	5	9
Percent Tolerant Organisms	24.6%	47.0%	49.6%	42.8%
Percent Dominant Taxon (genus level)	29.9%	38.2%	28.9%	30.0%
Hilsenhoff Biotic Index	6.71	7.53	6.95	7.19
Shannon Diversity (base e)	2.55	2.20	2.80	2.79

South Twin: Station ST S1

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	169	49	39	257
Community Density (no./square meter)	1837	533	424	931
Total Number of Taxa (genus level)	24	10	12	31
Number of EPT Taxa (genus level)	6	4	2	9
Number of Ephemeroptera Taxa (genus level)	5	3	1	6
Number of Plecoptera Taxa (genus level)	0	0	0	0
Number of Trichoptera Taxa (genus level)	1	1	1	3
Percent EPT Specimens	5.9%	12.2%	7.7%	7.4%
Percent Ephemeroptera Specimens	5.3%	10.2%	5.1%	6.2%
Number of Intolerant Taxa (genus level)	5	3	0	6
Percent Tolerant Organisms	20.1%	4.1%	15.4%	16.3%
Percent Dominant Taxon (genus level)	34.9%	42.9%	28.2%	32.3%
Hilsenhoff Biotic Index	6.11	3.92	6.58	5.82
Shannon Diversity (base e)	1.91	1.64	2.05	2.09

South Twin: Station ST S2

Metric	Replicate			
	1	2	3	All
Total Number of Individuals	63	25	46	134
Community Density (no./square meter)	685	272	500	486
Total Number of Taxa (genus level)	13	14	16	28
Number of EPT Taxa (genus level)	2	4	3	6
Number of Ephemeroptera Taxa (genus level)	1	2	2	4
Number of Plecoptera Taxa (genus level)	0	1	0	1
Number of Trichoptera Taxa (genus level)	1	1	1	1
Percent EPT Specimens	3.2%	32.0%	23.9%	15.7%
Percent Ephemeroptera Specimens	1.6%	20.0%	8.7%	7.5%
Number of Intolerant Taxa (genus level)	0	1	2	3
Percent Tolerant Organisms	49.2%	32.0%	30.4%	39.6%
Percent Dominant Taxon (genus level)	33.3%	20.0%	17.4%	25.4%
Hilsenhoff Biotic Index	7.65	6.18	6.32	6.79
Shannon Diversity (base e)	2.01	2.45	2.52	2.71

Attachment 2
North Twin Impoundment
MDEP Wetland Aquatic Life Classification Attainment Reports

Penobscot Mills Project (P-2458) - North Twin Development - 2023 Impoundment Benthic Macroinvertebrate Sampling and MDEP Model Results

Waterbody name	DEP Site Name	NORMANDEAU ASSOCIATES Station ID	Sample Type	DEP Sample ID	Date	Time	lat	long	TA	GR	substrate
Ambajejus Lake	W-396	AM-K1	KQ-Kick/Qualitative	KQ-2023-396	8/15/2023	12:56	45.7182287	68.8802530	174	44	boulder, detritus, gravel, sand
Ambajejus Lake	W-397	AM-S1	SB-Surber	SB-2023-397	8/15/2023	13:42	45.7181276	68.8789582	347	44	boulder, rubble/cobble, sand
Ambajejus Lake	W-398	AM-K2	KQ-Kick/Qualitative	KQ-2023-398	8/15/2023	14:33	45.7376123	68.8903948	372	49	detritus, gravel, rubble/cobble, sand
Ambajejus Lake	W-399	AM-S2	SB-Surber	SB-2023-399	8/15/2023	15:05	45.7373725	68.8901031	96	32	boulder, gravel, rubble/cobble
North Twin Lake	W-400	NT-K1	KQ-Kick/Qualitative	KQ-2023-400	8/16/2023	7:28	45.6528826	68.8325157	158	29	boulder, gravel, rubble/cobble, silt, clay/muck
North Twin Lake	W-401	NT-S1	SB-Surber	SB-2023-401	8/16/2023	8:01	45.6530379	68.8340845	122	42	boulder, gravel, rubble/cobble
North Twin Lake	W-402	NT-K2	KQ-Kick/Qualitative	KQ-2023-402	8/16/2023	9:09	45.6471944	68.8482093	152	32	boulder, cobble, sand, silt/muck
North Twin Lake	W-403	NT-S2	SB-Surber	SB-2023-403	8/16/2023	9:13	45.6471088	68.8472313	159	35	boulder, gravel, rubble/cobble
Pemadumcook Lake	W-404	PE-K1	KQ-Kick/Qualitative	KQ-2023-404	8/15/2023	8:38	45.7178174	68.9312686	122	30	boulder, gravel, rubble/cobble, sand, silt
Pemadumcook Lake	W-405	PE-S1	SB-Surber	SB-2023-405	8/15/2023	9:25	45.7162493	68.9301780	73	31	boulder, gravel, rubble/cobble
Pemadumcook Lake	W-406	PE-K2	KQ-Kick/Qualitative	KQ-2023-406	8/15/2023	10:43	45.6922650	68.9526053	182	48	boulder, clay, rubble/cobble, silt/much, detritus
Pemadumcook Lake	W-407	PE-S2	SB-Surber	SB-2023-407	8/15/2023	11:35	45.6943160	68.9464225	85	31	boulder, rubble/cobble
South Twin Lake	W-408	ST-K1	KQ-Kick/Qualitative	KQ-2023-408	8/16/2023	10:53	45.6340378	68.8686347	197	45	boulder, gravel, rubble/cobble, sand, silt
South Twin Lake	W-409	ST-S1	SB-Surber	SB-2023-409	8/16/2023	11:30	45.6310637	68.8704489	86	30	boulder, gravel, rubble/cobble, sand
South Twin Lake	W-410	ST-K2	KQ-Kick/Qualitative	KQ-2023-410	8/16/2023	12:27	45.6175148	68.8785243	399	63	boulder, rubble/cobble, sand, silt, clay
South Twin Lake	W-411	ST-S2	SB-Surber	SB-2023-411	8/16/2023	12:54	45.6168427	68.8758753	45	27	boulder, gravel, rubble/cobble

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-396	Trip ID: 2023-396	River Basin:
Waterbody: AMBAJEJUS LAKE (K1)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-396	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	C	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.05	Class C: 0.43	Class A, B, or C	1.00
Class B: 0.51	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.57	Class A	0.05
Class C or Non-Attainment	0.43	Class B or C or Non-Attainment	0.95

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	4.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.182	≥ 0.140
Shannon-Wiener Diversity Index	3.656	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.789	≥ 0.131
Abundance of Sensitive Taxa	23.725	≥ 3.424
Richness of Sensitive Taxa	8.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	31.388	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.400	≥ 0.334

Other Variables

Total Mean Abundance	174
Generic Richness:	44
Hilsenhoff Biotic Index:	6.84

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Nais</i>	30.46
2	<i>Hyalella azteca</i>	24.71
3	<i>Stylaria lacustris</i>	4.02

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Cladotanytarsus</i>	3.83
4	<i>Psectrocladius</i>	3.83
5	<i>Tanytarsus</i>	3.45

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 12:56:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	10.34	mg/l	
In-situ	pH	6.99		
In-situ	Specific Conductance	26	us/cm	
In-situ	Temperature	21.67	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:
Dominant Plant Species:		
Additional Plant Community Observations:		
Habitat Classification:	Substrate Classification:	
OPEN WATER STANDING	BOULDER SUBSTRATE	
	DETRITUS SUBSTRATE	
	GRAVEL SUBSTRATE	
	SAND SUBSTRATE	
Average Depth:	Visible Flow: No	Rain In Previous 24 Hours: No
Sample Comments:		

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-396	Waterbody: AMBAJEJUS LAKE (K1)	Town: T01 R09 Wels
Log Number: KQ-2023-396	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	11.00	0.063	8	0.18
EPT Taxa:	9.67	0.056	7	0.16
Insects:	55.00	0.316	32	0.73
Non-Insects:	119.00	0.684	12	0.27
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	69.67	0.400	7	0.16
Snails:	2.33	0.013	3	0.07
Bivalves:	4.00	0.023	1	0.02
Isopods:	0.00	0.000	0	0.00
Amphipods:	43.00	0.247	1	0.02
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	4.00	0.023	4	0.09
Odonates:	1.33	0.008	1	0.02
Caddisflies:	5.67	0.033	3	0.07
Diptera:	44.00	0.253	24	0.55
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	40.33	0.232	20	0.45
Tanypodinae Tribe:	3.70	0.021	3	0.07
Chironomiinae Tribe:	23.86	0.137	12	0.27
Orthoclodiinae Tribe:	12.44	0.071	4	0.09
Collector-Filterers:	10.05	0.058	2	0.05
Collector-Gatherers:	137.23	0.789	21	0.48
Predators:	10.37	0.060	8	0.18
Piercers:	3.33	0.019	1	0.02
Shredders:	0.34	0.002	1	0.02
Scrapers:	2.67	0.015	4	0.09
Maine Tolerance:				
Sensitive:	23.73	0.152	8	0.27
Intermediate:	72.50	0.466	17	0.57
Eurytopic:	59.39	0.382	5	0.17
Ratio of MTI Sensitive to Eurytopic	0.40	0.400	1.60	1.60

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-396	Waterbody: AMBAJEJUS LAKE (K1)	Town: T01 R09 Wels
Log Number: KQ-2023-396	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Oligochaeta	0802	0.67	0.67	--	--	--	--	Oligochaete
Lumbriculus	08020101002	0.00	1.33	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	1.33	0.00	--	--	--	--	Worm
Stylodrilus	08020101004	0.00	1.33	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	1.33	0.00	--	--	--	--	Worm
Bratislavia	08020202003	2.67	2.67	--	--	--	--	Worm
Nais	08020202009	53.00	53.00	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	3.00	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	3.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	7.00	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	7.00	0.00	--	--	--	--	Worm
Vejdovskyella	08020202015	0.00	0.67	--	--	13.7-S	--	Worm
<i>Vejdovskyella comata</i>	08020202015001	0.67	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	43.00	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	43.00	0.00	--	--	--	--	Amphipod
Enallagma	09020309051	1.33	1.33	9	PR	26.2-I	--	Dragonfly/damselfly
Centropilum	09020401003	0.33	0.33	2	CG	--	--	Mayfly
Choroterpes	09020406022	0.33	0.33	2	CG	--	--	Mayfly
Paraleptophlebia	09020406026	0.33	0.33	1	CG	--	--	Mayfly
Caenis	09020412040	3.00	3.00	7	CG	22.1-I	--	Mayfly
Oxyethira	09020607028	3.33	3.33	3	P	22-S	--	Caddisfly
Psilotreta	09020614068	0.33	0.33	0	SC	--	--	Caddisfly
Oecetis	09020618078	2.00	2.00	8	PR	16.3-S	--	Caddisfly
Dasyhelea	09021010036	0.33	0.33	--	CG	30.6-I	--	Fly: Biting Midge
Probezzia	09021010041	1.33	1.33	6	PR	28.6-I	--	Fly: Biting Midge
Mallochohelea	09021010047	1.33	1.33	--	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	0.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	1.00	3.03	8	PR	23.6-I	T	Fly: Midge
<i>Ablabesmyia mallochi</i>	09021011001004	1.67	0.00	--	--	--	T	Fly: Midge
<i>Ablabesmyia aspera</i>	09021011001012	0.33	0.00	--	--	--	T	Fly: Midge
Paramerina	09021011013	0.33	0.34	--	--	29.3-I	T	Fly: Midge
Thienemannimyia	09021011020	0.00	0.34	3	PR	--	T	Fly: Midge
<i>Thienemannimyia group</i>	09021011020041	0.33	0.00	--	--	--	T	Fly: Midge
Potthastia	09021011026	0.00	0.34	2	CG	--	D	Fly: Midge
<i>Potthastia longimana</i>	09021011026046	0.33	0.00	--	--	--	D	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-396		Waterbody: AMBAJEJUS LAKE (K1)				Town: T01 R09 Wels		
Log Number: KQ-2023-396		Subsample Factor: X1		Replicates: 3		Calculated: 11/21/2024		
Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Corynoneura	09021011036	0.33	0.34	7	CG	40.1-I	--	Fly: Midge
Heterotrissocladius	09021011044	5.00	5.04	0	CG	--	--	Fly: Midge
Nanocladius	09021011049	0.33	0.34	3	CG	14.1-S	--	Fly: Midge
Psectrocladius	09021011056	6.67	6.72	8	CG	22-S	--	Fly: Midge
Cladotanytarsus	09021011068	6.67	6.72	7	CG	22.2-I	Y	Fly: Midge
Micropsectra	09021011070	1.00	1.01	7	CG	98.1-E	Y	Fly: Midge
Paratanytarsus	09021011071	1.00	1.01	6	--	43-E	Y	Fly: Midge
Tanytarsus	09021011076	6.00	6.05	6	CF	25.7-I	Y	Fly: Midge
Pseudochironomus	09021011078	4.00	4.03	5	CG	47.7-E	S	Fly: Midge
Cryptochironomus	09021011082	0.00	0.67	8	PR	31.3-I	C	Fly: Midge
<i>Cryptochironomus fulvus</i>	09021011082144	0.67	0.00	--	--	--	C	Fly: Midge
Dicrotendipes	09021011085	2.33	2.35	8	CG	28.8-I	C	Fly: Midge
Harnischia	09021011090	0.67	0.67	8	CG	--	C	Fly: Midge
Parachironomus	09021011097	0.33	0.34	10	PR	28.6-I	C	Fly: Midge
Phaenopsectra	09021011101	0.00	0.34	7	SC	44.2-E	C	Fly: Midge
<i>Phaenopsectra obediens</i>	09021011101182	0.33	0.00	--	SC	--	C	Fly: Midge
Polypedilum	09021011102	0.00	0.34	6	SH	24.2-I	C	Fly: Midge
<i>Polypedilum flavum</i>	09021011102182	0.33	0.00	--	--	--	C	Fly: Midge
Stictochironomus	09021011106	0.00	0.34	9	CG	--	C	Fly: Midge
<i>Stictochironomus devinctus</i>	09021011106197	0.33	0.00	--	--	--	C	Fly: Midge
Chrysops	09021014052	0.67	0.67	6	CG	20.7-S	--	Fly: Horse And Deer
Gyraulus	10010203029	1.00	1.00	--	SC	37.2-I	--	Snail
Helisoma	10010203030	1.00	1.00	--	SC	42.8-I	--	Snail
Menetus	10010203031	0.00	0.33	--	--	--	--	Snail
<i>Menetus dilatatus</i>	10010203031059	0.33	0.00	--	--	--	--	Snail
Pisidium	10020201002	4.00	4.00	--	CF	--	--	Clam

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-398	Trip ID: 2023-398	River Basin:
Waterbody: AMBAJEJUS LAKE (K2)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-398	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.16	Class C: 0.10	Class A, B, or C	1.00
Class B: 0.74	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.90	Class A	0.16
Class C or Non-Attainment	0.10	Class B or C or Non-Attainment	0.84

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	7.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.224	≥ 0.140
Shannon-Wiener Diversity Index	3.725	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.673	≥ 0.131
Abundance of Sensitive Taxa	71.414	≥ 3.424
Richness of Sensitive Taxa	10.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	31.127	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.541	≥ 0.334

Other Variables

Total Mean Abundance	372
Generic Richness:	49
Hilsenhoff Biotic Index:	6.96

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Nais</i>	34.59
2	<i>Hyalella azteca</i>	15.77
3	<i>Stylaria lacustris</i>	6.54

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Oligochaeta</i>	5.56
5	<i>Slavina appendiculata</i>	4.03

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 2:33:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.07	mg/l	
In-situ	pH	6.82		
In-situ	Specific Conductance	26	us/cm	
In-situ	Temperature	22.72	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:
Dominant Plant Species:		
Additional Plant Community Observations:		
Habitat Classification:	Substrate Classification:	
OPEN WATER STANDING	DETRITUS SUBSTRATE	
	GRAVEL SUBSTRATE	
	RUBBLE/COBBLE SUBSTRATE	
	SAND SUBSTRATE	
Average Depth:	Visible Flow: No	Rain In Previous 24 Hours: No
Sample Comments:		

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-398	Waterbody: AMBAJEJUS LAKE (K2)	Town: T01 R09 Wels
Log Number: KQ-2023-398	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	26.33	0.071	11	0.22
EPT Taxa:	19.00	0.051	9	0.18
Insects:	90.33	0.243	35	0.71
Non-Insects:	281.67	0.757	14	0.29
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	203.00	0.546	7	0.14
Snails:	13.33	0.036	4	0.08
Bivalves:	6.33	0.017	1	0.02
Isopods:	0.00	0.000	0	0.00
Amphipods:	58.67	0.158	1	0.02
Mites:	0.33	0.001	1	0.02
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	7.00	0.019	5	0.10
Odonates:	7.33	0.020	2	0.04
Caddisflies:	12.00	0.032	4	0.08
Diptera:	63.00	0.169	21	0.43
Hemiptera:	0.33	0.001	1	0.02
Beetles:	0.67	0.002	2	0.04
Chironomids:	59.33	0.159	20	0.41
Tanypodinae Tribe:	7.16	0.019	4	0.08
Chironomiinae Tribe:	31.37	0.084	11	0.22
Orthoclodiinae Tribe:	20.12	0.054	4	0.08
Collector-Filterers:	15.54	0.042	2	0.04
Collector-Gatherers:	250.39	0.673	18	0.37
Predators:	22.91	0.062	10	0.20
Piercers:	10.00	0.027	2	0.04
Shredders:	6.47	0.017	2	0.04
Scrapers:	13.00	0.035	5	0.10
Maine Tolerance:				
Sensitive:	71.41	0.226	10	0.34
Intermediate:	112.70	0.356	14	0.48
Eurytopic:	132.05	0.418	5	0.17
Ratio of MTI Sensitive to Eurytopic	0.54	0.541	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-398	Waterbody: AMBAJEJUS LAKE (K2)	Town: T01 R09 Wels
Log Number: KQ-2023-398	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Oligochaeta	0802	20.67	20.67	--	--	--	--	Oligochaete
Stylodrilus	08020101004	0.00	5.67	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	5.67	0.00	--	--	--	--	Worm
Tubificida	080202	0.67	0.67	--	--	--	--	Worm
Enchytraeidae	08020201	6.67	6.67	--	--	--	--	Worm
Nais	08020202009	128.67	128.67	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	15.00	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	15.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	24.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	24.33	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	1.00	1.00	--	--	3.8-S	--	Tubificid Worm
Lumbricidae	08020205	0.33	0.33	--	--	--	--	Worm
Hyaella	09010203006	0.00	58.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	58.67	0.00	--	--	--	--	Amphipod
Libellulidae	09020306	1.00	1.00	--	--	--	--	Dragonfly/damselfly
Enallagma	09020309051	6.33	6.33	9	PR	26.2-I	--	Dragonfly/damselfly
Centropilum	09020401003	0.67	0.67	2	CG	--	--	Mayfly
Maccaffertium	09020402015	0.33	0.33	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	0.67	0.67	1	CG	--	--	Mayfly
Ephemera	09020407027	0.33	0.33	1	CG	--	--	Mayfly
Caenis	09020412040	5.00	5.00	7	CG	22.1-I	--	Mayfly
Gerridae	09020506	0.33	0.33	--	--	--	--	True Bug
Oxyethira	09020607028	9.67	9.67	3	P	22-S	--	Caddisfly
Molanna	09020615069	0.33	0.33	6	SC	--	--	Caddisfly
Nectopsyche	09020618074	0.33	0.33	3	SH	--	--	Caddisfly
Oecetis	09020618078	1.67	1.67	8	PR	16.3-S	--	Caddisfly
Palpomyia	09021010044	3.67	3.67	6	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	1.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	0.33	4.43	8	PR	23.6-I	T	Fly: Midge
<i>Ablabesmyia mallochii</i>	09021011001004	4.00	0.00	--	--	--	T	Fly: Midge
Clinotanypus	09021011002	0.00	0.68	8	PR	30.3-I	T	Fly: Midge
<i>Clinotanypus pinguis</i>	09021011002008	0.67	0.00	--	--	--	--	Fly: Midge
Labrundinia	09021011008	1.67	1.70	7	PR	18.1-S	T	Fly: Midge
Thienemannimyia	09021011020	0.00	0.34	3	PR	--	T	Fly: Midge
<i>Thienemannimyia group</i>	09021011020041	0.33	0.00	--	--	--	T	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-398	Waterbody: AMBAJEJUS LAKE (K2)	Town: T01 R09 Wels
Log Number: KQ-2023-398	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Potthastia	09021011026	0.00	0.68	2	CG	--	D	Fly: Midge	
<i>Potthastia longimana</i>	09021011026046	0.67	0.00	--	--	--	D	Fly: Midge	
Corynoneura	09021011036	2.33	2.39	7	CG	40.1-I	--	Fly: Midge	
Heterotrissocladius	09021011044	1.00	1.02	0	CG	--	--	Fly: Midge	
Orthocladius	09021011050	2.00	2.05	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	14.33	14.66	8	CG	22-S	--	Fly: Midge	
Cladotanytarsus	09021011068	4.00	4.09	7	CG	22.2-I	Y	Fly: Midge	
Micropsectra	09021011070	1.00	1.02	7	CG	98.1-E	Y	Fly: Midge	
Paratanytarsus	09021011071	1.00	1.02	6	--	43-E	Y	Fly: Midge	
Stempellina	09021011073	4.33	4.43	2	CG	--	Y	Fly: Midge	
Tanytarsus	09021011076	9.00	9.21	6	CF	25.7-I	Y	Fly: Midge	
Cryptochironomus	09021011082	0.00	1.36	8	PR	31.3-I	C	Fly: Midge	
<i>Cryptochironomus fulvus</i>	09021011082144	1.33	0.00	--	--	--	C	Fly: Midge	
Dicrotendipes	09021011085	0.67	0.68	8	CG	28.8-I	C	Fly: Midge	
Parachironomus	09021011097	2.33	2.39	10	PR	28.6-I	C	Fly: Midge	
Polypedilum	09021011102	1.33	6.14	6	SH	24.2-I	C	Fly: Midge	
<i>Polypedilum flavum</i>	09021011102182	2.67	0.00	--	--	--	C	Fly: Midge	
<i>Polypedilum illinoense</i>	09021011102204	2.00	0.00	--	--	--	--	Fly: Midge	
Stenochironomus	09021011105	0.33	0.34	5	CG	--	C	Fly: Midge	
Stictochironomus	09021011106	0.00	0.68	9	CG	--	C	Fly: Midge	
<i>Stictochironomus devinctus</i>	09021011106197	0.67	0.00	--	--	--	C	Fly: Midge	
Peltodytes	09021101002	0.33	0.33	--	P	56.2-E	--	Beetle	
Gyrinus	09021104033	0.33	0.33	2	PR	11.9-S	--	Beetle	
Hydrachnidia	09030101	0.33	0.33	--	--	--	--	Mite	
Valvata	10010101001	10.33	10.33	--	SC	33.4-I	--	Snail	
Amnicola	10010104013	1.00	1.00	--	SC	18.7-S	--	Snail	
Fossaria	10010201021	1.00	1.00	--	--	56.1-E	--	Snail	
Gyraulus	10010203029	1.00	1.00	--	SC	37.2-I	--	Snail	
Pisidium	10020201002	6.33	6.33	--	CF	--	--	Clam	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-400	Trip ID: 2023-400	River Basin:
Waterbody: NORTH TWIN LAKE (K1)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-400	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.13	Class C: 0.04	Class A, B, or C	1.00
Class B: 0.83	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.96	Class A	0.13
Class C or Non-Attainment	0.04	Class B or C or Non-Attainment	0.87

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	1.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.207	≥ 0.140
Shannon-Wiener Diversity Index	2.176	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.867	≥ 0.131
Abundance of Sensitive Taxa	28.974	≥ 3.424
Richness of Sensitive Taxa	6.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	24.867	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	5.795	≥ 0.334

Other Variables

Total Mean Abundance	158
Generic Richness:	29
Hilsenhoff Biotic Index:	7.84

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	65.89
2	<i>Stylaria lacustris</i>	9.05
3	<i>Psectrocladius</i>	6.95

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Enallagma</i>	2.11
4	<i>Gyraulus</i>	2.11
5	<i>Nais</i>	1.68

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 7:28:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	7.91	mg/l	
In-situ	pH	6.74		
In-situ	Specific Conductance	28	us/cm	
In-situ	Temperature	20.91	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SILT/MUCK SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments: SUBSTRATE ALSO HAS 20% CLAY/MUCK

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-400	Waterbody: NORTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-400	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	5.67	0.036	6	0.21
EPT Taxa:	1.67	0.011	4	0.14
Insects:	26.67	0.168	16	0.55
Non-Insects:	131.67	0.832	13	0.45
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	18.00	0.114	4	0.14
Snails:	6.67	0.042	4	0.14
Bivalves:	1.67	0.011	2	0.07
Isopods:	0.00	0.000	0	0.00
Amphipods:	104.33	0.659	1	0.03
Mites:	0.67	0.004	1	0.03
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	1.33	0.008	3	0.10
Odonates:	4.00	0.025	2	0.07
Caddisflies:	0.33	0.002	1	0.03
Diptera:	19.67	0.124	9	0.31
Hemiptera:	0.00	0.000	0	0.00
Beetles:	1.33	0.008	1	0.03
Chironomids:	18.67	0.118	8	0.28
Tanypodinae Tribe:	2.15	0.014	2	0.07
Chironomiinae Tribe:	2.87	0.018	4	0.14
Orthoclodiinae Tribe:	13.64	0.086	2	0.07
Collector-Filterers:	2.03	0.013	3	0.10
Collector-Gatherers:	137.33	0.867	10	0.34
Predators:	7.87	0.050	6	0.21
Piercers:	0.33	0.002	1	0.03
Shredders:	1.44	0.009	1	0.03
Scrapers:	4.67	0.029	4	0.14
Maine Tolerance:				
Sensitive:	28.97	0.187	6	0.26
Intermediate:	121.00	0.781	15	0.65
Eurytopic:	5.00	0.032	2	0.09
Ratio of MTI Sensitive to Eurytopic	5.79	5.795	3.00	3.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-400	Waterbody: NORTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-400	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Lumbriculus	08020101002	0.00	0.67	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	0.67	0.00	--	--	--	--	Worm
Nais	08020202009	2.67	2.67	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	0.33	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	0.33	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	14.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	14.33	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	104.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	104.33	0.00	--	--	--	--	Amphipod
Orconectes	09010301008	0.33	0.33	--	CG	--	--	Crayfish
Leucorrhinia	09020306034	0.00	0.67	9	PR	24.7-I	--	Dragonfly/damselfly
<i>Leucorrhinia intacta</i>	09020306034073	0.67	0.00	--	--	--	--	Dragonfly/damselfly
Enallagma	09020309051	3.33	3.33	9	PR	26.2-I	--	Dragonfly/damselfly
Maccaffertium	09020402015	0.33	0.33	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	0.33	0.33	1	CG	--	--	Mayfly
Caenis	09020412040	0.67	0.67	7	CG	22.1-I	--	Mayfly
Oxyethira	09020607028	0.33	0.33	3	P	22-S	--	Caddisfly
Probezzia	09021010041	1.00	1.00	6	PR	28.6-I	--	Fly: Biting Midge
Chironomidae	09021011	1.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	1.00	1.79	8	PR	23.6-I	T	Fly: Midge
<i>Ablabesmyia mallochi</i>	09021011001004	0.67	0.00	--	--	--	T	Fly: Midge
Thienemannimyia	09021011020	0.00	0.36	3	PR	--	T	Fly: Midge
<i>Thienemannimyia group</i>	09021011020041	0.33	0.00	--	--	--	T	Fly: Midge
Orthocladius	09021011050	1.67	1.79	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	11.00	11.85	8	CG	22-S	--	Fly: Midge
Cladotanytarsus	09021011068	0.33	0.36	7	CG	22.2-I	Y	Fly: Midge
Tanytarsus	09021011076	0.33	0.36	6	CF	25.7-I	Y	Fly: Midge
Cryptochironomus	09021011082	0.00	0.72	8	PR	31.3-I	C	Fly: Midge
<i>Cryptochironomus fulvus</i>	09021011082144	0.67	0.00	--	--	--	C	Fly: Midge
Polypedilum	09021011102	0.67	1.44	6	SH	24.2-I	C	Fly: Midge
<i>Polypedilum illinoense</i>	09021011102204	0.67	0.00	--	--	--	--	Fly: Midge
Dineutus	09021104032	1.33	1.33	2	--	23.2-I	--	Beetle
Hydrachnidia	09030101	0.67	0.67	--	--	--	--	Mite
Amnicola	10010104013	0.33	0.33	--	SC	18.7-S	--	Snail
Fossaria	10010201021	2.33	2.33	--	--	56.1-E	--	Snail

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-400	Waterbody: NORTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-400	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Gyraulus	10010203029	3.33	3.33	--	SC	37.2-I	--	Snail
Helisoma	10010203030	0.00	0.67	--	SC	42.8-I	--	Snail
<i>Helisoma anceps</i>	10010203030058	0.67	0.00	--	--	--	--	Snail
Musculium	10020201001	0.33	0.33	--	CF	24.8-I	--	Clam
Pisidium	10020201002	1.33	1.33	--	CF	--	--	Clam

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-402	Trip ID: 2023-402	River Basin:
Waterbody: NORTH TWIN LAKE (K2)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-402	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination:	Best Professional Judgement	
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.12	Class C: 0.11	Class A, B, or C	1.00
Class B: 0.77	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.89	Class A	0.12
Class C or Non-Attainment	0.11	Class B or C or Non-Attainment	0.88

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	2.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.188	≥ 0.140
Shannon-Wiener Diversity Index	3.368	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.764	≥ 0.131
Abundance of Sensitive Taxa	44.667	≥ 3.424
Richness of Sensitive Taxa	8.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	26.791	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	1.718	≥ 0.334

Other Variables

Total Mean Abundance	152
Generic Richness:	32
Hilsenhoff Biotic Index:	7.40

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	31.29
2	<i>Psectrocladius</i>	18.60
3	<i>Nais</i>	15.97

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Stylaria lacustris</i>	5.91
5	<i>Enchytraeidae</i>	4.38

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 9:09:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.72	mg/l	
In-situ	pH	7.03		
In-situ	Specific Conductance	25	us/cm	
In-situ	Temperature	21.59	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics		
<u>Human Disturbance</u> Total Score: Hydrologic Modifications: Vegetative Modifications: Chemical Pollutants: Watershed Characterization and Non-point Sources:	<u>Landscape-level Cowardin Classification</u> System: Subsystem: Class 1: Subclass 1: Class 2: Subclass 2: Class 3: Subclass 3:	<u>Hydrogeomorphic Setting</u> Landscape Position: Lotic Gradient: Flow Path: Land Form: Land Form Type: Waterbody Type: Waterbody Subtype:
Comments: Dominant Plant Species: Additional Plant Community Observations: Habitat Classification: OPEN WATER STANDING Substrate Classification: BOULDER SUBSTRATE RUBBLE/COBBLE SUBSTRATE SAND SUBSTRATE SILT/MUCK SUBSTRATE Average Depth: Visible Flow: No Rain In Previous 24 Hours: No Sample Comments:		

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-402	Waterbody: NORTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-402	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	4.33	0.028	6	0.19
EPT Taxa:	3.67	0.024	5	0.16
Insects:	55.33	0.363	22	0.69
Non-Insects:	97.00	0.637	10	0.31
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	46.33	0.304	5	0.16
Snails:	1.33	0.009	2	0.06
Bivalves:	1.33	0.009	1	0.03
Isopods:	0.00	0.000	0	0.00
Amphipods:	47.67	0.313	1	0.03
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	2.33	0.015	3	0.09
Odonates:	0.67	0.004	1	0.03
Caddisflies:	1.33	0.009	2	0.06
Diptera:	51.00	0.335	16	0.50
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	49.33	0.324	13	0.41
Tanypodinae Tribe:	3.00	0.020	3	0.09
Chironomiinae Tribe:	17.00	0.112	8	0.25
Orthoclodiinae Tribe:	29.33	0.193	2	0.06
Collector-Filterers:	6.00	0.039	2	0.06
Collector-Gatherers:	116.33	0.764	11	0.34
Predators:	6.33	0.042	6	0.19
Piercers:	1.00	0.007	1	0.03
Shredders:	6.00	0.039	1	0.03
Scrapers:	2.00	0.013	4	0.13
Maine Tolerance:				
Sensitive:	44.67	0.326	8	0.36
Intermediate:	66.33	0.484	11	0.50
Eurytopic:	26.00	0.190	3	0.14
Ratio of MTI Sensitive to Eurytopic	1.72	1.718	2.67	2.67

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-402	Waterbody: NORTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-402	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Nematoda	05	0.33	0.33	--	--	--	--	Nematode
Oligochaeta	0802	1.00	1.00	--	--	--	--	Oligochaete
Tubificida	080202	1.67	1.67	--	--	--	--	Worm
Enchytraeidae	08020201	6.67	6.67	--	--	--	--	Worm
Nais	08020202009	24.33	24.33	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	2.67	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	2.67	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	9.00	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	9.00	0.00	--	--	--	--	Worm
Vejdovskyella	08020202015	0.00	1.00	--	--	13.7-S	--	Worm
<i>Vejdovskyella comata</i>	08020202015001	1.00	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	47.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	47.67	0.00	--	--	--	--	Amphipod
Enallagma	09020309051	0.67	0.67	9	PR	26.2-I	--	Dragonfly/damselfly
Centroptilum	09020401003	1.33	1.33	2	CG	--	--	Mayfly
Maccaffertium	09020402015	0.33	0.33	4	SC	--	--	Mayfly
Caenis	09020412040	0.67	0.67	7	CG	22.1-I	--	Mayfly
Oxyethira	09020607028	1.00	1.00	3	P	22-S	--	Caddisfly
Psilotreta	09020614068	0.33	0.33	0	SC	--	--	Caddisfly
Culicidae	09021008	0.33	0.33	--	--	--	--	Fly: Mosquito
Probezzia	09021010041	1.00	1.00	6	PR	28.6-I	--	Fly: Biting Midge
Ceratopogon	09021010046	0.33	0.33	--	--	71.5-E	--	Fly: Biting Midge
Ablabesmyia	09021011001	0.67	0.67	8	PR	23.6-I	T	Fly: Midge
Labrundinia	09021011008	1.00	1.00	7	PR	18.1-S	T	Fly: Midge
Thienemannimyia	09021011020	0.00	1.33	3	PR	--	T	Fly: Midge
<i>Thienemannimyia group</i>	09021011020041	1.33	0.00	--	--	--	T	Fly: Midge
Orthocladius	09021011050	1.00	1.00	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	28.33	28.33	8	CG	22-S	--	Fly: Midge
Cladotanytarsus	09021011068	2.00	2.00	7	CG	22.2-I	Y	Fly: Midge
Tanytarsus	09021011076	4.67	4.67	6	CF	25.7-I	Y	Fly: Midge
Pseudochironomus	09021011078	1.33	1.33	5	CG	47.7-E	S	Fly: Midge
Cryptochironomus	09021011082	0.00	1.67	8	PR	31.3-I	C	Fly: Midge
<i>Cryptochironomus fulvus</i>	09021011082144	1.67	0.00	--	--	--	C	Fly: Midge
Nilothauma	09021011095	0.67	0.67	2	--	11-S	C	Fly: Midge
Paralauterborniella	09021011099	0.00	0.33	8	CG	--	C	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-402	Waterbody: NORTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-402	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
<i>Paralauterborniella nigrohalteralis</i>	09021011099175	0.33	0.00	--	--	--	C	Fly: Midge	
Polypedilum	090210111102	1.33	6.00	6	SH	24.2-I	C	Fly: Midge	
<i>Polypedilum illinoense</i>	09021011102204	4.67	0.00	--	--	--	--	Fly: Midge	
Stenochironomus	090210111105	0.33	0.33	5	CG	--	C	Fly: Midge	
Valvata	10010101001	0.67	0.67	--	SC	33.4-I	--	Snail	
Helisoma	10010203030	0.67	0.67	--	SC	42.8-I	--	Snail	
Pisidium	10020201002	1.33	1.33	--	CF	--	--	Clam	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-404	Trip ID: 2023-404	River Basin:
Waterbody: PEMADUMCOOK LAKE (K1)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-404	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	A	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.63	Class C: 0.01	Class A, B, or C	1.00
Class B: 0.36	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.99	Class A	0.63
Class C or Non-Attainment	0.01	Class B or C or Non-Attainment	0.37

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	1.667	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.267	≥ 0.140
Shannon-Wiener Diversity Index	3.589	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.678	≥ 0.131
Abundance of Sensitive Taxa	72.339	≥ 3.424
Richness of Sensitive Taxa	10.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	24.396	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	3.121	≥ 0.334

Other Variables

Total Mean Abundance	122
Generic Richness:	30
Hilsenhoff Biotic Index:	6.56

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Stylaria lacustris</i>	26.58
2	<i>Psectrocladius</i>	13.97
3	<i>Nais</i>	10.41

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Hyalella azteca</i>	8.49
4	<i>Paratanytarsus</i>	8.49
5	<i>Oxyethira</i>	6.30

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 8:38:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.7	mg/l	
In-situ	pH	6.88		
In-situ	Specific Conductance	26	us/cm	
In-situ	Temperature	19.76	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	

Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SAND SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments: SUBSTRATE ALSO HAS 5% SILT

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-404	Waterbody: PEMADUMCOOK LAKE (K1)	Town: T01 R09 Wels
Log Number: KQ-2023-404	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	12.67	0.104	8	0.27
EPT Taxa:	12.67	0.104	8	0.27
Insects:	52.67	0.433	19	0.63
Non-Insects:	69.00	0.567	11	0.37
Leeches:	0.33	0.003	1	0.03
Oligochaetes:	54.33	0.447	7	0.23
Snails:	3.00	0.025	1	0.03
Bivalves:	1.00	0.008	1	0.03
Isopods:	0.00	0.000	0	0.00
Amphipods:	10.33	0.085	1	0.03
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	1.67	0.014	4	0.13
Odonates:	0.00	0.000	0	0.00
Caddisflies:	11.00	0.090	4	0.13
Diptera:	39.67	0.326	10	0.33
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.33	0.003	1	0.03
Chironomids:	39.33	0.323	9	0.30
Tanypodinae Tribe:	0.00	0.000	0	0.00
Chironomiinae Tribe:	18.99	0.156	6	0.20
Orthoclodiinae Tribe:	20.01	0.164	2	0.07
Collector-Filterers:	4.05	0.033	2	0.07
Collector-Gatherers:	82.43	0.678	13	0.43
Predators:	1.67	0.014	3	0.10
Piercers:	7.67	0.063	1	0.03
Shredders:	1.67	0.014	2	0.07
Scrapers:	4.33	0.036	3	0.10
Maine Tolerance:				
Sensitive:	72.34	0.625	10	0.48
Intermediate:	20.14	0.174	9	0.43
Eurytopic:	23.18	0.200	2	0.10
Ratio of MTI Sensitive to Eurytopic	3.12	3.121	5.00	5.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-404	Waterbody: PEMADUMCOOK LAKE (K1)	Town: T01 R09 Wels
Log Number: KQ-2023-404	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Oligochaeta	0802	0.33	0.33	--	--	--	--	Oligochaete
Lumbriculus	08020101002	0.00	0.33	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	0.33	0.00	--	--	--	--	Worm
Enchytraeidae	08020201	0.67	0.67	--	--	--	--	Worm
Nais	08020202009	12.67	12.67	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	7.00	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	7.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	32.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	32.33	0.00	--	--	--	--	Worm
Vejdovskyella	08020202015	0.00	0.67	--	--	13.7-S	--	Worm
<i>Vejdovskyella comata</i>	08020202015001	0.67	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	0.00	0.33	--	--	3.8-S	--	Tubificid Worm
<i>Aulodrilus pluriseta</i>	08020202018004	0.33	0.00	--	--	--	--	Tubificid Worm
Erpobdella	08030203002	0.00	0.33	--	--	36.4-I	--	Leech
<i>Erpobdella punctata</i>	08030203002001	0.33	0.00	--	--	--	--	Leech
Hyaella	09010203006	0.00	10.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	10.33	0.00	--	--	--	--	Amphipod
Plauditus	09020401012	0.33	0.33	--	CG	--	--	Mayfly
Maccaffertium	09020402015	0.33	0.33	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	0.33	0.33	1	CG	--	--	Mayfly
Caenis	09020412040	0.67	0.67	7	CG	22.1-I	--	Mayfly
Oxyethira	09020607028	7.67	7.67	3	P	22-S	--	Caddisfly
Molanna	09020615069	1.00	1.00	6	SC	--	--	Caddisfly
Nectopsyche	09020618074	1.33	1.33	3	SH	--	--	Caddisfly
Oecetis	09020618078	1.00	1.00	8	PR	16.3-S	--	Caddisfly
Probezzia	09021010041	0.33	0.33	6	PR	28.6-I	--	Fly: Biting Midge
Chironomidae	09021011	0.67	0.00	--	--	--	--	Fly: Midge
Potthastia	09021011026	0.00	0.34	2	CG	--	D	Fly: Midge
<i>Potthastia longimana</i>	09021011026046	0.33	0.00	--	--	--	D	Fly: Midge
Orthocladius	09021011050	2.67	2.71	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	17.00	17.29	8	CG	22-S	--	Fly: Midge
Cladotanytarsus	09021011068	1.00	1.02	7	CG	22.2-I	Y	Fly: Midge
Paratanytarsus	09021011071	10.33	10.51	6	--	43-E	Y	Fly: Midge
Tanytarsus	09021011076	3.00	3.05	6	CF	25.7-I	Y	Fly: Midge
Dicrotendipes	09021011085	3.67	3.73	8	CG	28.8-I	C	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-404	Waterbody: PEMADUMCOOK LAKE (K1)	Town: T01 R09 Wels
Log Number: KQ-2023-404	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Polypedilum	09021011102	0.33	0.34	6	SH	24.2-I	C	Fly: Midge
Stictochironomus	09021011106	0.00	0.34	9	CG	--	C	Fly: Midge
<i>Stictochironomus devinctus</i>	09021011106197	0.33	0.00	--	--	--	C	Fly: Midge
Gyrinus	09021104033	0.33	0.33	2	PR	11.9-S	--	Beetle
Amnicola	10010104013	3.00	3.00	--	SC	18.7-S	--	Snail
Pisidium	10020201002	1.00	1.00	--	CF	--	--	Clam

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-406	Trip ID: 2023-406	River Basin:
Waterbody: PEMADUMCOOK LAKE (K2)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-406	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	A	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.62	Class C: 0.02	Class A, B, or C	1.00
Class B: 0.36	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.98	Class A	0.62
Class C or Non-Attainment	0.02	Class B or C or Non-Attainment	0.38

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	10.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.250	≥ 0.140
Shannon-Wiener Diversity Index	3.844	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.660	≥ 0.131
Abundance of Sensitive Taxa	44.412	≥ 3.424
Richness of Sensitive Taxa	9.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	25.213	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	2.335	≥ 0.334

Other Variables

Total Mean Abundance	182
Generic Richness:	48
Hilsenhoff Biotic Index:	7.08

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	33.64
2	<i>Stylaria lacustris</i>	10.05
3	<i>Nais</i>	9.87

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Oxyethira</i>	6.95
5	<i>Tanytarsus</i>	4.20

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 10:43:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.33	mg/l	
In-situ	pH	6.79		
In-situ	Specific Conductance	21	us/cm	
In-situ	Temperature	21.83	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

CLAY SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SILT/MUCK SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments: SUBSTRATE ALSO HAS 5% DETRITUS

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-406	Waterbody: PEMADUMCOOK LAKE (K2)	Town: T01 R09 Wels
Log Number: KQ-2023-406	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	33.67	0.185	12	0.25
EPT Taxa:	26.67	0.146	10	0.21
Insects:	65.33	0.358	36	0.75
Non-Insects:	117.00	0.642	12	0.25
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	48.00	0.263	8	0.17
Snails:	7.00	0.038	2	0.04
Bivalves:	0.67	0.004	1	0.02
Isopods:	0.00	0.000	0	0.00
Amphipods:	61.33	0.336	1	0.02
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	10.00	0.055	5	0.10
Odonates:	7.00	0.038	2	0.04
Caddisflies:	16.67	0.091	5	0.10
Diptera:	31.00	0.170	22	0.46
Hemiptera:	0.33	0.002	1	0.02
Beetles:	0.33	0.002	1	0.02
Chironomids:	30.67	0.168	21	0.44
Tanypodinae Tribe:	3.79	0.021	3	0.06
Chironomiinae Tribe:	21.71	0.119	13	0.27
Orthoclodiinae Tribe:	4.82	0.026	4	0.08
Collector-Filterers:	8.93	0.049	3	0.06
Collector-Gatherers:	120.42	0.660	19	0.40
Predators:	15.85	0.087	10	0.21
Piercers:	12.67	0.069	1	0.02
Shredders:	2.04	0.011	2	0.04
Scrapers:	7.67	0.042	4	0.08
Maine Tolerance:				
Sensitive:	44.41	0.268	9	0.33
Intermediate:	102.34	0.617	14	0.52
Eurytopic:	19.02	0.115	4	0.15
Ratio of MTI Sensitive to Eurytopic	2.33	2.335	2.25	2.25

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-406

Waterbody: PEMADUMCOOK LAKE (K2)

Town: T01 R09 Wels

Log Number: KQ-2023-406

Subsample Factor: X1

Replicates: 3

Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Oligochaeta	0802	1.67	1.67	--	--	--	--	Oligochaete
Stylodrilus	08020101004	0.00	0.67	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	0.67	0.00	--	--	--	--	Worm
Pristina	08020202004	0.67	0.67	--	--	--	--	Worm
Nais	08020202009	18.00	18.00	--	CG	43-E	--	Worm
Ripistes	08020202011	0.00	0.33	--	--	--	--	Worm
<i>Ripistes parasita</i>	08020202011001	0.33	0.00	--	--	--	--	Worm
Slavina	08020202012	0.00	4.67	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	4.67	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	18.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	18.33	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	0.00	3.33	--	--	3.8-S	--	Tubificid Worm
<i>Aulodrilus americanus</i>	08020202018001	0.67	0.00	--	--	--	--	Tubificid Worm
<i>Aulodrilus pigueti</i>	08020202018003	2.67	0.00	--	--	--	--	Tubificid Worm
Limnodrilus	08020202022	0.33	0.33	--	CG	83.9-E	--	Tubificid Worm
Hyaella	09010203006	0.00	61.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	61.33	0.00	--	--	--	--	Amphipod
Gomphus	09020302012	0.33	0.33	5	PR	--	--	Dragonfly/damselfly
Enallagma	09020309051	6.67	6.67	9	PR	26.2-I	--	Dragonfly/damselfly
Centropilum	09020401003	0.67	0.67	2	CG	--	--	Mayfly
Maccaffertium	09020402015	0.33	0.33	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	1.33	1.33	1	CG	--	--	Mayfly
Hexagenia	09020407028	1.00	1.00	6	CG	--	--	Mayfly
Caenis	09020412040	6.67	6.67	7	CG	22.1-I	--	Mayfly
Corixidae	09020501	0.33	0.33	--	--	--	--	True Bug
Cheumatopsyche	09020604015	0.33	0.33	5	CF	--	--	Caddisfly
Oxyethira	09020607028	12.67	12.67	3	P	22-S	--	Caddisfly
Lepidostoma	09020611064	0.67	0.67	1	SH	--	--	Caddisfly
Molanna	09020615069	0.33	0.33	6	SC	--	--	Caddisfly
Oecetis	09020618078	2.67	2.67	8	PR	16.3-S	--	Caddisfly
Palpomyia	09021010044	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	1.00	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	1.67	1.72	8	PR	23.6-I	T	Fly: Midge
Clinotanypus	09021011002	0.00	1.72	8	PR	30.3-I	T	Fly: Midge
<i>Clinotanypus pinguis</i>	09021011002008	1.67	0.00	--	--	--	--	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-406	Waterbody: PEMADUMCOOK LAKE (K2)	Town: T01 R09 Wels
Log Number: KQ-2023-406	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Labrundinia	09021011008	0.33	0.34	7	PR	18.1-S	T	Fly: Midge	
Heterotanytarsus	09021011043	2.33	2.41	--	--	--	--	Fly: Midge	
Heterotrissocladius	09021011044	0.33	0.34	0	CG	--	--	Fly: Midge	
Orthocladius	09021011050	0.67	0.69	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	1.33	1.38	8	CG	22-S	--	Fly: Midge	
Cladotanytarsus	09021011068	1.33	1.38	7	CG	22.2-I	Y	Fly: Midge	
Paratanytarsus	09021011071	0.33	0.34	6	--	43-E	Y	Fly: Midge	
Stempellina	09021011073	1.00	1.03	2	CG	--	Y	Fly: Midge	
Tanytarsus	09021011076	7.67	7.93	6	CF	25.7-I	Y	Fly: Midge	
Zavrelia	09021011077	1.33	1.38	--	CG	--	Y	Fly: Midge	
Pseudochironomus	09021011078	0.33	0.34	5	CG	47.7-E	S	Fly: Midge	
Chironomus	09021011080	4.00	4.13	10	CG	27.4-I	C	Fly: Midge	
Cryptochironomus	09021011082	0.00	1.38	8	PR	31.3-I	C	Fly: Midge	
<i>Cryptochironomus fulvus</i>	09021011082144	1.33	0.00	--	--	--	C	Fly: Midge	
Dicrotendipes	09021011085	0.67	0.69	8	CG	28.8-I	C	Fly: Midge	
Parachironomus	09021011097	0.33	0.34	10	PR	28.6-I	C	Fly: Midge	
Paralauterborniella	09021011099	0.00	0.34	8	CG	--	C	Fly: Midge	
<i>Paralauterborniella nigrohalteralis</i>	09021011099175	0.33	0.00	--	--	--	C	Fly: Midge	
Polypedilum	09021011102	1.33	1.38	6	SH	24.2-I	C	Fly: Midge	
Stictochironomus	09021011106	0.00	1.03	9	CG	--	C	Fly: Midge	
<i>Stictochironomus devinctus</i>	09021011106197	1.00	0.00	--	--	--	C	Fly: Midge	
Lasiodiamesa	09021011139	0.33	0.34	--	--	--	P	Fly: Midge	
Gyrinus	09021104033	0.33	0.33	2	PR	11.9-S	--	Beetle	
Valvata	10010101001	6.67	6.67	--	SC	33.4-I	--	Snail	
Gyraulus	10010203029	0.33	0.33	--	SC	37.2-I	--	Snail	
Pisidium	10020201002	0.67	0.67	--	CF	--	--	Clam	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-408	Trip ID: 2023-408	River Basin:
Waterbody: SOUTH TWIN LAKE (K1)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-408	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	A	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.83	Class C: 0.00	Class A, B, or C	1.00
Class B: 0.17	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	1.00	Class A	0.83
Class C or Non-Attainment	0.00	Class B or C or Non-Attainment	0.17

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	3.667	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.244	≥ 0.140
Shannon-Wiener Diversity Index	3.708	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.680	≥ 0.131
Abundance of Sensitive Taxa	82.471	≥ 3.424
Richness of Sensitive Taxa	12.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	24.337	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	4.034	≥ 0.334

Other Variables

Total Mean Abundance	197
Generic Richness:	45
Hilsenhoff Biotic Index:	7.26

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	26.78
2	<i>Stylaria lacustris</i>	23.73
3	<i>Amnicola</i>	7.97

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Nais</i>	7.63
5	<i>Pisidium</i>	4.58

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 10:53:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.74	mg/l	
In-situ	pH	6.92		
In-situ	Specific Conductance	25	us/cm	
In-situ	Temperature	22.08	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	

Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SAND SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments: SUBSTRATE ALSO HAS 10% SILT

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-408	Waterbody: SOUTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-408	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	14.33	0.073	11	0.24
EPT Taxa:	8.67	0.044	8	0.18
Insects:	38.67	0.197	28	0.62
Non-Insects:	158.00	0.803	17	0.38
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	77.67	0.395	10	0.22
Snails:	18.00	0.092	3	0.07
Bivalves:	9.00	0.046	1	0.02
Isopods:	0.00	0.000	0	0.00
Amphipods:	52.67	0.268	1	0.02
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	3.67	0.019	4	0.09
Odonates:	5.67	0.029	3	0.07
Caddisflies:	5.00	0.025	4	0.09
Diptera:	24.33	0.124	17	0.38
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	23.00	0.117	15	0.33
Tanypodinae Tribe:	1.74	0.009	2	0.04
Chironomiinae Tribe:	10.11	0.051	8	0.18
Orthoclodiinae Tribe:	10.45	0.053	4	0.09
Collector-Filterers:	12.12	0.062	3	0.07
Collector-Gatherers:	133.75	0.680	17	0.38
Predators:	9.80	0.050	9	0.20
Piercers:	0.00	0.000	0	0.00
Shredders:	6.08	0.031	3	0.07
Scrapers:	17.02	0.087	3	0.07
Maine Tolerance:				
Sensitive:	82.47	0.479	12	0.40
Intermediate:	69.29	0.402	12	0.40
Eurytopic:	20.44	0.119	6	0.20
Ratio of MTI Sensitive to Eurytopic	4.03	4.034	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-408	Waterbody: SOUTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-408	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Nematoda	05	0.33	0.33	--	--	--	--	Nematode
Oligochaeta	0802	3.00	3.00	--	--	--	--	Oligochaete
Lumbriculus	08020101002	0.00	1.00	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	1.00	0.00	--	--	--	--	Worm
Tubificida	080202	1.33	1.33	--	--	--	--	Worm
Enchytraeidae	08020201	1.33	1.33	--	--	--	--	Worm
Naididae	08020202	1.33	0.00	--	--	--	--	Worm
Bratislavia	08020202003	1.00	1.02	--	--	--	--	Worm
Arcteonais	08020202006	0.00	1.02	--	--	--	--	Worm
<i>Arcteonais lomondi</i>	08020202006001	1.00	0.00	--	--	--	--	Worm
Nais	08020202009	15.00	15.29	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	3.06	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	3.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	47.56	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	46.67	0.00	--	--	--	--	Worm
Vejdovskyella	08020202015	0.00	2.38	--	--	13.7-S	--	Worm
<i>Vejdovskyella comata</i>	08020202015001	2.33	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	0.00	0.34	--	--	3.8-S	--	Tubificid Worm
<i>Aulodrilus pluriset</i>	08020202018004	0.33	0.00	--	--	--	--	Tubificid Worm
Limnodrilus	08020202022	0.33	0.34	--	CG	83.9-E	--	Tubificid Worm
Hyaella	09010203006	0.00	52.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	52.67	0.00	--	--	--	--	Amphipod
Orconectes	09010301008	0.33	0.33	--	CG	--	--	Crayfish
Boyeria	09020301004	0.00	0.33	2	PR	8-S	--	Dragonfly/damselfly
<i>Boyeria vinosa</i>	09020301004012	0.33	0.00	--	--	--	--	Dragonfly/damselfly
Libellulidae	09020306	0.67	0.67	--	--	--	--	Dragonfly/damselfly
Enallagma	09020309051	4.67	4.67	9	PR	26.2-I	--	Dragonfly/damselfly
Baetis	09020401001	1.67	1.67	4	CG	29.9-I	--	Mayfly
Centroptilum	09020401003	0.33	0.33	2	CG	--	--	Mayfly
Paraleptophlebia	09020406026	0.67	0.67	1	CG	--	--	Mayfly
Caenis	09020412040	1.00	1.00	7	CG	22.1-I	--	Mayfly
Chimarra	09020601003	0.33	0.33	2	CF	--	--	Caddisfly
Ptilostomis	09020608041	2.33	2.33	5	SH	--	--	Caddisfly
Triaenodes	09020618077	2.00	2.00	6	SH	19.3-S	--	Caddisfly
Oecetis	09020618078	0.33	0.33	8	PR	16.3-S	--	Caddisfly

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-408	Waterbody: SOUTH TWIN LAKE (K1)	Town: T4 Indian Purchase T
Log Number: KQ-2023-408	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Probezzia	09021010041	0.67	0.67	6	PR	28.6-I	--	Fly: Biting	Midge
Chironomidae	09021011	1.00	0.00	--	--	--	--	Fly: Midge	
Labrundinia	09021011008	0.67	0.70	7	PR	18.1-S	T	Fly: Midge	
Thienemannimyia	09021011020	1.00	1.05	3	PR	--	T	Fly: Midge	
Potthastia	09021011026	0.00	0.70	2	CG	--	D	Fly: Midge	
<i>Potthastia longimana</i>	09021011026046	0.67	0.00	--	--	--	D	Fly: Midge	
Heterotrissocladius	09021011044	0.33	0.35	0	CG	--	--	Fly: Midge	
Nanocladius	09021011049	0.33	0.35	3	CG	14.1-S	--	Fly: Midge	
Orthocladius	09021011050	4.00	4.18	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	5.33	5.58	8	CG	22-S	--	Fly: Midge	
Cladotanytarsus	09021011068	0.67	0.70	7	CG	22.2-I	Y	Fly: Midge	
Micropsectra	09021011070	1.00	1.05	7	CG	98.1-E	Y	Fly: Midge	
Paratanytarsus	09021011071	2.00	2.09	6	--	43-E	Y	Fly: Midge	
Tanytarsus	09021011076	2.67	2.79	6	CF	25.7-I	Y	Fly: Midge	
Cryptochironomus	09021011082	0.00	1.05	8	PR	31.3-I	C	Fly: Midge	
<i>Cryptochironomus fulvus</i>	09021011082144	1.00	0.00	--	--	--	C	Fly: Midge	
Parachironomus	09021011097	0.33	0.35	10	PR	28.6-I	C	Fly: Midge	
Phaenopsectra	09021011101	0.00	0.35	7	SC	44.2-E	C	Fly: Midge	
<i>Phaenopsectra obediens</i>	09021011101182	0.33	0.00	--	SC	--	C	Fly: Midge	
Polypedilum	09021011102	0.00	1.74	6	SH	24.2-I	C	Fly: Midge	
<i>Polypedilum illinoense</i>	09021011102204	1.67	0.00	--	--	--	--	Fly: Midge	
Hemerodromia	09021016057	0.67	0.67	3	PR	--	--	Fly: Aquatic	Dance
Amnicola	10010104013	15.67	15.67	--	SC	18.7-S	--	Snail	
Fossaria	10010201021	1.33	1.33	--	--	56.1-E	--	Snail	
Gyraulus	10010203029	1.00	1.00	--	SC	37.2-I	--	Snail	
Pisidium	10020201002	9.00	9.00	--	CF	--	--	Clam	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-410	Trip ID: 2023-410	River Basin:
Waterbody: SOUTH TWIN LAKE (K2)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: KQ-2023-410	Type of Sample: KICK-QUALITATIVE	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	A	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.61	Class C: 0.02	Class A, B, or C	1.00
Class B: 0.37	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.98	Class A	0.61
Class C or Non-Attainment	0.02	Class B or C or Non-Attainment	0.39

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	4.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.175	≥ 0.140
Shannon-Wiener Diversity Index	3.951	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.721	≥ 0.131
Abundance of Sensitive Taxa	84.464	≥ 3.424
Richness of Sensitive Taxa	16.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	28.698	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	1.040	≥ 0.334

Other Variables

Total Mean Abundance	399
Generic Richness:	63
Hilsenhoff Biotic Index:	7.17

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	29.99
2	<i>Nais</i>	17.46
3	<i>Stylaria lacustris</i>	10.69

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Tanytarsus</i>	5.43
5	<i>Musculium</i>	2.59

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 12:27:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.24	mg/l	
In-situ	pH	6.97		
In-situ	Specific Conductance	23	us/cm	
In-situ	Temperature	22.25	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SAND SUBSTRATE

SILT/MUCK SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments: SUBSTRATE ALSO HAS 10% CLAY

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-410	Waterbody: SOUTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-410	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	21.33	0.053	11	0.17
EPT Taxa:	15.33	0.038	10	0.16
Insects:	119.67	0.300	42	0.67
Non-Insects:	279.33	0.700	21	0.33
Leeches:	0.33	0.001	1	0.02
Oligochaetes:	128.33	0.322	11	0.17
Snails:	1.67	0.004	2	0.03
Bivalves:	16.33	0.041	2	0.03
Isopods:	0.00	0.000	0	0.00
Amphipods:	119.67	0.300	1	0.02
Mites:	6.33	0.016	1	0.02
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	4.00	0.010	6	0.10
Odonates:	6.00	0.015	1	0.02
Caddisflies:	11.33	0.028	4	0.06
Diptera:	97.67	0.245	29	0.46
Hemiptera:	0.33	0.001	1	0.02
Beetles:	0.33	0.001	1	0.02
Chironomids:	89.67	0.225	20	0.32
Tanypodinae Tribe:	6.21	0.016	3	0.05
Chironomiinae Tribe:	61.04	0.153	11	0.17
Orthoclodiinae Tribe:	21.73	0.054	5	0.08
Collector-Filterers:	38.75	0.097	3	0.05
Collector-Gatherers:	287.61	0.721	25	0.40
Predators:	33.12	0.083	18	0.29
Piercers:	7.33	0.018	1	0.02
Shredders:	7.49	0.019	2	0.03
Scrapers:	1.67	0.004	2	0.03
Maine Tolerance:				
Sensitive:	84.46	0.234	16	0.41
Intermediate:	195.80	0.542	20	0.51
Eurytopic:	81.24	0.225	3	0.08
Ratio of MTI Sensitive to Eurytopic	1.04	1.040	5.33	5.33

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-410	Waterbody: SOUTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-410	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Hydra	02010101001	5.33	5.33	--	PR	--	--	Hydroid
Nematoda	05	0.67	0.67	--	--	--	--	Nematode
Oligochaeta	0802	0.67	0.67	--	--	--	--	Oligochaete
Lumbriculus	08020101002	0.00	0.67	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	0.67	0.00	--	--	--	--	Worm
Stylodrilus	08020101004	0.00	1.00	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	1.00	0.00	--	--	--	--	Worm
Tubificida	080202	1.33	1.33	--	--	--	--	Worm
Enchytraeidae	08020201	1.00	1.00	--	--	--	--	Worm
Naididae	08020202	0.33	0.00	--	--	--	--	Worm
Bratislavia	08020202003	0.33	0.33	--	--	--	--	Worm
Arcteonais	08020202006	0.00	1.00	--	--	--	--	Worm
<i>Arcteonais lomondi</i>	08020202006001	1.00	0.00	--	--	--	--	Worm
Nais	08020202009	69.67	69.85	--	CG	43-E	--	Worm
Ripistes	08020202011	0.00	0.67	--	--	--	--	Worm
<i>Ripistes parascia</i>	08020202011001	0.67	0.00	--	--	--	--	Worm
Slavina	08020202012	0.00	3.01	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	3.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	42.78	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	42.67	0.00	--	--	--	--	Worm
Vejdovskyella	08020202015	0.00	4.68	--	--	13.7-S	--	Worm
<i>Vejdovskyella comata</i>	08020202015001	4.67	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	0.00	1.34	--	--	3.8-S	--	Tubificid Worm
<i>Aulodrilus americanus</i>	08020202018001	1.33	0.00	--	--	--	--	Tubificid Worm
Batracobdella	08030101008	0.33	0.33	--	--	--	--	Leech
Hyaella	09010203006	0.00	119.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	119.67	0.00	--	--	--	--	Amphipod
Orconectes	09010301008	0.67	0.67	--	CG	--	--	Crayfish
Enallagma	09020309051	6.00	6.00	9	PR	26.2-I	--	Dragonfly/damselfly
Baetis	09020401001	0.33	0.33	4	CG	29.9-I	--	Mayfly
Centroptilum	09020401003	0.67	0.67	2	CG	--	--	Mayfly
Choroterpes	09020406022	0.33	0.33	2	CG	--	--	Mayfly
Paraleptophlebia	09020406026	1.00	1.00	1	CG	--	--	Mayfly
Hexagenia	09020407028	0.33	0.33	6	CG	--	--	Mayfly
Caenis	09020412040	1.33	1.33	7	CG	22.1-I	--	Mayfly

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-410	Waterbody: SOUTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-410	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Notonecta	09020505015	0.33	0.33	--	PR	--	--	True Bug	
Polycentropus	09020603010	0.33	0.33	6	PR	15.4-S	--	Caddisfly	
Oxyethira	09020607028	7.33	7.33	3	P	22-S	--	Caddisfly	
Trienodes	09020618077	2.67	2.67	6	SH	19.3-S	--	Caddisfly	
Oecetis	09020618078	1.00	1.00	8	PR	16.3-S	--	Caddisfly	
Chaoborus	09021007025	0.00	0.67	8	PR	25-I	--	Fly: Phantom Midge	
<i>Chaoborus punctipennis</i>	09021007025007	0.67	0.00	--	--	--	--	Fly: Phantom Midge	
Dasyhelea	09021010036	0.67	0.67	--	CG	30.6-I	--	Fly: Biting Midge	
Culicoides	09021010037	0.33	0.33	10	PR	42.1-I	--	Fly: Biting Midge	
Proboezzia	09021010041	1.33	1.33	6	PR	28.6-I	--	Fly: Biting Midge	
Palpomyia	09021010044	0.33	0.33	6	PR	--	--	Fly: Biting Midge	
Mallochohelea	09021010047	2.00	2.00	--	PR	--	--	Fly: Biting Midge	
Chironomidae	09021011	3.00	0.00	--	--	--	--	Fly: Midge	
Ablabesmyia	09021011001	1.33	3.45	8	PR	23.6-I	T	Fly: Midge	
<i>Ablabesmyia mallochii</i>	09021011001004	2.00	0.00	--	--	--	T	Fly: Midge	
Labrundinia	09021011008	1.00	1.03	7	PR	18.1-S	T	Fly: Midge	
Thienemannimyia	09021011020	0.00	1.72	3	PR	--	T	Fly: Midge	
<i>Thienemannimyia group</i>	09021011020041	1.67	0.00	--	--	--	T	Fly: Midge	
Monodiamesa	09021011030	0.67	0.69	7	CG	--	R	Fly: Midge	
Corynoneura	09021011036	2.00	2.07	7	CG	40.1-I	--	Fly: Midge	
Heterotrissocladius	09021011044	1.33	1.38	0	CG	--	--	Fly: Midge	
Orthocladius	09021011050	9.33	9.66	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	7.67	7.93	8	CG	22-S	--	Fly: Midge	
Thienemanniella	09021011062	0.00	0.69	6	CG	24.7-I	--	Fly: Midge	
<i>Thienemanniella lobapodema</i>	09021011062114	0.67	0.00	--	--	--	--	Fly: Midge	
Cladotanytarsus	09021011068	6.67	6.90	7	CG	22.2-I	Y	Fly: Midge	
Micropsectra	09021011070	6.67	6.90	7	CG	98.1-E	Y	Fly: Midge	
Stempellina	09021011073	1.00	1.03	2	CG	--	Y	Fly: Midge	
Tanytarsus	09021011076	21.67	22.42	6	CF	25.7-I	Y	Fly: Midge	
Pseudochironomus	09021011078	4.33	4.48	5	CG	47.7-E	S	Fly: Midge	
Cryptochironomus	09021011082	0.00	3.10	8	PR	31.3-I	C	Fly: Midge	
<i>Cryptochironomus fulvus</i>	09021011082144	3.00	0.00	--	--	--	C	Fly: Midge	
Dicrotendipes	09021011085	6.33	6.55	8	CG	28.8-I	C	Fly: Midge	
Parachironomus	09021011097	3.67	3.79	10	PR	28.6-I	C	Fly: Midge	
Paratendipes	09021011100	0.00	0.69	8	CG	20.8-S	C	Fly: Midge	
<i>Paratendipes albimanus group</i>	09021011100176	0.67	0.00	--	--	--	C	Fly: Midge	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-410	Waterbody: SOUTH TWIN LAKE (K2)	Town: T4 Indian Purchase T
Log Number: KQ-2023-410	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Polypedilum	09021011102	2.00	4.83	6	SH	24.2-I	C	Fly: Midge	
<i>Polypedilum flavum</i>	09021011102182	0.33	0.00	--	--	--	C	Fly: Midge	
<i>Polypedilum halterale group</i>	09021011102193	0.33	0.00	--	--	--	C	Fly: Midge	
<i>Polypedilum illinoense</i>	09021011102204	2.00	0.00	--	--	--	--	Fly: Midge	
Xenochironomus	09021011108	0.00	0.34	0	PR	1.5-S	C	Fly: Midge	
<i>Xenochironomus xenolabis</i>	09021011108200	0.33	0.00	--	--	--	C	Fly: Midge	
Chrysops	09021014052	0.33	0.33	6	CG	20.7-S	--	Fly: Horse And Deer	
Hemerodromia	09021016057	1.67	1.67	3	PR	--	--	Fly: Aquatic Dance	
Muscidae	09021022	0.67	0.67	6	--	--	--	Fly: Aquatic Muscid	
Gyrinus	09021104033	0.33	0.33	2	PR	11.9-S	--	Beetle	
Hydrachnidia	09030101	6.33	6.33	--	--	--	--	Mite	
Amnicola	10010104013	1.00	1.00	--	SC	18.7-S	--	Snail	
Gyraulus	10010203029	0.67	0.67	--	SC	37.2-I	--	Snail	
Musculium	10020201001	10.33	10.33	--	CF	24.8-I	--	Clam	
Pisidium	10020201002	6.00	6.00	--	CF	--	--	Clam	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-397	Trip ID: 2023-397	River Basin:
Waterbody: AMBAJEJUS LAKE (S1)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-397	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.12	Class C: 0.05	Class A, B, or C	1.00
Class B: 0.84	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.95	Class A	0.12
Class C or Non-Attainment	0.05	Class B or C or Non-Attainment	0.88

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	14.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.273	≥ 0.140
Shannon-Wiener Diversity Index	3.315	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.693	≥ 0.131
Abundance of Sensitive Taxa	114.667	≥ 3.424
Richness of Sensitive Taxa	8.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	31.435	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	1.009	≥ 0.334

Other Variables

Total Mean Abundance	347
Generic Richness:	44
Hilsenhoff Biotic Index:	5.86

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Stylaria lacustris</i>	29.85
2	<i>Nais</i>	28.60
3	<i>Tanytarsus</i>	7.68
4	<i>Problezzia</i>	7.20

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5 *Hyalella azteca*

4.13

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 1:42:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.69	mg/l	
In-situ	pH	6.97		
In-situ	Specific Conductance	26	us/cm	
In-situ	Temperature	21.23	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	

Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SAND SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-397	Waterbody: AMBAJEJUS LAKE (S1)	Town: T01 R09 Wels
Log Number: SB-2023-397	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	16.67	0.048	12	0.27
EPT Taxa:	17.67	0.051	13	0.30
Insects:	92.33	0.266	28	0.64
Non-Insects:	255.00	0.734	16	0.36
Leeches:	1.33	0.004	1	0.02
Oligochaetes:	217.67	0.627	7	0.16
Snails:	21.33	0.061	6	0.14
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	14.33	0.041	1	0.02
Mites:	0.00	0.000	0	0.00
Stoneflies:	1.33	0.004	2	0.05
Mayflies:	14.00	0.040	7	0.16
Odonates:	0.33	0.001	1	0.02
Caddisflies:	2.33	0.007	4	0.09
Diptera:	74.33	0.214	14	0.32
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	45.33	0.131	12	0.27
Tanypodinae Tribe:	3.33	0.010	3	0.07
Chironomiinae Tribe:	37.67	0.108	6	0.14
Orthoclodiinae Tribe:	4.33	0.012	3	0.07
Collector-Filterers:	27.00	0.078	2	0.05
Collector-Gatherers:	240.67	0.693	15	0.34
Predators:	34.00	0.098	8	0.18
Piercers:	0.00	0.000	0	0.00
Shredders:	0.67	0.002	2	0.05
Scrapers:	22.00	0.063	8	0.18
Maine Tolerance:				
Sensitive:	114.67	0.366	8	0.31
Intermediate:	85.00	0.271	14	0.54
Eurytopic:	113.67	0.363	4	0.15
Ratio of MTI Sensitive to Eurytopic	1.01	1.009	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-397	Waterbody: AMBAJEJUS LAKE (S1)	Town: T01 R09 Wels
Log Number: SB-2023-397	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Nematoda	05	0.33	0.33	--	--	--	--	Nematode
Lumbriculus	08020101002	0.00	1.00	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	1.00	0.00	--	--	--	--	Worm
Tubificida	080202	4.33	4.33	--	--	--	--	Worm
Enchytraeidae	08020201	1.67	1.67	--	--	--	--	Worm
Nais	08020202009	99.33	99.33	--	CG	43-E	--	Worm
Ripistes	08020202011	0.00	1.00	--	--	--	--	Worm
<i>Ripistes parascita</i>	08020202011001	1.00	0.00	--	--	--	--	Worm
Slavina	08020202012	0.00	6.00	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	6.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	103.67	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	103.67	0.00	--	--	--	--	Worm
Aulodrilus	08020202018	0.67	0.67	--	--	3.8-S	--	Tubificid Worm
Erpobdella	08030203002	1.33	1.33	--	--	36.4-I	--	Leech
Hyaella	09010203006	0.00	14.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	14.33	0.00	--	--	--	--	Amphipod
Sweltsa	09020208040	1.00	1.00	--	PR	--	--	Stonefly
Acroneuria	09020209042	0.33	0.33	0	PR	--	--	Stonefly
Enallagma	09020309051	0.33	0.33	9	PR	26.2-I	--	Dragonfly/damselfly
Centropetium	09020401003	3.67	3.67	2	CG	--	--	Mayfly
Acentrella	09020401008	0.33	0.33	3	CG	--	--	Mayfly
Maccaffertium	09020402015	4.33	4.33	4	SC	--	--	Mayfly
Stenonema	09020402016	0.00	2.00	4	SC	--	--	Mayfly
<i>Stenonema femoratum</i>	09020402016001	2.00	0.00	4	SC	--	--	Mayfly
Choroterpes	09020406022	1.33	1.33	2	CG	--	--	Mayfly
Paraleptophlebia	09020406026	2.00	2.00	1	CG	--	--	Mayfly
Eurylophella	09020410036	0.00	0.33	3	CG	23.2-I	--	Mayfly
<i>Eurylophella aestiva</i>	09020410036112	0.33	0.00	--	--	--	--	Mayfly
Dolophilodes	09020601001	0.33	0.33	0	CF	--	--	Caddisfly
Psilotreta	09020614068	0.33	0.33	0	SC	--	--	Caddisfly
Molanna	09020615069	1.33	1.33	6	SC	--	--	Caddisfly
Triaenodes	09020618077	0.33	0.33	6	SH	19.3-S	--	Caddisfly
Proboezzia	09021010041	25.00	25.00	6	PR	28.6-I	--	Fly: Biting Midge
Palpomyia	09021010044	4.00	4.00	6	PR	--	--	Fly: Biting Midge
Ablabesmyia	09021011001	0.33	0.33	8	PR	23.6-I	T	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-397	Waterbody: AMBAJEJUS LAKE (S1)	Town: T01 R09 Wels
Log Number: SB-2023-397	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Labrundinia	09021011008	0.33	0.33	7	PR	18.1-S	T	Fly: Midge	
Thienemannimyia	09021011020	0.00	2.67	3	PR	--	T	Fly: Midge	
<i>Thienemannimyia group</i>	09021011020041	2.67	0.00	--	--	--	T	Fly: Midge	
Corynoneura	09021011036	1.00	1.00	7	CG	40.1-I	--	Fly: Midge	
Orthocladius	09021011050	1.33	1.33	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	2.00	2.00	8	CG	22-S	--	Fly: Midge	
Micropsectra	09021011070	9.00	9.00	7	CG	98.1-E	Y	Fly: Midge	
Tanytarsus	09021011076	26.67	26.67	6	CF	25.7-I	Y	Fly: Midge	
Pseudochironomus	09021011078	0.67	0.67	5	CG	47.7-E	S	Fly: Midge	
Dicrotendipes	09021011085	0.67	0.67	8	CG	28.8-I	C	Fly: Midge	
Nilothauma	09021011095	0.33	0.33	2	--	11-S	C	Fly: Midge	
Polypedilum	09021011102	0.33	0.33	6	SH	24.2-I	C	Fly: Midge	
Valvata	10010101001	6.33	6.33	--	SC	33.4-I	--	Snail	
Fossaria	10010201021	4.67	4.67	--	--	56.1-E	--	Snail	
Physidae	10010202	0.33	0.33	--	SC	--	--	Snail	
Gyraulus	10010203029	6.00	6.00	--	SC	37.2-I	--	Snail	
Helisoma	10010203030	1.33	1.33	--	SC	42.8-I	--	Snail	
Menetus	10010203031	0.00	2.67	--	--	--	--	Snail	
<i>Menetus dilatatus</i>	10010203031059	2.67	0.00	--	--	--	--	Snail	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-399	Trip ID: 2023-399	River Basin:
Waterbody: AMBAJEJUS LAKE (S2)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-399	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.58	Class C: 0.04	Class A, B, or C	1.00
Class B: 0.38	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.96	Class A	0.58
Class C or Non-Attainment	0.04	Class B or C or Non-Attainment	0.42

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	23.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.250	≥ 0.140
Shannon-Wiener Diversity Index	3.989	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.322	≥ 0.131
Abundance of Sensitive Taxa	25.121	≥ 3.424
Richness of Sensitive Taxa	8.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	30.409	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	1.570	≥ 0.334

Other Variables

Total Mean Abundance	96
Generic Richness:	32
Hilsenhoff Biotic Index:	4.70

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Stylaria lacustris</i>	14.63
2	<i>Fossaria</i>	11.85
2	<i>Maccaffertium</i>	11.85
3	<i>Gyraulus</i>	10.10

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Stenonema femoratum</i>	9.76
5	<i>Slavina appendiculata</i>	7.67

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 3:05:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.21	mg/l	
In-situ	pH	7.03		
In-situ	Specific Conductance	27	us/cm	
In-situ	Temperature	23.19	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-399	Waterbody: AMBAJEJUS LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-399	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	25.00	0.261	8	0.25
EPT Taxa:	26.00	0.272	9	0.28
Insects:	32.00	0.334	19	0.59
Non-Insects:	63.67	0.666	13	0.41
Leeches:	0.67	0.007	1	0.03
Oligochaetes:	28.00	0.293	5	0.16
Snails:	27.67	0.289	5	0.16
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	5.33	0.056	1	0.03
Mites:	2.00	0.021	1	0.03
Stoneflies:	1.00	0.010	1	0.03
Mayflies:	23.33	0.244	5	0.16
Odonates:	0.00	0.000	0	0.00
Caddisflies:	1.67	0.017	3	0.09
Diptera:	5.67	0.059	9	0.28
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.33	0.003	1	0.03
Chironomids:	4.00	0.042	7	0.22
Tanypodinae Tribe:	0.00	0.000	0	0.00
Chironomiinae Tribe:	1.82	0.019	3	0.09
Orthoclodiinae Tribe:	2.18	0.023	4	0.13
Collector-Filterers:	1.09	0.011	1	0.03
Collector-Gatherers:	30.85	0.322	12	0.38
Predators:	2.03	0.021	3	0.09
Piercers:	1.33	0.014	2	0.06
Shredders:	0.36	0.004	1	0.03
Scrapers:	37.00	0.387	6	0.19
Maine Tolerance:				
Sensitive:	25.12	0.364	8	0.35
Intermediate:	27.88	0.404	13	0.57
Eurytopic:	16.00	0.232	2	0.09
Ratio of MTI Sensitive to Eurytopic	1.57	1.570	4.00	4.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-399	Waterbody: AMBAJEJUS LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-399	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Lumbriculus	08020101002	0.00	1.67	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	1.67	0.00	--	--	--	--	Worm
Stylodrilus	08020101004	0.00	0.33	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	0.33	0.00	--	--	--	--	Worm
Nais	08020202009	4.67	4.67	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	7.33	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	7.33	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	14.00	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	14.00	0.00	--	--	--	--	Worm
Erpobdella	08030203002	0.67	0.67	--	--	36.4-I	--	Leech
Hyaella	09010203006	0.00	5.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	5.33	0.00	--	--	--	--	Amphipod
Perlinella	09020209047	1.00	1.00	1	--	--	--	Stonefly
Procloeon	09020401010	1.33	1.33	--	CG	21-S	--	Mayfly
Maccaffertium	09020402015	11.33	11.33	4	SC	--	--	Mayfly
Stenonema	09020402016	0.00	9.33	4	SC	--	--	Mayfly
<i>Stenonema femoratum</i>	09020402016001	9.33	0.00	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	1.00	1.00	1	CG	--	--	Mayfly
Eurylophella	09020410036	0.33	0.33	3	CG	23.2-I	--	Mayfly
Hydroptila	09020607026	0.67	0.67	6	P	--	--	Caddisfly
Oxyethira	09020607028	0.67	0.67	3	P	22-S	--	Caddisfly
Mystacides	09020618075	0.33	0.33	4	CG	18.2-S	--	Caddisfly
Probezzia	09021010041	1.33	1.33	6	PR	28.6-I	--	Fly: Biting Midge
Palpomyia	09021010044	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	0.33	0.00	--	--	--	--	Fly: Midge
Corynoneura	09021011036	0.33	0.36	7	CG	40.1-I	--	Fly: Midge
Orthocladius	09021011050	0.67	0.73	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	0.33	0.36	8	CG	22-S	--	Fly: Midge
Thienemanniella	09021011062	0.67	0.73	6	CG	24.7-I	--	Fly: Midge
Tanytarsus	09021011076	1.00	1.09	6	CF	25.7-I	Y	Fly: Midge
Polypedilum	09021011102	0.33	0.36	6	SH	24.2-I	C	Fly: Midge
Xenochironomus	09021011108	0.00	0.36	0	PR	1.5-S	C	Fly: Midge
<i>Xenochironomus xenolabis</i>	09021011108200	0.33	0.00	--	--	--	C	Fly: Midge
Dineutus	09021104032	0.33	0.33	2	--	23.2-I	--	Beetle
Hydrachnidia	09030101	2.00	2.00	--	--	--	--	Mite

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-399	Waterbody: AMBAJEJUS LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-399	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Valvata	10010101001	5.00	5.00	--	SC	33.4-I	--	Snail
Fossaria	10010201021	11.33	11.33	--	--	56.1-E	--	Snail
Physidae	10010202	0.67	0.67	--	SC	--	--	Snail
Gyraulus	10010203029	9.67	9.67	--	SC	37.2-I	--	Snail
Helisoma	10010203030	1.00	1.00	--	SC	42.8-I	--	Snail

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-401	Trip ID: 2023-401	River Basin:
Waterbody: NORTH TWIN LAKE (S1)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-401	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.40	Class C: 0.25	Class A, B, or C	1.00
Class B: 0.36	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.75	Class A	0.40
Class C or Non-Attainment	0.25	Class B or C or Non-Attainment	0.60

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	16.667	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.310	≥ 0.140
Shannon-Wiener Diversity Index	3.964	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.642	≥ 0.131
Abundance of Sensitive Taxa	29.333	≥ 3.424
Richness of Sensitive Taxa	6.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	42.653	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.633	≥ 0.334

Other Variables

Total Mean Abundance	122
Generic Richness:	42
Hilsenhoff Biotic Index:	5.54

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Nais</i>	19.95
2	<i>Stylaria lacustris</i>	19.13
3	<i>Micropsectra</i>	14.75
4	<i>Maccaffertium</i>	6.83

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5	<i>Problezzia</i>	3.83
5	<i>Tanytarsus</i>	3.83

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 8:01:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.22	mg/l	
In-situ	pH	6.89		
In-situ	Specific Conductance	25	us/cm	
In-situ	Temperature	20.78	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	

Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-401	Waterbody: NORTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-401	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	20.33	0.167	13	0.31
EPT Taxa:	20.33	0.167	13	0.31
Insects:	60.67	0.497	30	0.71
Non-Insects:	61.33	0.503	12	0.29
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	51.33	0.421	8	0.19
Snails:	8.33	0.068	3	0.07
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	1.67	0.014	1	0.02
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.33	0.003	1	0.02
Mayflies:	16.67	0.137	6	0.14
Odonates:	0.33	0.003	1	0.02
Caddisflies:	3.33	0.027	6	0.14
Diptera:	39.67	0.325	15	0.36
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.33	0.003	1	0.02
Chironomids:	31.67	0.260	11	0.26
Tanypodinae Tribe:	0.33	0.003	1	0.02
Chironomiinae Tribe:	27.33	0.224	8	0.19
Orthoclodiinae Tribe:	4.00	0.033	2	0.05
Collector-Filterers:	5.67	0.046	2	0.05
Collector-Gatherers:	78.33	0.642	14	0.33
Predators:	10.67	0.087	10	0.24
Piercers:	0.33	0.003	1	0.02
Shredders:	2.33	0.019	3	0.07
Scrapers:	17.00	0.139	5	0.12
Maine Tolerance:				
Sensitive:	29.33	0.300	6	0.26
Intermediate:	22.00	0.225	14	0.61
Eurytopic:	46.33	0.474	3	0.13
Ratio of MTI Sensitive to Eurytopic	0.63	0.633	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-401	Waterbody: NORTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-401	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Oligochaeta	0802	0.33	0.33	--	--	--	--	Oligochaete
Lumbriculus	08020101002	0.00	0.33	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	0.33	0.00	--	--	--	--	Worm
Stylodrilus	08020101004	0.00	0.33	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	0.33	0.00	--	--	--	--	Worm
Enchytraeidae	08020201	0.67	0.67	--	--	--	--	Worm
Bratislavia	08020202003	0.33	0.33	--	--	--	--	Worm
Nais	08020202009	24.33	24.33	--	CG	43-E	--	Worm
Ripistes	08020202011	0.00	0.33	--	--	--	--	Worm
<i>Ripistes parasita</i>	08020202011001	0.33	0.00	--	--	--	--	Worm
Slavina	08020202012	0.00	1.33	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	1.33	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	23.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	23.33	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	1.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	1.67	0.00	--	--	--	--	Amphipod
Acroneuria	09020209042	0.00	0.33	0	PR	--	--	Stonefly
<i>Acroneuria abnormis</i>	09020209042121	0.33	0.00	0	PR	--	--	Stonefly
Enallagma	09020309051	0.33	0.33	9	PR	26.2-I	--	Dragonfly/damselfly
Centropetrum	09020401003	0.67	0.67	2	CG	--	--	Mayfly
Acentrella	09020401008	1.33	1.33	3	CG	--	--	Mayfly
Leucocuta	09020402011	3.67	3.67	1	SC	--	--	Mayfly
Maccaffertium	09020402015	8.33	8.33	4	SC	--	--	Mayfly
Eurylophella	09020410036	1.00	1.00	3	CG	23.2-I	--	Mayfly
Caenis	09020412040	1.67	1.67	7	CG	22.1-I	--	Mayfly
Hydroptila	09020607026	0.33	0.33	6	P	--	--	Caddisfly
Brachycentrus	09020609043	1.00	1.00	0	CF	--	--	Caddisfly
Micrasema	09020609044	0.33	0.33	2	SH	--	--	Caddisfly
Lepidostoma	09020611064	0.67	0.67	1	SH	--	--	Caddisfly
Psilotreta	09020614068	0.67	0.67	0	SC	--	--	Caddisfly
Mystacides	09020618075	0.33	0.33	4	CG	18.2-S	--	Caddisfly
Probozzia	09021010041	4.67	4.67	6	PR	28.6-I	--	Fly: Biting Midge
Sphaeromyia	09021010042	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Palpomyia	09021010044	1.67	1.67	6	PR	--	--	Fly: Biting Midge
Ablabesmyia	09021011001	0.33	0.33	8	PR	23.6-I	T	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-401	Waterbody: NORTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-401	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
Orthocladius	09021011050	0.33	0.33	6	CG	22-S	--	Fly: Midge	
Psectrocladius	09021011056	3.67	3.67	8	CG	22-S	--	Fly: Midge	
Cladotanytarsus	09021011068	0.67	0.67	7	CG	22.2-I	Y	Fly: Midge	
Micropsectra	09021011070	18.00	18.00	7	CG	98.1-E	Y	Fly: Midge	
Tanytarsus	09021011076	4.67	4.67	6	CF	25.7-I	Y	Fly: Midge	
Cryptochironomus	09021011082	0.00	0.33	8	PR	31.3-I	C	Fly: Midge	
<i>Cryptochironomus fulvus</i>	09021011082144	0.33	0.00	--	--	--	C	Fly: Midge	
Dicrotendipes	09021011085	1.00	1.00	8	CG	28.8-I	C	Fly: Midge	
Parachironomus	09021011097	1.00	1.00	10	PR	28.6-I	C	Fly: Midge	
Polypedilum	09021011102	0.00	1.33	6	SH	24.2-I	C	Fly: Midge	
<i>Polypedilum illinoense</i>	09021011102204	1.33	0.00	--	--	--	--	Fly: Midge	
Xenochironomus	09021011108	0.00	0.33	0	PR	1.5-S	C	Fly: Midge	
<i>Xenochironomus xenolabis</i>	09021011108200	0.33	0.00	--	--	--	C	Fly: Midge	
Hemerodromia	09021016057	1.33	1.33	3	PR	--	--	Fly: Aquatic Dance	
Oulimnius	09021113068	0.00	0.33	--	--	--	--	Beetle	
<i>Oulimnius latiusculus</i>	09021113068049	0.33	0.00	--	--	--	--	Beetle	
Fossaria	10010201021	4.00	4.00	--	--	56.1-E	--	Snail	
Physidae	10010202	1.33	1.33	--	SC	--	--	Snail	
Gyraulus	10010203029	3.00	3.00	--	SC	37.2-I	--	Snail	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-403	Trip ID: 2023-403	River Basin:
Waterbody: NORTH TWIN LAKE (S2)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-403	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.32	Class C: 0.08	Class A, B, or C	1.00
Class B: 0.60	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.92	Class A	0.32
Class C or Non-Attainment	0.08	Class B or C or Non-Attainment	0.68

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	9.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.314	≥ 0.140
Shannon-Wiener Diversity Index	3.616	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.390	≥ 0.131
Abundance of Sensitive Taxa	30.048	≥ 3.424
Richness of Sensitive Taxa	7.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	32.559	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.866	≥ 0.334

Other Variables

Total Mean Abundance	159
Generic Richness:	35
Hilsenhoff Biotic Index:	6.04

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Tanytarsus</i>	23.06
2	<i>Problezzia</i>	14.05
3	<i>Stylaria lacustris</i>	13.21
4	<i>Nais</i>	10.06

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5 *Fossaria*

8.18

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 9:13:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.59	mg/l	
In-situ	pH	7.01		
In-situ	Specific Conductance	25	us/cm	
In-situ	Temperature	21.85	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-403	Waterbody: NORTH TWIN LAKE (S2)	Town: T4 Indian Purchase T
Log Number: SB-2023-403	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	12.00	0.075	11	0.31
EPT Taxa:	12.33	0.078	12	0.34
Insects:	88.00	0.553	25	0.71
Non-Insects:	71.00	0.447	10	0.29
Leeches:	1.00	0.006	1	0.03
Oligochaetes:	39.00	0.245	4	0.11
Snails:	19.33	0.122	3	0.09
Bivalves:	0.33	0.002	1	0.03
Isopods:	0.00	0.000	0	0.00
Amphipods:	11.33	0.071	1	0.03
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.33	0.002	1	0.03
Mayflies:	9.33	0.059	5	0.14
Odonates:	0.00	0.000	0	0.00
Caddisflies:	2.67	0.017	6	0.17
Diptera:	75.67	0.476	13	0.37
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	51.33	0.323	8	0.23
Tanypodinae Tribe:	1.01	0.006	2	0.06
Chironomiinae Tribe:	43.28	0.272	4	0.11
Orthoclodiinae Tribe:	7.05	0.044	2	0.06
Collector-Filterers:	37.57	0.236	3	0.09
Collector-Gatherers:	62.08	0.390	9	0.26
Predators:	25.34	0.159	7	0.20
Piercers:	0.33	0.002	1	0.03
Shredders:	1.67	0.010	3	0.09
Scrapers:	15.33	0.096	6	0.17
Maine Tolerance:				
Sensitive:	30.05	0.208	7	0.35
Intermediate:	79.58	0.551	9	0.45
Eurytopic:	34.70	0.240	4	0.20
Ratio of MTI Sensitive to Eurytopic	0.87	0.866	1.75	1.75

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-403	Waterbody: NORTH TWIN LAKE (S2)	Town: T4 Indian Purchase T
Log Number: SB-2023-403	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Enchytraeidae	08020201	1.00	1.00	--	--	--	--	Worm
Nais	08020202009	16.00	16.00	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	1.00	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	1.00	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	21.00	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	21.00	0.00	--	--	--	--	Worm
Erpobdella	08030203002	1.00	1.00	--	--	36.4-I	--	Leech
Hyaella	09010203006	0.00	11.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	11.33	0.00	--	--	--	--	Amphipod
Perlinella	09020209047	0.33	0.33	1	--	--	--	Stonefly
Heterocloeon	09020401005	1.33	1.33	2	SC	--	--	Mayfly
Leucrocuta	09020402011	1.33	1.33	1	SC	--	--	Mayfly
Maccaffertium	09020402015	6.00	6.00	4	SC	--	--	Mayfly
Hexagenia	09020407028	0.33	0.33	6	CG	--	--	Mayfly
Eurylophella	09020410036	0.33	0.33	3	CG	23.2-I	--	Mayfly
Oxyethira	09020607028	0.33	0.33	3	P	22-S	--	Caddisfly
Brachycentrus	09020609043	0.33	0.33	0	CF	--	--	Caddisfly
Micrasema	09020609044	0.67	0.67	2	SH	--	--	Caddisfly
Lepidostoma	09020611064	0.67	0.67	1	SH	--	--	Caddisfly
Psilotreta	09020614068	0.33	0.33	0	SC	--	--	Caddisfly
Oecetis	09020618078	0.33	0.33	8	PR	16.3-S	--	Caddisfly
Probezzia	09021010041	22.33	22.33	6	PR	28.6-I	--	Fly: Biting Midge
Sphaeromyias	09021010042	0.67	0.67	6	PR	--	--	Fly: Biting Midge
Palpomyia	09021010044	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Ceratopogon	09021010046	0.33	0.33	--	--	71.5-E	--	Fly: Biting Midge
Chironomidae	09021011	0.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	0.67	0.67	8	PR	23.6-I	T	Fly: Midge
Labrundinia	09021011008	0.33	0.34	7	PR	18.1-S	T	Fly: Midge
Orthocladius	09021011050	1.00	1.01	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	6.00	6.04	8	CG	22-S	--	Fly: Midge
Micropsectra	09021011070	5.33	5.37	7	CG	98.1-E	Y	Fly: Midge
Tanytarsus	09021011076	36.67	36.91	6	CF	25.7-I	Y	Fly: Midge
Dicrotendipes	09021011085	0.00	0.67	8	CG	28.8-I	C	Fly: Midge
<i>Dicrotendipes neomodestus</i>	09021011085152	0.67	0.00	--	--	--	C	Fly: Midge
Polypedilum	09021011102	0.33	0.34	6	SH	24.2-I	C	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-403	Waterbody: NORTH TWIN LAKE (S2)	Town: T4 Indian Purchase T
Log Number: SB-2023-403	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Hemerodromia	09021016057	0.67	0.67	3	PR	--	--	Fly: Aquatic Dance
Fossaria	10010201021	13.00	13.00	--	--	56.1-E	--	Snail
Physidae	10010202	0.33	0.33	--	SC	--	--	Snail
Gyraulus	10010203029	6.00	6.00	--	SC	37.2-I	--	Snail
Pisidium	10020201002	0.33	0.33	--	CF	--	--	Clam

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-405	Trip ID: 2023-405	River Basin:
Waterbody: PEMADUMCOOK LAKE (S1)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-405	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.46	Class C: 0.22	Class A, B, or C	1.00
Class B: 0.31	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.78	Class A	0.46
Class C or Non-Attainment	0.22	Class B or C or Non-Attainment	0.54

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	10.000	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.323	≥ 0.140
Shannon-Wiener Diversity Index	3.899	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.236	≥ 0.131
Abundance of Sensitive Taxa	9.733	≥ 3.424
Richness of Sensitive Taxa	7.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	40.794	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.362	≥ 0.334

Other Variables

Total Mean Abundance	73
Generic Richness:	31
Hilsenhoff Biotic Index:	4.86

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Fossaria</i>	29.22
2	<i>Gyraulus</i>	9.13
3	<i>Maccaffertium</i>	8.68
4	<i>Hyalella azteca</i>	6.39

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5 *Stylaria lacustris*

5.94

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 9:25:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.29	mg/l	
In-situ	pH	7		
In-situ	Specific Conductance	26	us/cm	
In-situ	Temperature	20.37	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-405	Waterbody: PEMADUMCOOK LAKE (S1)	Town: T01 R09 Wels
Log Number: SB-2023-405	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	13.33	0.183	10	0.32
EPT Taxa:	14.33	0.196	10	0.32
Insects:	24.67	0.338	22	0.71
Non-Insects:	48.33	0.662	9	0.29
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	12.67	0.174	4	0.13
Snails:	31.00	0.425	4	0.13
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	4.67	0.064	1	0.03
Mites:	0.00	0.000	0	0.00
Stoneflies:	1.33	0.018	1	0.03
Mayflies:	10.00	0.137	5	0.16
Odonates:	0.33	0.005	1	0.03
Caddisflies:	3.00	0.041	4	0.13
Diptera:	10.00	0.137	11	0.35
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	7.33	0.100	9	0.29
Tanypodinae Tribe:	0.73	0.010	1	0.03
Chironomiinae Tribe:	5.87	0.080	6	0.19
Orthoclodiinae Tribe:	0.73	0.010	2	0.06
Collector-Filterers:	2.57	0.035	1	0.03
Collector-Gatherers:	17.23	0.236	8	0.26
Predators:	4.80	0.066	8	0.26
Piercers:	0.33	0.005	1	0.03
Shredders:	2.70	0.037	3	0.10
Scrapers:	17.70	0.242	7	0.23
Maine Tolerance:				
Sensitive:	9.73	0.185	7	0.39
Intermediate:	16.03	0.305	7	0.39
Eurytopic:	26.87	0.510	4	0.22
Ratio of MTI Sensitive to Eurytopic	0.36	0.362	1.75	1.75

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-405

Waterbody: PEMADUMCOOK LAKE (S1)

Town: T01 R09 Wels

Log Number: SB-2023-405

Subsample Factor: X1

Replicates: 3

Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Stylodrilus	08020101004	0.00	1.33	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	1.33	0.00	--	--	--	--	Worm
Nais	08020202009	3.33	3.33	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	3.67	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	3.67	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	4.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	4.33	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	4.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	4.67	0.00	--	--	--	--	Amphipod
Acroneuria	09020209042	0.00	1.33	0	PR	--	--	Stonefly
<i>Acroneuria carolinensis</i>	09020209042123	1.33	0.00	--	--	--	--	Stonefly
Boyeria	09020301004	0.00	0.33	2	PR	8-S	--	Dragonfly/damselfly
<i>Boyeria vinosa</i>	09020301004012	0.33	0.00	--	--	--	--	Dragonfly/damselfly
Centropilum	09020401003	2.00	2.00	2	CG	--	--	Mayfly
Leucrocuta	09020402011	0.33	0.33	1	SC	--	--	Mayfly
Stenacron	09020402014	1.00	1.00	7	SC	--	--	Mayfly
Maccaffertium	09020402015	6.33	6.33	4	SC	--	--	Mayfly
Paraleptophlebia	09020406026	0.33	0.33	1	CG	--	--	Mayfly
Oxyethira	09020607028	0.33	0.33	3	P	22-S	--	Caddisfly
Lepidostoma	09020611064	2.00	2.00	1	SH	--	--	Caddisfly
Nectopsyche	09020618074	0.33	0.33	3	SH	--	--	Caddisfly
Oecetis	09020618078	0.33	0.33	8	PR	16.3-S	--	Caddisfly
Diptera	090210	1.33	1.33	--	--	--	--	Fly
Palpomyia	09021010044	0.67	0.67	6	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	0.67	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	0.00	0.73	8	PR	23.6-I	T	Fly: Midge
<i>Ablabesmyia mallochi</i>	09021011001004	0.67	0.00	--	--	--	T	Fly: Midge
Eukiefferiella	09021011041	0.33	0.37	8	CG	--	--	Fly: Midge
Psectrocladius	09021011056	0.33	0.37	8	CG	22-S	--	Fly: Midge
Micropsectra	09021011070	1.67	1.83	7	CG	98.1-E	Y	Fly: Midge
Tanytarsus	09021011076	2.33	2.57	6	CF	25.7-I	Y	Fly: Midge
Parachironomus	09021011097	0.33	0.37	10	PR	28.6-I	C	Fly: Midge
Phaenopsectra	09021011101	0.00	0.37	7	SC	44.2-E	C	Fly: Midge
<i>Phaenopsectra punctipes</i>	09021011101183	0.33	0.00	--	SC	--	C	Fly: Midge
Polypedilum	09021011102	0.00	0.37	6	SH	24.2-I	C	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-405	Waterbody: PEMADUMCOOK LAKE (S1)	Town: T01 R09 Wels
Log Number: SB-2023-405	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa	Group
		Actual	Adjusted						
<i>Polypedilum illinoense</i>	09021011102204	0.33	0.00	--	--	--	--	Fly: Midge	
<i>Xenochironomus</i>	090210111108	0.00	0.37	0	PR	1.5-S	C	Fly: Midge	
<i>Xenochironomus xenolabis</i>	09021011108200	0.33	0.00	--	--	--	C	Fly: Midge	
<i>Hemerodromia</i>	09021016057	0.67	0.67	3	PR	--	--	Fly: Aquatic Dance	
<i>Fossaria</i>	10010201021	21.33	21.33	--	--	56.1-E	--	Snail	
<i>Physidae</i>	10010202	2.33	2.33	--	SC	--	--	Snail	
<i>Gyraulus</i>	10010203029	6.67	6.67	--	SC	37.2-I	--	Snail	
<i>Helisoma</i>	10010203030	0.67	0.67	--	SC	42.8-I	--	Snail	

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-407	Trip ID: 2023-407	River Basin:
Waterbody: PEMADUMCOOK LAKE (S2)		HUC8 Name:
Town: T01 R09 Wels		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-407	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/15/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.16	Class C: 0.35	Class A, B, or C	1.00
Class B: 0.48	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.65	Class A	0.16
Class C or Non-Attainment	0.35	Class B or C or Non-Attainment	0.84

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	9.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.226	≥ 0.140
Shannon-Wiener Diversity Index	4.115	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.293	≥ 0.131
Abundance of Sensitive Taxa	18.766	≥ 3.424
Richness of Sensitive Taxa	6.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	33.922	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.826	≥ 0.334

Other Variables

Total Mean Abundance	85
Generic Richness:	31
Hilsenhoff Biotic Index:	5.73

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Fossaria</i>	19.69
2	<i>Tanytarsus</i>	13.39
3	<i>Gyraulus</i>	7.87
4	<i>Stylaria lacustris</i>	6.69

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5 *Maccaffertium*

6.30

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/15/2023 11:35:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.45	mg/l	
In-situ	pH	6.96		
In-situ	Specific Conductance	24	us/cm	
In-situ	Temperature	21.3	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	

Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-407	Waterbody: PEMADUMCOOK LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-407	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	12.33	0.146	7	0.23
EPT Taxa:	13.00	0.154	8	0.26
Insects:	47.00	0.555	21	0.68
Non-Insects:	37.67	0.445	10	0.32
Leeches:	1.00	0.012	1	0.03
Oligochaetes:	8.33	0.098	3	0.10
Snails:	23.33	0.276	2	0.06
Bivalves:	0.67	0.008	1	0.03
Isopods:	0.00	0.000	0	0.00
Amphipods:	2.67	0.031	1	0.03
Mites:	1.00	0.012	1	0.03
Stoneflies:	0.67	0.008	1	0.03
Mayflies:	9.33	0.110	4	0.13
Odonates:	0.00	0.000	0	0.00
Caddisflies:	3.00	0.035	3	0.10
Diptera:	34.00	0.402	13	0.42
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	31.67	0.374	12	0.39
Tanypodinae Tribe:	1.35	0.016	2	0.06
Chironomiinae Tribe:	19.88	0.235	6	0.19
Orthoclodiinae Tribe:	10.11	0.119	3	0.10
Collector-Filterers:	12.12	0.143	2	0.06
Collector-Gatherers:	24.81	0.293	11	0.35
Predators:	7.35	0.087	8	0.26
Piercers:	0.00	0.000	0	0.00
Shredders:	0.34	0.004	1	0.03
Scrapers:	15.00	0.177	4	0.13
Maine Tolerance:				
Sensitive:	18.77	0.273	6	0.30
Intermediate:	27.17	0.396	11	0.55
Eurytopic:	22.72	0.331	3	0.15
Ratio of MTI Sensitive to Eurytopic	0.83	0.826	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-407	Waterbody: PEMADUMCOOK LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-407	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Hydra	02010101001	0.67	0.67	--	PR	--	--	Hydroid
Nais	08020202009	1.33	1.33	--	CG	43-E	--	Worm
Slavina	08020202012	0.00	1.33	--	--	4.2-S	--	Worm
<i>Slavina appendiculata</i>	08020202012001	1.33	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	5.67	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	5.67	0.00	--	--	--	--	Worm
Erpobdella	08030203002	1.00	1.00	--	--	36.4-I	--	Leech
Hyaella	09010203006	0.00	2.67	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	2.67	0.00	--	--	--	--	Amphipod
Acroneuria	09020209042	0.67	0.67	0	PR	--	--	Stonefly
Centropilum	09020401003	1.00	1.00	2	CG	--	--	Mayfly
Heterocloeon	09020401005	0.33	0.33	2	SC	--	--	Mayfly
Leucrocuta	09020402011	2.67	2.67	1	SC	--	--	Mayfly
Maccaffertium	09020402015	5.33	5.33	4	SC	--	--	Mayfly
Polycentropus	09020603010	0.33	0.33	6	PR	15.4-S	--	Caddisfly
Ceraclea	09020618072	0.67	0.67	3	CG	23.9-I	--	Caddisfly
Oecetis	09020618078	2.00	2.00	8	PR	16.3-S	--	Caddisfly
Diptera	090210	0.33	0.33	--	--	--	--	Fly
Palpomyia	09021010044	2.00	2.00	6	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	0.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	0.33	0.34	8	PR	23.6-I	T	Fly: Midge
Thienemannimyia	09021011020	1.00	1.01	3	PR	--	T	Fly: Midge
Potthastia	09021011026	0.00	0.34	2	CG	--	D	Fly: Midge
<i>Potthastia longimana</i>	09021011026046	0.33	0.00	--	--	--	D	Fly: Midge
Orthocladius	09021011050	4.33	4.38	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	5.00	5.05	8	CG	22-S	--	Fly: Midge
Thienemanniella	09021011062	0.67	0.67	6	CG	24.7-I	--	Fly: Midge
Cladotanytarsus	09021011068	1.33	1.35	7	CG	22.2-I	Y	Fly: Midge
Paratanytarsus	09021011071	4.67	4.72	6	--	43-E	Y	Fly: Midge
Tanytarsus	09021011076	11.33	11.45	6	CF	25.7-I	Y	Fly: Midge
Dicrotendipes	09021011085	1.67	1.68	8	CG	28.8-I	C	Fly: Midge
Parachironomus	09021011097	0.33	0.34	10	PR	28.6-I	C	Fly: Midge
Polypedilum	09021011102	0.33	0.34	6	SH	24.2-I	C	Fly: Midge
Hydrachnidia	09030101	1.00	1.00	--	--	--	--	Mite
Fossaria	10010201021	16.67	16.67	--	--	56.1-E	--	Snail

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-407	Waterbody: PEMADUMCOOK LAKE (S2)	Town: T01 R09 Wels
Log Number: SB-2023-407	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Gyraulus	10010203029	6.67	6.67	--	SC	37.2-I	--	Snail
Pisidium	10020201002	0.67	0.67	--	CF	--	--	Clam

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-409	Trip ID: 2023-409	River Basin:
Waterbody: SOUTH TWIN LAKE (S1)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-409	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	B	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.15	Class C: 0.20	Class A, B, or C	1.00
Class B: 0.65	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.80	Class A	0.15
Class C or Non-Attainment	0.20	Class B or C or Non-Attainment	0.85

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	5.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.300	≥ 0.140
Shannon-Wiener Diversity Index	3.022	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.833	≥ 0.131
Abundance of Sensitive Taxa	31.000	≥ 3.424
Richness of Sensitive Taxa	6.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	37.712	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	0.853	≥ 0.334

Other Variables

Total Mean Abundance	86
Generic Richness:	30
Hilsenhoff Biotic Index:	5.82

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Stylaria lacustris</i>	32.30
2	<i>Nais</i>	31.91
3	<i>Micropsectra</i>	10.12
4	<i>Hyalella azteca</i>	2.72

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

4	<i>Tubificida</i>	2.72
5	<i>Hemerodromia</i>	1.95
5	<i>Probetzia</i>	1.95

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 11:30:00 AM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	8.82	mg/l	
In-situ	pH	6.93		
In-situ	Specific Conductance	24	us/cm	
In-situ	Temperature	22.19	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

SAND SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-409	Waterbody: SOUTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-409	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	6.33	0.074	9	0.30
EPT Taxa:	6.33	0.074	9	0.30
Insects:	24.33	0.284	22	0.73
Non-Insects:	61.33	0.716	8	0.27
Leeches:	0.00	0.000	0	0.00
Oligochaetes:	58.67	0.685	6	0.20
Snails:	0.33	0.004	1	0.03
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	2.33	0.027	1	0.03
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.00	0.000	0	0.00
Mayflies:	5.33	0.062	6	0.20
Odonates:	0.00	0.000	0	0.00
Caddisflies:	1.00	0.012	3	0.10
Diptera:	17.67	0.206	12	0.40
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.33	0.004	1	0.03
Chironomids:	14.00	0.163	9	0.30
Tanypodinae Tribe:	0.33	0.004	1	0.03
Chironomiinae Tribe:	11.00	0.128	5	0.17
Orthoclodiinae Tribe:	2.67	0.031	3	0.10
Collector-Filterers:	1.00	0.012	2	0.07
Collector-Gatherers:	71.33	0.833	12	0.40
Predators:	4.67	0.054	6	0.20
Piercers:	0.00	0.000	0	0.00
Shredders:	0.67	0.008	2	0.07
Scrapers:	4.00	0.047	3	0.10
Maine Tolerance:				
Sensitive:	31.00	0.419	6	0.38
Intermediate:	6.67	0.090	7	0.44
Eurytopic:	36.33	0.491	3	0.19
Ratio of MTI Sensitive to Eurytopic	0.85	0.853	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-409	Waterbody: SOUTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-409	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe Taxa Group	
		Actual	Adjusted					
Lumbriculus	08020101002	0.00	0.33	--	CG	35-I	--	Worm
<i>Lumbriculus variegatus</i>	08020101002001	0.33	0.00	--	--	--	--	Worm
Stylodrilus	08020101004	0.00	0.33	--	--	--	--	Worm
<i>Stylodrilus heringianus</i>	08020101004001	0.33	0.00	--	--	--	--	Worm
Tubificida	080202	2.33	2.33	--	--	--	--	Worm
Bratislavia	08020202003	0.33	0.33	--	--	--	--	Worm
Nais	08020202009	27.33	27.33	--	CG	43-E	--	Worm
Ripistes	08020202011	0.00	0.33	--	--	--	--	Worm
<i>Ripistes parasita</i>	08020202011001	0.33	0.00	--	--	--	--	Worm
Stylaria	08020202014	0.00	27.67	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	27.67	0.00	--	--	--	--	Worm
Hyaella	09010203006	0.00	2.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	2.33	0.00	--	--	--	--	Amphipod
Centropetium	09020401003	0.67	0.67	2	CG	--	--	Mayfly
Acentrella	09020401008	0.33	0.33	3	CG	--	--	Mayfly
Plauditus	09020401012	0.33	0.33	--	CG	--	--	Mayfly
Leucrocota	09020402011	1.33	1.33	1	SC	--	--	Mayfly
Maccaffertium	09020402015	1.33	1.33	4	SC	--	--	Mayfly
Stenonema	09020402016	0.00	1.33	4	SC	--	--	Mayfly
<i>Stenonema femoratum</i>	09020402016001	1.33	0.00	4	SC	--	--	Mayfly
Cheumatopsyche	09020604015	0.33	0.33	5	CF	--	--	Caddisfly
Lepidostoma	09020611064	0.33	0.33	1	SH	--	--	Caddisfly
Oecetis	09020618078	0.33	0.33	8	PR	16.3-S	--	Caddisfly
Probezzia	09021010041	1.67	1.67	6	PR	28.6-I	--	Fly: Biting Midge
Palpomyia	09021010044	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Labrundinia	09021011008	0.33	0.33	7	PR	18.1-S	T	Fly: Midge
Nanocladius	09021011049	0.33	0.33	3	CG	14.1-S	--	Fly: Midge
Orthocladius	09021011050	1.33	1.33	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	1.00	1.00	8	CG	22-S	--	Fly: Midge
Micropsectra	09021011070	8.67	8.67	7	CG	98.1-E	Y	Fly: Midge
Tanytarsus	09021011076	0.67	0.67	6	CF	25.7-I	Y	Fly: Midge
Cryptochironomus	09021011082	0.00	0.33	8	PR	31.3-I	C	Fly: Midge
<i>Cryptochironomus fulvus</i>	09021011082144	0.33	0.00	--	--	--	C	Fly: Midge
Dicrotendipes	09021011085	1.00	1.00	8	CG	28.8-I	C	Fly: Midge
Polypedilum	09021011102	0.00	0.33	6	SH	24.2-I	C	Fly: Midge

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-409	Waterbody: SOUTH TWIN LAKE (S1)	Town: T4 Indian Purchase T
Log Number: SB-2023-409	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
<i>Polypedilum flavum</i>	09021011102182	0.33	0.00	--	--	--	C	Fly: Midge
Hemerodromia	09021016057	1.67	1.67	3	PR	--	--	Fly: Aquatic Dance
Oulimnius	09021113068	0.00	0.33	--	--	--	--	Beetle
<i>Oulimnius latiusculus</i>	09021113068049	0.33	0.00	--	--	--	--	Beetle
Fossaria	10010201021	0.33	0.33	--	--	56.1-E	--	Snail

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Station Information

Station Number: W-411	Trip ID: 2023-411	River Basin:
Waterbody: SOUTH TWIN LAKE (S2)		HUC8 Name:
Town: T4 Indian Purchase Twp		Latitude:
Mitigation Monitoring Site: No		Longitude:

Sample Information

Sample ID: SB-2023-411	Type of Sample: SURBER	Sampling Organization: NORMANDEAU ASSOCIATES
Date Sampled: 8/16/2023	Replicates: 3	Taxonomist: NORMANDEAU ASSOCIATES
Subsample Factor: X1		

Classification Attainment

Statutory Class:	GPA	Final Determination:	C	Date: 1/3/2025
Model Result with $P \geq 0.6$:	I	Reason for Determination: Best Professional Judgement		
Date Last Calculated:	11/21/2024	Comments: Sample method not appropriate for model. Sample does meet structure and function.		

Model Probabilities

<u>First Stage Model</u>		<u>C or Better Model</u>	
Class A: 0.17	Class C: 0.33	Class A, B, or C	1.00
Class B: 0.50	NA: 0.00	Non-Attainment	0.00
<u>B or Better Model</u>		<u>A Model</u>	
Class A or B	0.67	Class A	0.17
Class C or Non-Attainment	0.33	Class B or C or Non-Attainment	0.83

Model Variables

		Reference Range (10th or 90th percentile value)
Abundance of Taxa in the Order Ephemeroptera	3.333	≥ 0.000
Relative Richness of Taxa in the Orders Ephemeroptera, Odonata and Tricoptera	0.185	≥ 0.140
Shannon-Wiener Diversity Index	3.881	≥ 2.497
Relative Abundance of Collector-Gatherer Taxa	0.593	≥ 0.131
Abundance of Sensitive Taxa	12.083	≥ 3.424
Richness of Sensitive Taxa	4.000	≥ 3.000
Maine Tolerance Index Score For Wetland Macroinvertebrates	25.226	≤ 29.776
Ratio of MTI Sensitive to Eurytopic Taxa Abundance	3.229	≥ 0.334

Other Variables

Total Mean Abundance	45
Generic Richness:	27
Hilsenhoff Biotic Index:	6.79

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hyaella azteca</i>	25.37
2	<i>Stylaria lacustris</i>	11.94
3	<i>Enchytraeidae</i>	8.21
4	<i>Polycentropus</i>	7.46

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

5 *Paratanytarsus*

6.72

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Surface Water Chemistry

Sample Date: 8/16/2023 12:54:00 PM

Collection Method	Parameter	Value	Units	Qualifier
In-situ	Dissolved Oxygen	9.09	mg/l	
In-situ	pH	7.08		
In-situ	Specific Conductance	24	us/cm	
In-situ	Temperature	22.67	deg c	

Landcover Summary - 2004 Data

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Summary of Habitat Characteristics

<u>Human Disturbance</u>	<u>Landscape-level Cowardin Classification</u>	<u>Hydrogeomorphic Setting</u>
Total Score:	System:	Landscape Position:
Hydrologic Modifications:	Subsystem:	Lotic Gradient:
Vegetative Modifications:	Class 1:	Flow Path:
Chemical Pollutants:	Subclass 1:	Land Form:
Watershed	Class 2:	Land Form Type:
Characterization and	Subclass 2:	Waterbody Type:
Non-point Sources:	Class 3:	Waterbody Subtype:
	Subclass 3:	
		Comments:

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:

OPEN WATER STANDING

Substrate Classification:

BOULDER SUBSTRATE

GRAVEL SUBSTRATE

RUBBLE/COBBLE SUBSTRATE

Average Depth:

Visible Flow: No

Rain In Previous 24 Hours: No

Sample Comments:

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Additional Summary Variables

Station Number: W-411	Waterbody: SOUTH TWIN LAKE (S2)	Town: T4 Indian Purchase T
Log Number: SB-2023-411	Subsample Factor: X1	Replicates: 3
		Calculated: 11/21/2024

	Abundance	Relative Abundance	Richness	Relative Richness
EOT Taxa:	6.67	0.149	5	0.19
EPT Taxa:	7.00	0.157	6	0.22
Insects:	22.67	0.507	21	0.78
Non-Insects:	22.00	0.493	6	0.22
Leeches:	0.33	0.007	1	0.04
Oligochaetes:	9.67	0.216	3	0.11
Snails:	0.00	0.000	0	0.00
Bivalves:	0.00	0.000	0	0.00
Isopods:	0.00	0.000	0	0.00
Amphipods:	11.33	0.254	1	0.04
Mites:	0.00	0.000	0	0.00
Stoneflies:	0.33	0.007	1	0.04
Mayflies:	3.33	0.075	4	0.15
Odonates:	0.00	0.000	0	0.00
Caddisflies:	3.33	0.075	1	0.04
Diptera:	15.67	0.351	15	0.56
Hemiptera:	0.00	0.000	0	0.00
Beetles:	0.00	0.000	0	0.00
Chironomids:	13.67	0.306	11	0.41
Tanypodinae Tribe:	1.03	0.023	2	0.07
Chironomiinae Tribe:	8.54	0.191	6	0.22
Orthoclodiinae Tribe:	4.10	0.092	3	0.11
Collector-Filterers:	1.71	0.038	1	0.04
Collector-Gatherers:	26.51	0.593	13	0.48
Predators:	6.03	0.135	7	0.26
Piercers:	0.00	0.000	0	0.00
Shredders:	0.68	0.015	1	0.04
Scrapers:	2.00	0.045	1	0.04
Maine Tolerance:				
Sensitive:	12.08	0.346	4	0.25
Intermediate:	19.14	0.547	10	0.63
Eurytopic:	3.74	0.107	2	0.13
Ratio of MTI Sensitive to Eurytopic	3.23	3.229	2.00	2.00

**Maine Department of Environmental Protection
Biological Monitoring Program
Wetland Aquatic Life Classification Attainment Report**

Aquatic Life Taxonomic Inventory Report

Station Number: W-411	Waterbody: SOUTH TWIN LAKE (S2)	Town: T4 Indian Purchase T
Log Number: SB-2023-411	Subsample Factor: X1	Replicates: 3 Calculated: 11/21/2024

Taxon	Maine Taxonomic Code	Count (Mean of Samples)		Hilsen- hoff Biotic Index	Func- tional Feeding Group	Maine Toler- ance Index	Tribe	Taxa Group
		Actual	Adjusted					
Nematoda	05	0.67	0.67	--	--	--	--	Nematode
Enchytraeidae	08020201	3.67	3.67	--	--	--	--	Worm
Nais	08020202009	0.67	0.67	--	CG	43-E	--	Worm
Stylaria	08020202014	0.00	5.33	--	CG	18-S	--	Worm
<i>Stylaria lacustris</i>	08020202014002	5.33	0.00	--	--	--	--	Worm
Erpobdella	08030203002	0.33	0.33	--	--	36.4-I	--	Leech
Hyaella	09010203006	0.00	11.33	8	CG	24.5-I	--	Amphipod
<i>Hyaella azteca</i>	09010203006011	11.33	0.00	--	--	--	--	Amphipod
Sweltsa	09020208040	0.33	0.33	--	PR	--	--	Stonefly
Maccaffertium	09020402015	2.00	2.00	4	SC	--	--	Mayfly
Choroterpes	09020406022	0.67	0.67	2	CG	--	--	Mayfly
Caenis	09020412040	0.33	0.33	7	CG	22.1-I	--	Mayfly
Baetisca	09020413041	0.33	0.33	4	CG	--	--	Mayfly
Polycentropus	09020603010	3.33	3.33	6	PR	15.4-S	--	Caddisfly
Dasyhelea	09021010036	0.67	0.67	--	CG	30.6-I	--	Fly: Biting Midge
Culicoides	09021010037	0.67	0.67	10	PR	42.1-I	--	Fly: Biting Midge
Sphaeromias	09021010042	0.33	0.33	6	PR	--	--	Fly: Biting Midge
Mallochohelea	09021010047	0.33	0.33	--	PR	--	--	Fly: Biting Midge
Chironomidae	09021011	0.33	0.00	--	--	--	--	Fly: Midge
Ablabesmyia	09021011001	0.67	0.68	8	PR	23.6-I	T	Fly: Midge
Thienemannimyia	09021011020	0.00	0.34	3	PR	--	T	Fly: Midge
<i>Thienemannimyia group</i>	09021011020041	0.33	0.00	--	--	--	T	Fly: Midge
Orthocladius	09021011050	1.33	1.37	6	CG	22-S	--	Fly: Midge
Psectrocladius	09021011056	2.00	2.05	8	CG	22-S	--	Fly: Midge
Tvetenia	09021011065	0.00	0.68	5	CG	--	--	Fly: Midge
<i>Tvetenia paucunca</i>	09021011065114	0.67	0.00	--	--	--	--	Fly: Midge
Cladotanytarsus	09021011068	0.33	0.34	7	CG	22.2-I	Y	Fly: Midge
Paratanytarsus	09021011071	3.00	3.08	6	--	43-E	Y	Fly: Midge
Stempellina	09021011073	0.33	0.34	2	CG	--	Y	Fly: Midge
Tanytarsus	09021011076	1.67	1.71	6	CF	25.7-I	Y	Fly: Midge
Dicrotendipes	09021011085	2.33	2.39	8	CG	28.8-I	C	Fly: Midge
Polypedilum	09021011102	0.67	0.68	6	SH	24.2-I	C	Fly: Midge

Attachment 3

Correspondence

From: [Rachel Russo](#)
To: [Rachel Russo](#)
Subject: FW: GLHA - BMI data for North Twin Impoundment
Date: Thursday, May 29, 2025 11:38:03 AM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)

From: Connors, Beth <Beth.Connors@maine.gov>
Sent: Friday, January 31, 2025 9:00 AM
To: Paye, Laura <Laura.Paye@maine.gov>; Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>
Cc: Garland, Wendy <Wendy.Garland@maine.gov>; DiFranco, Jeanne L <Jeanne.L.DiFranco@maine.gov>; Drew Trested <dtrested@normandeau.com>; Scarzello, Michael <michael.scarzello@brookfieldrenewable.com>; Dorman, Randy <randy.dorman@brookfieldrenewable.com>; Russell, Cate <cate.russell@hdrinc.com>
Subject: RE: GLHA - BMI data for North Twin Impoundment

Hi everyone -

To clarify, since the macroinvertebrate samples collected from the North Twin Impoundments were not collected with the DEP Dipnet method, the samples are not appropriate for the wetland MI model and the model predictions shown on the report should be disregarded. Sorry for any confusion. We don't have a model or standardized report specifically to use for non-standard samples and data.

Best professional judgement was used to evaluate the biological communities found at each of the locations. The communities maintain structure and function of the resident biological community, which is the ALU standard for hydropower impoundments managed as great ponds **§464. Classification of Maine waters 9-A A.** (4) The existing impounded waters are able to support all species of fish indigenous to those waters and **the structure and function of the resident biological community** in the impounded waters is maintained. So yes, the applicable surface water quality standards are met in the North Twin Impoundment.

Please let me know if you have further questions,

Beth

Beth Connors

Biological Monitoring Unit, Maine DEP

312 Canco Road, Portland, ME 04103

(207) 441-6139

www.maine.gov/dep/water/monitoring/biomonitoring/index.html

From: Paye, Laura <Laura.Paye@maine.gov>

Sent: Wednesday, January 29, 2025 11:02 AM

To: Garland, Wendy <Wendy.Garland@maine.gov>; Connors, Beth <Beth.Connors@maine.gov>; DiFranco, Jeanne L <Jeanne.L.DiFranco@maine.gov>

Subject: FW: GLHA - BMI data for North Twin Impoundment

Hi All,

See Wendy Bley from Kleinschmidt's question below about the North Twin BMI samples. I also wanted to share the update on the West Branch samples for your information!

Best,

Laura

From: Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>

Sent: Wednesday, January 29, 2025 10:59 AM

To: Paye, Laura <Laura.Paye@maine.gov>; Drew Trested <dtrested@normandeau.com>

Cc: Scarzello, Michael <michael.scarzello@brookfieldrenewable.com>; Dorman, Randy <randy.dorman@brookfieldrenewable.com>; Russell, Cate <cate.russell@hdrinc.com>

Subject: RE: GLHA - BMI data for North Twin Impoundment

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Laura,

Many thanks to you and the analytical team for evaluating the benthic macroinvertebrate samples from the North Twin impoundment so quickly! We were encouraged to see the model generate such good results. Like the Ripogenus lakes/impoundment results you and Beth provided last year, we are drawing the conclusion that these modeling results demonstrate that the North Twin impoundment meets the surface water quality standards established by the Maine Revised Statutes §§464-468. When you get a chance, can you confirm this is an accurate interpretation?

Also, as an update, we are hopeful that Moody Mountain Environmental (Paul Leeper) will be completing his work on the riverine samples collected this past summer at 6 sites on the West Branch Penobscot River, and that we will be able to send that data along to you folks in the next couple weeks.

Finally, in case you hadn't heard, Jesse Wechsler is no longer at Kleinschmidt. He has taken a new position in California! I just wanted to let you know.

Best,
- Wendy Bley

From: Paye, Laura <Laura.Paye@maine.gov>
Sent: Tuesday, January 7, 2025 4:11 PM
To: Drew Trested <dtrested@normandeau.com>
Cc: Michael.Scarzello <Michael.Scarzello@brookfieldrenewable.com>; Dorman, Randy <randy.dorman@brookfieldrenewable.com>; Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>; Russell, Cate <cate.russell@hdrinc.com>
Subject: RE: GLHA - BMI data for North Twin Impoundment

Good Afternoon,

I've attached the final reports here, along with a spreadsheet to cross reference the consultant site names to the DEP site names. The results will be displayed on the Biomonitoring ArcOnline site when that is next updated in February or March.

Let me know if you need any other information on any of these!

Best,
Laura

*Laura Paye (she/her)
Hydropower Coordinator
Bureau of Land Resources
Maine Department of Environmental Protection
(207) 219-9563*

From: Drew Trested <dtrested@normandeau.com>
Sent: Tuesday, September 24, 2024 7:10 PM
To: Paye, Laura <Laura.Paye@maine.gov>
Cc: Michael.Scarzello <Michael.Scarzello@brookfieldrenewable.com>; Dorman, Randy <Randy.Dorman@brookfieldrenewable.com>; Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>; Russell, Cate <Cate.Russell@hdrinc.com>
Subject: RE: GLHA - BMI data for North Twin Impoundment

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Laura –

Per your request below, the benthic macroinvertebrate data collected in 2023 from four basins within the North Twin impoundment has been copied over to the wetland field data and updated taxonomy data sheets. Please let me know if you or the DEA staff have any additional questions on what was collected during this sampling.

Thank you for the updated data templates. I have updated those in our Normandeau project folders for future projects.

Drew

Drew Trested, PhD
Senior Vice President | Fisheries Scientist
Normandeau Associates, Inc.
30 International Drive, Portsmouth, NH 03801
603-319-5310 (direct) 603-973-3179 (cell)

From: Paye, Laura <Laura.Paye@maine.gov>
Sent: Thursday, September 19, 2024 10:02 AM
To: Drew Trested <dtrested@normandeau.com>
Cc: Michael.Scarzello <Michael.Scarzello@brookfieldrenewable.com>; Dorman, Randy <Randy.Dorman@brookfieldrenewable.com>; Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>; Russell, Cate <Cate.Russell@hdrinc.com>
Subject: RE: GLHA - BMI data for North Twin Impoundment

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Drew,

DEA staff requested you resubmit this lake/impoundment data using the wetland field data pre-EDD file, as well as an updated version of the pre-EDD file for taxonomy. I've attached both here. Let me know if you have any questions!

Best,
Laura

From: Drew Trested <dtrested@normandeau.com>
Sent: Wednesday, September 11, 2024 11:20 AM
To: Paye, Laura <Laura.Paye@maine.gov>
Cc: Michael.Scarzello <Michael.Scarzello@brookfieldrenewable.com>; Dorman, Randy <Randy.Dorman@brookfieldrenewable.com>; Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>;

Russell, Cate <Cate.Russell@hdrinc.com>

Subject: GLHA - BMI data for North Twin Impoundment

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Laura,

On behalf of GLHA, licensee of the Penobscot Mills Project, please find the attached benthic macroinvertebrate data collected in 2023 from four basins within the North Twin impoundment on the West Branch of the Penobscot River. Two surber and two kick samples were collected from the Ambajejus, Pemadumcook, North Twin, and South Twin basins in the summer of 2023. While sampling was not required by FERC's formal study plan determination for the relicensing of the Penobscot Mills Project, GLHA collected this information in case additional information about the resident biological community is needed to support the upcoming Water Quality Certification application. We are hopeful that this information will be helpful to MDEP for your analysis, and we appreciate the time involved to review and analyze the results using the MDEP model.

The submittal includes sampling taxonomic counts and associated site info for each sampling location. Please let us know if you have any questions about the BMI data provided.

Thank you,
Drew

Drew Trested, PhD
Senior Vice President | Fisheries Scientist
Normandeau Associates, Inc.
30 International Drive, Portsmouth, NH 03801
603-319-5310 (direct) 603-973-3179 (cell)



The contents of this email message may contain privileged, confidential, or otherwise protected information and are solely for the use of the designated recipient(s). If you are not an intended recipient, do not copy, disseminate or disclose the contents of this communication. The sender does not waive confidentiality in the event of any inadvertent transmission to an unauthorized recipient. If you have received this email in error, please notify me immediately or contact Normandeau Associates, Inc. at (603) 472-5191 and permanently delete this message.

The contents of this email message may contain privileged, confidential, or otherwise protected information and are solely for the use of the designated recipient(s). If you are

not an intended recipient, do not copy, disseminate or disclose the contents of this communication. The sender does not waive confidentiality in the event of any inadvertent transmission to an unauthorized recipient. If you have received this email in error, please notify me immediately or contact Normandeau Associates, Inc. at (603) 472-5191 and permanently delete this message.

The contents of this email message may contain privileged, confidential, or otherwise protected information and are solely for the use of the designated recipient(s). If you are not an intended recipient, do not copy, disseminate or disclose the contents of this communication. The sender does not waive confidentiality in the event of any inadvertent transmission to an unauthorized recipient. If you have received this email in error, please notify me immediately or contact Normandeau Associates, Inc. at (603) 472-5191 and permanently delete this message.

Appendix B

2024 West Branch Macroinvertebrate Sampling Results (Moody Mountain Environmental Report)

Ripogenus Hydroelectric Project (FERC No. 2572)
Penobscot Mills Hydroelectric Project (FERC No. 2458)

2024 Macroinvertebrate Sampling
of Six Sites in the West Branch Penobscot River
Downstream of the Ripogenus and Penobscot Mills Projects

Submitted by:

Paul C. Leeper
Moody Mountain Environmental
137 Diamond Str
Searsmont Maine 04973

Submitted to:

Wendy Bley
Kleinschmidt Associates
141 Main Street
Pittsfield, ME 04967

Date: May23, 2025

Introduction

This macroinvertebrate sampling study was conducted in support of the Federal Energy Regulatory Commission (FERC) relicensing of the Ripogenus Hydroelectric Project (FERC No. 2572) and Penobscot Mills Hydroelectric Project (FERC No. 2458). In 2022 as part of a FERC approved study plan, Great Lakes Hydro America, LLC (GLHA), collected benthic macroinvertebrate community samples from ten riverine locations throughout the Ripogenus and Penobscot Mills Project areas, in accordance with Maine Department of Environmental Protection (MDEP) protocols. Data collected in 2022 was subsequently provided to MDEP for evaluation with their linear discriminant model (LDM). Of the sites evaluated in 2022, the LDM returned results for six sites that indicated that the macroinvertebrate community was not consistent with the aquatic habitat classification of the reach. These six sites were resampled in 2024, and the results of the 2024 sampling are reported herein.

Study Objectives

The goal of the macroinvertebrate sampling study was to obtain data on the aquatic macroinvertebrate community in the West Branch of the Penobscot River (West Branch) and Millinocket Stream and assess these communities in terms of Maine's Aquatic Life Standards.

Study Area

In 2024, Moody Mountain Environmental (MME) placed samplers at four (4) sites in the West Branch and two (2) sites in Millinocket Stream to study aquatic macroinvertebrates (Figures 1 and 2).

Figure 1. Location of two (2) macroinvertebrate sampling sites downstream of McKay Station and at Little Ambejackmockamus Falls on the West Branch. July, August 2024. Source: Google Earth Pro

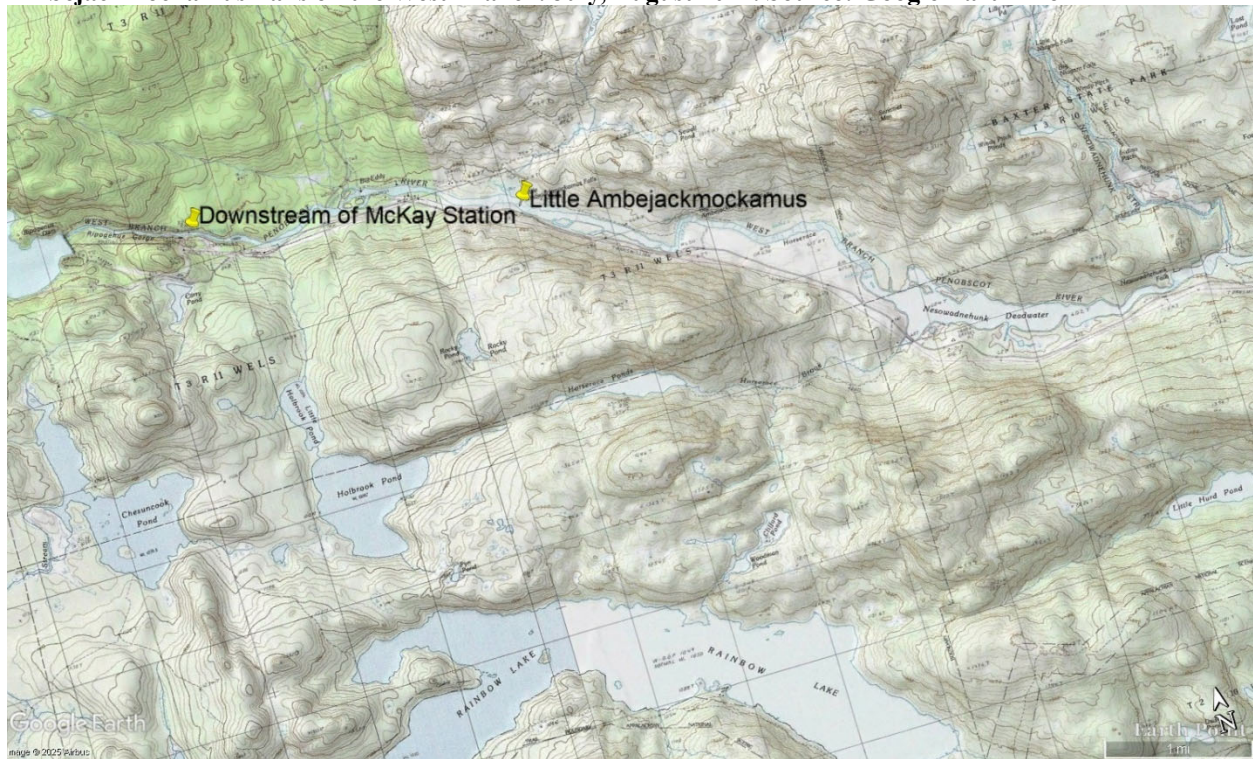
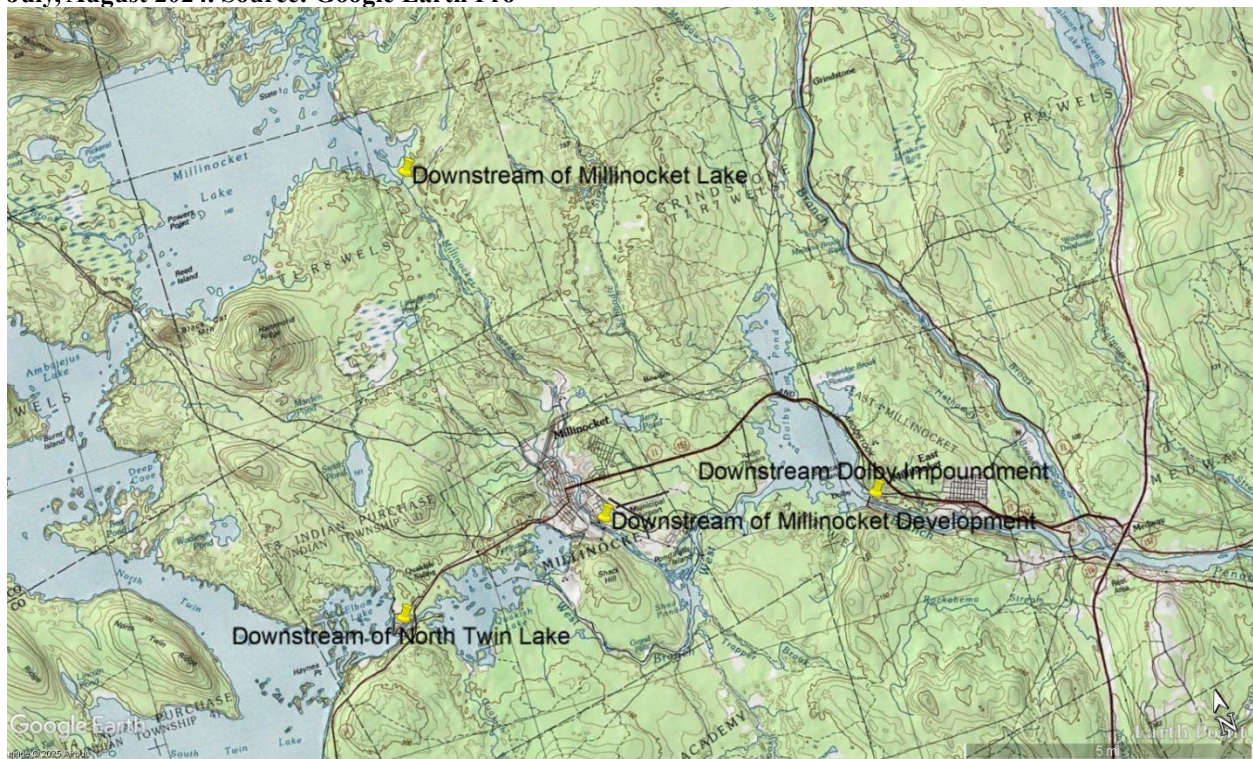


Figure 2. Location of four (4) macroinvertebrate sampling sites on the West Branch and Millinocket Stream. July, August 2024. Source: Google Earth Pro



Water Classification

Water classifications for the various reaches of the West Branch and Millinocket Stream are provided in Table 1. The West Branch downstream of the Ripogenus Project (McKay Station and Little Ambejackmockamus Falls [Little A]) is classified as Class A and AA, respectively (38 M.R.S.A § 467(7)(C)(1)). The West Branch downstream of the North Twin and Dolby dams is classified Class B (38 M.R.S.A § 467(7)(C)(1)). Millinocket Stream is classified as Class A downstream of the Millinocket Lake Storage dam and Class B downstream of the Millinocket Hydropower Station (38 M.R.S.A § 467(7)(C)(2)).

Table 1. Water classes of macroinvertebrate sampling sites downstream of the Ripogenus and Penobscot Mills Projects, 2024.

FERC Project	Sample Location	Waterbody	Classification
Ripogenus	McKay Station	W. Br. Penobscot R.	A
Ripogenus	Little Ambejackmockamus Falls	W. Br. Penobscot R.	AA
Penobscot Mills	Millinocket Lake Storage	Millinocket Stream	A
Penobscot Mills	North Twin Station	W. Br. Penobscot R.	B
Penobscot Mills	Millinocket Station	Millinocket Stream	B
Penobscot Mills	Dolby Station	W. Br. Penobscot R.	B

With respect to designated uses, the Maine Water Quality Law requires that “Class A waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life.” In addition, for Class A waters, “The habitat must be characterized as natural.” (38 M.R.S.A. § 465(4)(A). The term “Natural” is defined as “means living in, or as if in, a state of nature not measurably affected by human activity.” ((38 M.R.S.A. § 466(9)). The aquatic life standards and biocriteria requirements are the same for Class A and AA.

Maine Water Quality Law requires that “Class B waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other

aquatic life. The habitat must be characterized as unimpaired” (38 M.R.S.A. § 465(3)(A)). The word “unimpaired” is defined to mean “without a diminished capacity to support aquatic life” (38 M.R.S.A. § 466(11)). In addition, for Class B waters, “Discharges to Class B waters may not cause adverse impact to aquatic life in that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community” (38 M.R.S.A. § 465(3)(C)). The term “resident biological community” is defined as “aquatic life expected to exist in a habitat which is free from the influence of the discharge of any pollutant” (38 M.R.S.A. § 466(10)). The term “without detrimental changes in the resident biological community” means no significant loss of species or excessive dominance by any species or group of species attributable to human activity” (38 M.R.S.A. § 466(12)).

Study Methods

The objective of the macroinvertebrate sampling study was to determine if the aquatic life, in this case the macroinvertebrate communities, attained the respective Water Class standards. The Maine Department of Environmental Protection (MDEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in the macroinvertebrate sampling study. A summary of these methods is provided below.

The MDEP standard rock bag samplers were used for this study. These samplers hold approximately 16 lbs. of clean, washed, bank-run cobble, graded to uniform diameter range of 1.5 to 3 inches. Three (3) samplers were placed at each sample site; samplers were left in the water for approximately 28 days ($\pm$ 4 days) to allow for invertebrate colonization. Retrieval of the samplers was done using an aquatic D-net. The net was placed directly downstream of a sampler; the sampler was then picked up and placed in the net. The contents of each sampler and the net were washed through a sieve bucket and preserved in labeled jars. Habitat measurements including substrate type, depth, and temperature were collected at sampler collection and retrieval.

Samples were collected, preserved, and transported to the Moody Mountain Environmental laboratory. The three (3) samplers (replicates) from each site were sorted, identified, and enumerated.

The MDEP uses a linear discriminant water quality model (LDM) and professional judgment to determine water quality class attainment of aquatic macroinvertebrate communities. The LDM results are percentages indicating the probability of a site attaining water quality Classes A, and AA (the biocriteria requirements are the same), B, or C. The LDM numeric criteria results can be supplanted by professional judgment if conditions are such that the data sets are unsuitable for LDM analysis.

The LDM outlines a number of conditions that can trigger the use of professional judgment to analyze data; among these are:

1. Minimum Provisions - if the sample Mean Total Abundance is less than 50 individuals or Generic Richness is less than 15 genera.
2. Atypical Conditions - where atypical conditions could result in uncharacteristic findings, professional judgment can be used to make adjustments. Examples of these atypical conditions are:
 - a. - Habitat Factors
 - Lake Outlets
 - Impounded Waters
 - Substrate Characteristics
 - Tidal Waters
 - b. - Sampling Factors
 - Disturbed Samples
 - Unusual Taxa Assemblages
 - Human Error in Sampling
 - c. - Analytical Factors
 - Subsample versus Whole Sample analysis
 - Human Error in Processing

In cases where professional judgment is used, the Method outlines a process by which adjustments should occur. These are:

- a. **Resample** the site if specific sampling factors may have influenced the results
- b. **Raise the Finding** of the LDM from non-attainment to indeterminant or attainment of Class C;
- c. **Raise the Finding** of the LDM from one class to the next higher class;
- d. **Lower the Finding** of the LDM to indeterminant or the next lower class. This would be based on evidence that the narrative aquatic life criteria for the assigned class are not met;

e. **Determination of Non-Attainment:** Minimum Provisions not met by samples for which no evidence exists of atypical conditions.

f. **Determination of Attainment:** Minimum Provisions not met by samples for which there is evidence of factors that could result in minimum provisions not being met, professional judgment may be used to make a professional finding of attainment of the aquatic life criteria for any class. Such decisions will be provisional until appropriate resampling is carried out.

Typically, the process for analyzing community data using the LDM and making adjustments is the responsibility of the MDEP; however, in this report, professional judgment is used, taking into account these same factors.

Results

The samplers were placed at the sites on July 24 and 25, 2024. Samplers were retrieved on August 21 and 22, 2024. Specific site locations are shown in Table 2. Habitat measurements are shown in Table 3 and Appendix 1. Photos of the areas around the sample sites and substrates are included below.

Table 2. Site locations of six (6) macroinvertebrate sample sites on the West Branch and Millinocket Stream in 2024.

FERC Project	Sample Location	Waterbody	Town	Coordinates	
Ripogenus	McKay Station	West Branch	T3R11	45.878423	-69.159402
Ripogenus	Little A Falls	West Branch	T3R11	45.871855	-69.114129
Penobscot Mills	Millinocket Lake Storage	Millinocket Stream	T1R8	45.74194	-68.733223
Penobscot Mills	Millinocket Station	Millinocket Stream	Millinocket	45.64519	-68.700626
Penobscot Mills	North Twin Station	West Branch	T3 Indian Purchase	45.635572	-68.779458
Penobscot Mills	Dolby Station	West Branch	East Millinocket	45.631581	-68.605548

Table 3. Deployment/retrieval dates, substrate composition, and water quality at six (6) sites on the West Branch and Millinocket Stream in 2024.

Sample Location	Set Period (2024)		Substrate (percent composition)					Depth and Water Quality (Deploy/Retrieve)			
	Deploy	Retrieve	Bedrock	Boulder	Cobble	Gravel	Sand	Depth (cm)	Vel. (cm/s)	DO (mg/L)	Temp °C
McKay Station	7/24		80	20				30	80	7.8	21.9
		8/21						30	100.0	7.6	20.8
Little A Falls	7/24				60	30	10	27	90	8.6	21.9
		8/21						34	80.0	9	20.9
Millinocket Lake Storage	7/25			40	50	10		37	110	8.6	19.9
		8/22						30	100.0	8.8	21.9
Millinocket Station	7/25			5	50	45		37	110	8.6	19.9
		8/22						30	100.0	8.8	21.9
North Twin Station	7/25			40	30	30		79	31	8.1	23.1
		8/22						92	40.0	8.3	21.6
Dolby Station	7/25		10	70		20		91	25	7.6	23.6
		8/22						94	30.0	7.8	21.8

Photo 1 and 2. View upstream (L) and downstream (R) at sample site below McKay Station. W. Br. Penobscot R. 7/24/2025 PCL



Photo 3 and 4. Substrate and samplers at sample site below McKay Station. W. Br. Penobscot R. 8/21/2025 PCL

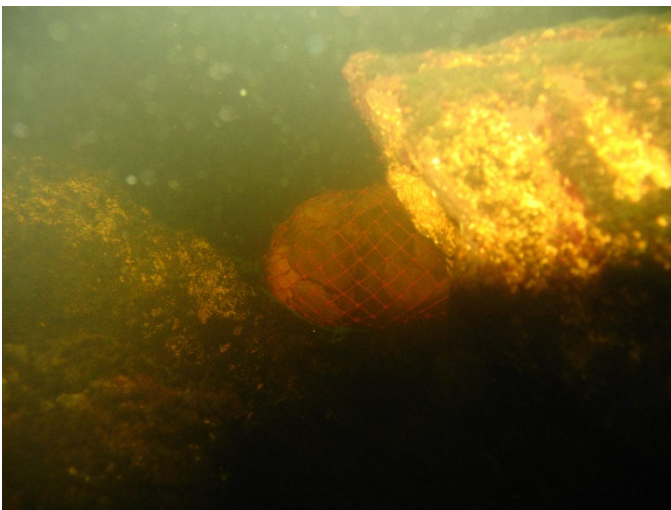


Photo 5 and 6. View across (L) and downstream (R) at sample site at Little A. W. Br. Penobscot R. 7/24/2025 PCL



Photo 7 and 8. Substrate and samplers at Little A sample site. W. Br. Penobscot R. 8/21/2025 PCL



Photo 9 and 10. View upstream (L) and downstream (R) at sample site below Millinocket Lake Storage dam. Millinocket Str. 7/25/2025 PCL



Photo 11 and 12. Substrate and sampler at sample site below Millinocket Lake Storage dam. Millinocket Str. 8/22/2025 PCL

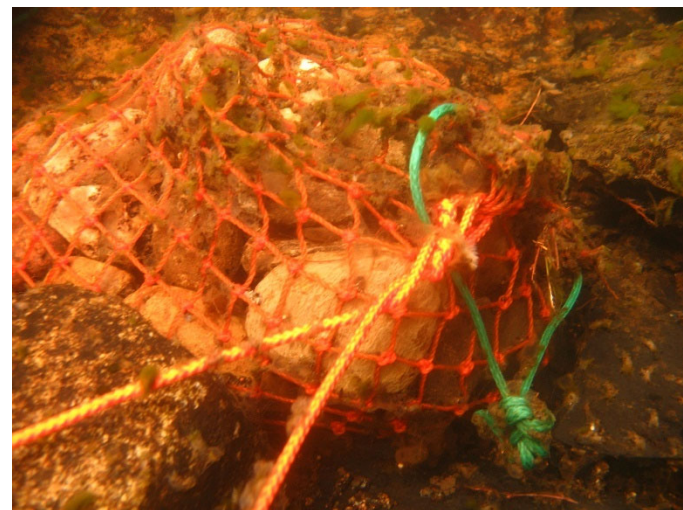


Photo 13 and 14. View upstream (L) and downstream (R) at sample site below Millinocket Station. Millinocket Str. 7/25/2025 PCL



Photo 15 and 16. Substrate and sampler at sample site below Millinocket Station. Millinocket Str. 8/22/2025 PCL

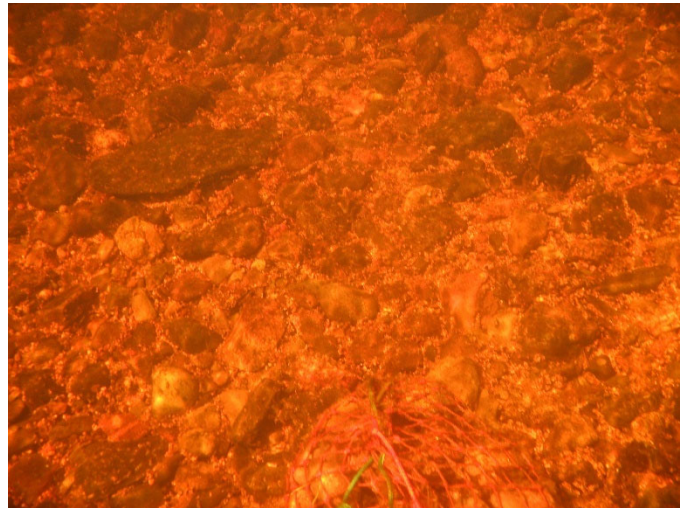
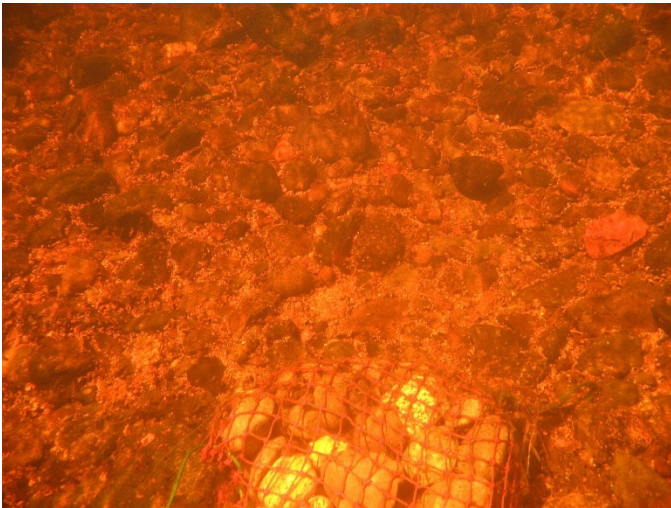


Photo 17 and 18. View upstream (L) and downstream (R) at sample site below North Twin dam. W. Br. Penobscot R. 7/25/2025 PCL



Photo 19 and 20. Substrate at North Twin sample site. W. Br. Penobscot R. 8/22/2025 PCL

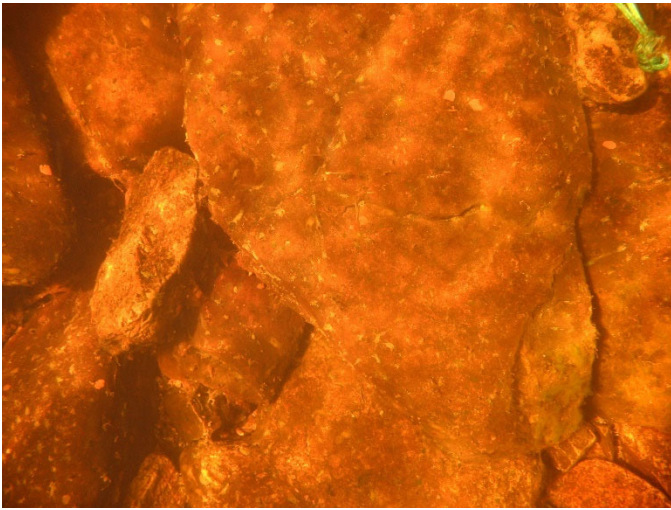
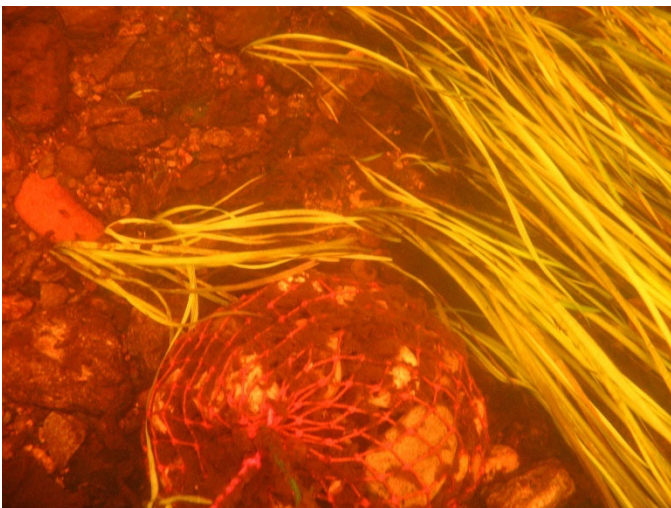


Photo 21 and 22. View upstream (L) and downstream (R) at sample site below Dolby dam. W. Br. Penobscot R. 7/25/2025 PCL



Photo 23 and 24. Substrate and samplers at Dolby sample site. W. Br. Penobscot R. 8/22/2025 PCL



LDM Results

The LDM biocriteria results from the MDEP were not available as of this writing. An addendum will be issued with the results when they are issued.

Community Analysis and Professional Opinion of Class Attainment

Community indices and dominant organisms for the six (6) macroinvertebrate sample sites are summarized in Tables 4 and 5 and Appendix 1. Individual community results and Moody Mountain Environmental's professional opinion of class attainment are presented by site below.

Table 4. Indices of community structure for the aquatic invertebrate community at six (6) sites on the West Branch and Millinocket Stream. July, August 2024.

Sample Location	Mean Tot. Abund.	Generic Richness	S.W. Diversity	H. Biotic Index		EPT Richness	EPT Tot. Ab.	EPT Rel. Abund.	EP Richness	EP Tot. Ab.	EP Rel. Ab.	Midge Richness	Midge Tot. Ab.	Midge Rel. Ab.
McKay Station	468.67	25	1.39	4.25	Very Good	19	409.67	87.4%	13	45.00	9.6%	4	56.67	12.1%
Little A	1561.77	31	2.33	4.25	Very Good	22	1136.27	72.8%	12	328.27	21.0%	5	383.50	24.6%
Millinocket Lake Storage	4839.33	29	1.91	4.14	Very Good	18	3421.67	70.7%	11	261.33	5.4%	3	500.00	10.3%
Millinocket Station	1885.33	35	2.36	4.63	Good	20	1585.00	84.1%	11	253.67	13.5%	7	273.33	14.5%
North Twin Station	2204.67	22	2.01	4.82	Good	16	1957.33	88.8%	8	209.67	9.5%	3	171.00	7.8%
Dolby Station	2250.50	35	2.34	5.81	Fair	20	1699.00	75.5%	11	250.50	11.1%	8	480.50	21.4%

Table 5. Dominant aquatic invertebrate organisms at six (6) sites on the West Branch and Millinocket Stream. July, August 2024.

Sensitivity to Poor Water Quality	Dominant Organism	% of Community					
		McKay Station	Little A	Mill. Lake Storage	Mill. Station	North Twin Station	Dolby Station
Sensitive	Mayfly-Heterocloeon		5.8%				
	Caddisfly-Macrostemum				8.5%	6.4%	
	Midge- Thienemannimyia group						6.1%
Intermediate	Caddisfly- Cheumatopsyche	8.6%	11.8%	23.0%	5.7%	8.3%	
	Caddisfly-Hydropsyche	67.6%	30.8%	34.0%	32.8%	40.1%	44.4%
Tolerant	Midge- Polypedilum		14.6%				
	Caddisfly- Neureclipsis			5.4%	15.5%	20.8%	
	Midge- Cricotopus	8.3%	14.8%	9.2%	7.1%		
	Flatworm- Planariidae			17.3%			

Downstream of McKay Station- Class A

The macroinvertebrate community sampled downstream of McKay Station was abundant and rich in taxa. The community was populated with 25 different taxa with a Mean Total Abundance of 469. The filter-feeding caddisflies *Hydropsyche* and *Cheumatopsyche* accounted for over 76 percent of the community.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Sensitive mayfly and stonefly taxa were well represented (13 taxa). The Hilsenhoff Biotic Index value, 4.25 indicated very good water quality (Hilsenhoff 1987).

The community structure and function found downstream of McKay Station on the West Branch indicates some evidence of organic enrichment and filter-feeder dominance which is a common phenomenon below natural lake outlets as well as impoundments (Hynes 1970, Spence and Hynes 1970, Parker and Voshell 1983). However, the presence in the community of sensitive stoneflies and mayflies indicates there is no excessive stress on the community.

Enrichment and caddisfly dominance downstream of lake outlets and dam outlets is a common phenomenon that has long been reported in the literature. Illies (1956 in Spence and Hynes 1970) reported an increase in the number of filter-feeding Trichoptera below a lake when compared to upstream communities. He attributed this to an increase in food availability. Filter-feeding organisms are often the dominant organisms in streams and rivers (Hynes 1970) and frequently are very abundant at lake outlets (Carlsson et al. 1977; Valett and Stanford 1987). The density or biomass of these filter-feeders typically decline the farther one looks downstream (Osgood 1979). This blossoming and decline of the aquatic community may be in response to a gradient in the quantity and/or quality of the food resources. High quality lake seston (the particulate matter in the water), typically made up of algal cells, is processed by the filter-feeders near the outlet and may be transformed to lower quality detritus (Benke and Wallace 1980, Valett and Stanford 1987).



This phenomenon has also been long observed at impoundment outlets. Spence and Hynes (1971) reported increased numbers of Hydropsychidae (the caddisflies *Hydropsyche* and *Cheumatopsyche* are genera in the family Hydropsychidae) and other organisms downstream of an impoundment and stated that the downstream differences were comparable to mild organic enrichment. Parker and Voshell (1983) reported production of filter-feeding Trichoptera to be the highest at a site closest to the dam when compared to sites farther downstream and sites on free-flowing rivers. They concluded that, not only the amount of high quality food, but the specific size of the seston, contributed to the ability of the caddisflies to occupy this niche.



Hydropsychidae and filter-feeding net
Photo by: J Montem



Hydropsychidae
and net
© David H. Funk

The community sampled downstream of McKay Station exhibited the typical community enrichment seen below natural lake and impoundment outlets. The Ripogenus dam operates in a similar manner to a natural lake outlet and enriches the aquatic community

downstream. The community sampled close to the dam is influenced by a high quality food resource exiting the impoundment. This resource allows the aquatic filter feeders to flourish. The community downstream of the dam is responding as expected within their habitats.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community downstream of McKay Station on the West Branch is as naturally occurs and attains Class A aquatic life standards.

Little A Falls- Class AA

The macroinvertebrate community sampled at Little A Falls (West Branch downstream of McKay Station) was very abundant and rich in taxa. The community was populated with 31 different taxa with a Mean Total Abundance of 1562. The filter-feeding caddisflies *Hydropsyche* and *Cheumatopsyche* accounted for over 43 percent of the community.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Sensitive mayfly and stonefly taxa were well represented (12 taxa) and the total abundance of these taxa represented over a fifth of the community. The mayfly *Heterocloeon* accounted for 6 percent of the community abundance. The Hilsenhoff Biotic Index value, 4.25 indicated very good water quality (Hilsenhoff 1987).

The community structure and function found at Little A Falls on the West Branch indicates some evidence of organic enrichment and filter-feeder dominance which, as discussed above, is a common phenomenon below lake outlets and impoundments. However, the community is more balanced at this site compared to the McKay Station site as it is over 2 miles downstream of the outlet. In addition, the presence in the community of sensitive stoneflies and mayflies indicates there is no excessive stress on the community.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community at the Little A Falls site on the West Branch is as naturally occurs and attains Class A (which are the same as Class AA) aquatic life standards.

Millinocket Lake Storage- Class A

The macroinvertebrate community sampled downstream of the Millinocket Lake Storage dam (Millinocket Stream) was very abundant and rich in taxa. The community was populated with 29 different taxa with a Mean Total Abundance of 4839. The filter-feeding caddisflies *Hydropsyche*, *Cheumatopsyche* and *Neureclipsis* accounted for over 62 percent of the community.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Sensitive mayfly and stonefly taxa were well represented (11 taxa). The Hilsenhoff Biotic Index value, 4.14 indicated very good water quality (Hilsenhoff 1987). Of note is that tolerant organisms were among the dominant taxa (relative abundance above 5%) representing 32 percent of the community.

The community structure and function found downstream of the Millinocket Lake Storage dam indicates evidence of organic enrichment and is dominated by filter-feeding organisms. As discussed above, this is a common phenomenon below lake outlets and impoundments. Sensitive stoneflies and mayflies are present in sufficient numbers and richness to indicate there is no excessive stress on the community.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community downstream of the Millinocket Lake Storage dam on Millinocket Stream is as naturally occurs and attains Class A aquatic life standards.

Millinocket Station- Class B

The macroinvertebrate community sampled downstream of the Millinocket Station on Millinocket Stream was very abundant and rich in taxa. The community was populated with 35 different taxa with a Mean Total Abundance of 1885. The filter-feeding caddisflies *Hydropsyche*, *Cheumatopsyche*, *Macrostemum*, and *Neureclipsis* accounted for over 62 percent of the community. *Macrostemum* is a caddisfly which is sensitive to poor water quality.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Sensitive mayfly and stonefly taxa were well represented (11 taxa) and made up 13 percent of the community abundance. The Hilsenhoff Biotic Index value, 4.63 indicated good water quality (Hilsenhoff 1987).

The community structure and function found downstream of the Millinocket Station indicates evidence of organic enrichment and is dominated by filter-feeding organisms. As discussed above, this is a common phenomenon below lake outlets and impoundments. Sensitive stoneflies and mayflies are present in sufficient numbers and richness to indicate there has been no detrimental changes in the resident biological community; specifically, there has been no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community downstream of the Millinocket Station on Millinocket Stream does not show excessive stress as a result of the project operation, and attains Class B aquatic life standards.

North Twin Dam- Class B

The macroinvertebrate community sampled downstream of the North Twin dam on the West Branch was very abundant and moderately rich in taxa. The community was populated with 22 different taxa with a Mean Total Abundance of 2205. The filter-feeding caddisflies *Hydropsyche*, *Cheumatopsyche*, *Macrostemum*, and *Neureclipsis* accounted for over 75 percent of the community. *Macrostemum* is a caddisfly which is sensitive to poor water quality.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Eight (8) sensitive mayfly and stonefly taxa are present representing 36 percent of the total richness. The Hilsenhoff Biotic Index value, 4.82 indicated good water quality (Hilsenhoff 1987).

The community structure and function found downstream of the North Twin dam indicates evidence of organic enrichment and filter-feeder dominance which, as discussed above, is a common phenomenon below lake outlets and impoundments. Sensitive stoneflies and mayflies are present in sufficient numbers and richness to indicate there has been no detrimental changes in the resident biological community; specifically, there has been no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community downstream of the North Twin dam on the West Branch does not show excessive stress as a result of the project operation, and attains Class B aquatic life standards.

Dolby Dam- Class B

The macroinvertebrate community sampled downstream of the Dolby dam on the West Branch was very abundant and rich in taxa. The community was populated with 35 different taxa with a Mean Total Abundance of 2250. The filter-feeding caddisflies *Hydropsyche* accounted for 44 percent of the community.

Indexes measuring the communities' tolerance to poor water quality conditions indicated good water quality. Eleven (11) sensitive mayfly and stonefly taxa are present representing 31 percent of the total richness. The Hilsenhoff Biotic Index value, 5.81 indicated only fair water quality (Hilsenhoff 1987).

The community structure and function found downstream of the Dolby dam indicates evidence of organic enrichment and filter-feeder dominance which, as discussed above, is a common phenomenon below lake outlets and impoundments. Sensitive stoneflies and mayflies are present in sufficient numbers and richness to indicate there has been no detrimental changes in the resident biological community; specifically, there has been no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

It is Moody Mountain Environmental's professional opinion that the macroinvertebrate community downstream of the Dolby dam on the West Branch does not show excessive stress as a result of the project operation, and attains Class B aquatic life standards.

Summary

1. The objective of the macroinvertebrate sampling study was to obtain data on the aquatic macroinvertebrate communities at six (6) sites on the West Branch and Millinocket Stream downstream of the Projects and assess these communities in terms of Maine's Aquatic Life Standards.
2. The Maine Department of Environmental Protection (MDEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in this study.
3. Samplers were retrieved on August 21 and 22, 2024 within an acceptable colonization time frame.
4. The LDM biocriteria results from the MDEP were not available as of this report. An

addendum will be issued when results are returned by the MDEP.

5. The invertebrate communities at all sites were abundant, rich, and well-populated with stress sensitive taxa.
6. The community structure and function at all sites indicate a healthy community with evidence of natural, biological enrichment.
7. It is my professional opinion that the macroinvertebrate communities sampled at McKay Station, Little A, and Millinocket Lake Storage Dam are naturally occurring, do not show excessive stress as a result of the project operation, and attain Class A aquatic life standards.
8. It is my professional opinion that the macroinvertebrate communities sampled at the Millinocket Station, North Twin Dam, and the Dolby Dam attain Class B aquatic life standards. There has been no detrimental changes in the resident biological communities at these sites; specifically, there has been no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

References

- Davies, S.P. and L. Tsomides. Revised 2014. Methods for biological sampling and analysis of Maine's rivers and streams. ME Dept. of Env. Prot. Augusta, ME. 31p.
- Hynes, H.B.N. 1970. The Ecology of Running Waters. Univ. of Toronto. Toronto, CA 555p.
- Parker, C.R. and J.R. Voshell Jr. 1983. Production of filter-feeding Trichoptera in an impounded and a free-flowing river. Can. J. Zool. 61:70-87.
- Spence, J.A., and H.B.N. Hynes. 1971. Differences in benthos upstream and downstream of an impoundment. J. Fish. Res. Bd. Canada 28: 35-43.

Appendix 1- LDM data files including field data, and individual replicate data.

New Site Information	
Waterbody Name	West Branch Penobscot River
Town	T3R11
Directions	Downstream of Mckay Station, river right
Coordinates Lat	45.878423
Coordinates Long	-69.159402
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data					
Waterbody Name	West Branch Penobscot River				
Town	T3R11				
Station Number	1234	Number only (omit 'S-')			
Log Number					
Sampled By	ntain Environmental	List			
Sample Method	RBG-Rock Bag	List			
Deployment Date	7/24/2024		Retrieval Date	8/21/2024	
Deployment Time	5:00:00 PM		Retrieval Time	4:00:00 PM	
Number Deployed	3		Number Retrieved	3	
Deployed Depth Rep 1	30	cm-required			
Deployed Depth Rep 2	30	cm-required			
Deployed Depth Rep 3	30	cm-required			
Physical Characteristics					
Land Use 1	Upland conifer	List			
Land Use 2	Upland hardwood	List			
Land Use 3		List			
Land Use 4		List			
Terrain	Hilly	List			
Canopy Cover	Partly open	List			
Location 1	Below Dam	List			
Location 2	Main Stem	List			
Location 3		List			
Potential Stressor(s)					
Stressor 1	Regulated Flows	List			
Stressor 2		List			
Stressor 3		List			
Stressor 4		List			
Physical Characteristics of Bottom					
Bedrock	80	%			
Boulders (>10")	20	%			
Rubble/Cobble (2.5" – 10")		%			
Gravel (1/8" – 2.5")		%			
Sand (<1/8")		%			
Silt		%			
Clay		%			
Muck		%			
Detritus		%			
Sum	100				
Habitat Characteristics			Habitat Characteristics		
		Unit	Retrieval Value		Unit
Wetted Width	21.0	m	21.0		m
Bankfull Width		m			m
Depth	30	cm	30		cm
Velocity	80	cm/sec	100.0		cm/sec
DO	7.8	mg/L	7.6		mg/L
DO Percent Saturation		%			%
Temperature	21.9	Deg C	20.8		Deg C
SPC		uS/cm			uS/cm
pH		STU			STU
DO Meter #	SI Pro DSS (ODO)	List	SI Pro DSS (ODO)		List
DO Meter calibrated?	Yes	List	Yes		List
SPC/pH Meter #		List			List
SPC/pH Meter calibrated?		List			List
HETL Folder #					
HETL Folder # - DUP					
Comments at Deployment:			Comments at Retrieval:		
			Before flow change V=120 cm/s D=61 cm		

New Site Information	
Waterbody Name	West Branch Penobscot River
Town	T3R11
Directions	Downstream of Little Amberjackawockamus Falls, River Right
Coordinates Lat	45.871855
Coordinates Long	-69.114129
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data					
Waterbody Name	West Branch Penobscot River				
Town	T3R11				
Station Number		Number only (omit 'S-')			
Log Number					
Sampled By	ntain Environmental	List			
Sample Method	RBG-Rock Bag	List			
Deployment Date	7/24/2024		Retrieval Date	8/21/2024	
Deployment Time	5:15:00 PM		Retrieval Time	6:15:00 PM	
Number Deployed	3		Number Retrieved	3	
Deployed Depth Rep 1	27	cm-required			
Deployed Depth Rep 2	27	cm-required			
Deployed Depth Rep 3	27	cm-required			
Physical Characteristics					
Land Use 1	Upland conifer	List			
Land Use 2	Upland hardwood	List			
Land Use 3		List			
Land Use 4		List			
Terrain	Rolling	List			
Canopy Cover	Open	List			
Location 1	Main Stem	List			
Location 2		List			
Location 3		List			
Potential Stressor(s)					
Stressor 1	Regulated Flows	List			
Stressor 2		List			
Stressor 3		List			
Stressor 4		List			
Physical Characteristics of Bottom					
Bedrock		%			
Boulders (>10")		%			
Rubble/Cobble (2.5" – 10")	60	%			
Gravel (1/8" – 2.5")	30	%			
Sand (<1/8")	10	%			
Silt		%			
Clay		%			
Muck		%			
Detritus		%			
Sum	100				
Habitat Characteristics					
Wetted Width	56.0	m	Wetted Width	56.0	m
Bankfull Width	75.0	m	Bankfull Width	75.0	m
Depth	27	cm	Depth	34	cm
Velocity	90	cm/sec	Velocity	80.0	cm/sec
DO	8.6	mg/L	DO	9	mg/L
DO Percent Saturation		%	DO Percent Saturation		%
Temperature	21.9	Deg C	Temperature	20.9	Deg C
SPC		uS/cm	SPC		uS/cm
pH		STU	pH		STU
DO Meter #	SI Pro DSS (ODO)	List	DO Meter #	SI Pro DSS (ODO)	List
DO Meter calibrated?	Yes	List	DO Meter calibrated?	Yes	List
SPC/pH Meter #		List	SPC/pH Meter #		List
SPC/pH Meter calibrated?		List	SPC/pH Meter calibrated?		List
HETL Folder #					
HETL Folder # - DUP					
Comments at Deployment:			Comments at Retrieval:		
1000cfs					

New Site Information

Waterbody Name	Millinocket Stream
Town	T1R8

Directions	Immediately downstream at Millinocket Lake Dam, River Center
Coordinates Lat	45.74194
Coordinates Long	-68.733223
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data					
Waterbody Name	Millinocket Stream				
Town	T1R8				
Station Number	1235		Number only (omit 'S-')		
Log Number					
Sampled By	ntain Environmental	List			
Sample Method	RBG-Rock Bag	List			
Deployment Date	7/25/2024		Retrieval Date	8/22/2024	
Deployment Time	1:28 PM		Retrieval Time	2:18 PM	
Number Deployed	3		Number Retrieved	3	
Deployed Depth Rep 1	37	cm-required			
Deployed Depth Rep 2	37	cm-required			
Deployed Depth Rep 3	37	cm-required			
Physical Characteristics					
Land Use 1	Upland conifer	List			
Land Use 2	Upland hardwood	List			
Land Use 3		List			
Land Use 4		List			
Terrain	Rolling	List			
Canopy Cover	Open	List			
Location 1	Below Dam	List			
Location 2	Main Stem	List			
Location 3		List			
Potential Stressor(s)					
Stressor 1	Regulated Flows	List			
Stressor 2		List			
Stressor 3		List			
Stressor 4		List			
Physical Characteristics of Bottom					
Bedrock		%			
Boulders (>10")	40	%			
Rubble/Cobble (2.5" - 10")	50	%			
Gravel (1/8" - 2.5")	10	%			
Sand (<1/8")		%			
Silt		%			
Clay		%			
Muck		%			
Detritus		%			
Sum	100				
Habitat Characteristics			Habitat Characteristics		
Deployment Value	Unit		Retrieval Value	Unit	
Wetted Width	25	m	25	m	
Bankfull Width		m		m	
Depth	37	cm	30	cm	
Velocity	110	cm/sec	100.0	cm/sec	
DO	8.6	mg/L	8.8	mg/L	
DO Percent Saturation		%		%	
Temperature	19.9	Deg C	21.9	Deg C	
SPC		uS/cm		uS/cm	
pH		STU		STU	
DO Meter #	YSI proDSS	List	DO Meter #	YSI proDSS	List
DO Meter calibrated?	Yes	List	DO Meter calibrated?	Yes	List
SPC/pH Meter #		List	SPC/pH Meter #		List
SPC/pH Meter calibrated?		List	SPC/pH Meter calibrated?		List
HETL Folder #					
HETL Folder # - DUP					
Comments at Deployment:			Comments at Retrieval:		
TDS 14 ppm			TDS 16 ppm		

New Site Information	
Waterbody Name	Millinocket Stream
Town	Millinocket
Directions	Downstream of Millinocket Station, river left
Coordinates Lat	45.64519
Coordinates Long	-68.700626
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data					
Waterbody Name	Millinocket Stream				
Town	Millinocket				
Station Number		Number only (omit 'S-')			
Log Number					
Sampled By	ntain Environmental	List			
Sample Method	RBG-Rock Bag	List			
Deployment Date	7/25/2024		Retrieval Date	8/22/2024	
Deployment Time	11:54:00 AM		Retrieval Time	12:59:00 PM	
Number Deployed	3		Number Retrieved	3	
Deployed Depth Rep 1	94	cm-required			
Deployed Depth Rep 2	94	cm-required			
Deployed Depth Rep 3	94	cm-required			
Physical Characteristics					
Land Use 1	Urban	List			
Land Use 2	Upland hardwood	List			
Land Use 3		List			
Land Use 4		List			
Terrain	Flat	List			
Canopy Cover	Open	List			
Location 1	Below Dam	List			
Location 2	Below Confluence	List			
Location 3	Below Urban NPS	List			
Potential Stressor(s)					
Stressor 1	Urban Runoff	List			
Stressor 2	Regulated Flows	List			
Stressor 3		List			
Stressor 4		List			
Physical Characteristics of Bottom					
Bedrock		%			
Boulders (>10")		%			
Rubble/Cobble (2.5" - 10")	5	%			
Gravel (1/8" - 2.5")	50	%			
Sand (<1/8")	45	%			
Silt		%			
Clay		%			
Muck		%			
Detritus		%			
Sum	100				
Habitat Characteristics					
Wetted Width	41.0	m			
Bankfull Width	53.0	m			
Depth	94	cm			
Velocity	60	cm/sec			
DO	7.4	mg/L			
DO Percent Saturation		%			
Temperature	23	Deg C			
SPC		uS/cm			
pH		STU			
DO Meter #	YSI Pro DSS (ODO)	List			
DO Meter calibrated?		List			
SPC/pH Meter #		List			
SPC/pH Meter calibrated?	Yes	List			
HETL Folder #					
HETL Folder # - DUP					
Comments at Deployment:			Comments at Retrieval:		

New Site Information	
Waterbody Name	West Branch Penobscot River
Town	T3 Indian Purchase
Directions	Downstream of North Twin Dam, river center
Coordinates Lat	45.635572
Coordinates Long	-68.779458
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data						
Waterbody Name	West Branch Penobscot River					
Town	T3 Indian Purchase					
Station Number		Number only (omit 'S-')				
Log Number						
Sampled By	ntain Environmental	List		Normandeau Associates		
Sample Method	RBG-Rock Bag	List				
Deployment Date	7/25/2024			Retrieval Date	8/22/2024	
Deployment Time	10:47:00 AM			Retrieval Time	11:06:00 AM	
Number Deployed	3			Number Retrieved	3	
Deployed Depth Rep 1	79	cm-required				
Deployed Depth Rep 2	79	cm-required				
Deployed Depth Rep 3	79	cm-required				
Physical Characteristics						
Land Use 1	Upland conifer	List				
Land Use 2	Upland hardwood	List				
Land Use 3		List				
Land Use 4		List				
Terrain	Rolling	List				
Canopy Cover	Open	List				
Location 1	Below Dam	List				
Location 2	Main Stem	List				
Location 3		List				
Potential Stressor(s)						
Stressor 1	Regulated Flows	List				
Stressor 2		List				
Stressor 3		List				
Stressor 4		List				
Physical Characteristics of Bottom						
Bedrock		%				
Boulders (>10")	40	%				
Rubble/Cobble (2.5" – 10")	30	%				
Gravel (1/8" – 2.5")	30	%				
Sand (<1/8")		%				
Silt		%				
Clay		%				
Muck		%				
Detritus		%				
Sum	100					
Habitat Characteristics						
Wetted Width	59.0	m		Habitat Characteristics	Retrieval Value	Unit
Bankfull Width		m		Wetted Width	62.0	m
Depth	79	cm		Bankfull Width		m
Velocity	31	cm/sec		Depth	92	cm
DO	8.1	mg/L		Velocity	40.0	cm/sec
DO Percent Saturation		%		DO	8.3	mg/L
Temperature	23.1	Deg C		DO Percent Saturation		%
SPC		uS/cm		Temperature	21.6	Deg C
pH		STU		SPC		uS/cm
DO Meter #	SI Pro DSS (ODO)	List		pH		STU
DO Meter calibrated?	Yes	List		DO Meter #	SI Pro DSS (ODO)	List
SPC/pH Meter #		List		DO Meter calibrated?	Yes	List
SPC/pH Meter calibrated?		List		SPC/pH Meter #		List
HETL Folder #				SPC/pH Meter calibrated?		List
HETL Folder # - DUP						
Comments at Deployment:			Comments at Retrieval:			

New Site Information	
Waterbody Name	West Branch Penobscot River
Town	East Millinocket
Directions	Downstream of Dolby Station, river left
Coordinates Lat	45.631581
Coordinates Long	-68.605548
Location Method	GPS Recreation Grade
Location Accuracy	Within 5M

EDD for Rivers/Streams Macroinvertebrate Field Data					
Waterbody Name	West Branch Penobscot River				
Town	East Millinocket				
Station Number	1231	Number only (omit 'S-')			
Log Number					
Sampled By		List			
Sample Method	RB-Rock Basket	List			
Deployment Date	7/25/2024		Retrieval Date	8/22/2024	
Deployment Time	10:30:00 AM		Retrieval Time	9:45:00 AM	
Number Deployed	3		Number Retrieved	3	
Deployed Depth Rep 1	91	cm-required			
Deployed Depth Rep 2	91	cm-required			
Deployed Depth Rep 3	91	cm-required			
Physical Characteristics					
Land Use 1	Urban	List			
Land Use 2	Upland hardwood	List			
Land Use 3	Upland conifer	List			
Land Use 4		List			
Terrain	Rolling	List			
Canopy Cover		List			
Location 1	Below Dam	List			
Location 2	Main Stem	List			
Location 3		List			
Potential Stressor(s)					
Stressor 1	Regulated Flows	List			
Stressor 2	Urban Runoff	List			
Stressor 3		List			
Stressor 4		List			
Physical Characteristics of Bottom					
Bedrock	10	%			
Boulders (>10")	70	%			
Rubble/Cobble (2.5" – 10")		%			
Gravel (1/8" – 2.5")	20	%			
Sand (<1/8")		%			
Silt		%			
Clay		%			
Muck		%			
Detritus		%			
Sum	100				
Habitat Characteristics					
Wetted Width	141.0	m	Wetted Width	141.0	m
Bankfull Width	141.0	m	Bankfull Width	141.0	m
Depth	91	cm	Depth	94	cm
Velocity	25	cm/sec	Velocity	30.0	cm/sec
DO	7.6	mg/L	DO	7.8	mg/L
DO Percent Saturation		%	DO Percent Saturation		%
Temperature	23.6	Deg C	Temperature	21.8	Deg C
SPC		uS/cm	SPC		uS/cm
pH		STU	pH		STU
DO Meter #	SI Pro DSS (ODO)	List	DO Meter #	SI Pro DSS (ODO)	List
DO Meter calibrated?	Yes	List	DO Meter calibrated?	Yes	List
SPC/pH Meter #		List	SPC/pH Meter #		List
SPC/pH Meter calibrated?		List	SPC/pH Meter calibrated?		List
HETL Folder #					
HETL Folder # - DUP					
Comments at Deployment:			Comments at Retrieval:		

Appendix C

Fish Stranding Mitigation Study Report

McKay Station Fish Stranding Mitigation Study Report

1.0 Introduction

Great Lakes Hydro America, LLC (“GLHA” or “Licensee”) is the Licensee of the Ripogenus Project (FERC No. 2572) (Project) located on the West Branch of the Penobscot River (West Branch) in Penobscot and Piscataquis counties, Maine. In accordance with 18 Code of Federal Regulations (CFR) §5.15, the McKay Station Fish Stranding Mitigation Study was conducted in response to the Federal Energy Regulatory Commission’s (FERC’s) Second Study Plan Determination (SPD) dated September 19, 2023.

2.0 Basis for the Study

Based on study requests from stakeholders, FERC’s May 13, 2022 SPD required GLHA to conduct a Fish Stranding Study in the West Branch downstream from McKay Station. The study was designed to evaluate the level of fish and macroinvertebrate stranding and mortality associated with an unplanned station trip (i.e., outage) at McKay Station, when flows would drop from generation releases (about 2,000 cubic feet per second [cfs]) to the outage flow of approximately 500 cfs¹. The results of the Fish Stranding Study were provided in the Initial Study Report (ISR) filed with FERC on April 24, 2023, and indicated that stranding and mortality of fish and macroinvertebrates occurs in the West Branch downstream of McKay Station when river flows change abruptly due to an unplanned station trip.

Based on the results of the Fish Stranding Study and stakeholders requests, FERC’s September 19, 2023 SPD required GLHA to conduct a McKay Station Ramping Rate Study² to explore protocols for changing flows at McKay Station that could reduce or eliminate stranding and mortality of fish in the West Branch. The results of the McKay Station Ramping Rate Study were provided in the Final License Application (FLA) filed with FERC on September 30, 2024, and indicated that stranding and mortality of fish and macroinvertebrates occurs in the West Branch downstream of

¹ As further discussed in this report, approximately 500 cfs represents the existing mitigation flow that is provided from McKay Station upon an unplanned station trip. This flow is in addition to any flows provided via Ripogenus Dam at the time of the unplanned outage.

² Though both the Fish Stranding Study and the McKay Station Ramping Rate Study are associated with evaluating stranding and mortality of aquatic organisms downstream of McKay Station, the studies differ in that the former addresses flow changes resulting from an unplanned station trip/shutdown and the latter addresses flow changes resulting from normal station operations.

McKay Station when river flows change during station operations, but to a lesser degree than the stranding/mortality that occurs during an unplanned station trip.

Based on the results of the Fish Stranding Study, FERC's September 19, 2023 SPD required GLHA to conduct a McKay Station Fish Stranding Mitigation Study to identify and assess measures to minimize the level of fish and macroinvertebrate stranding and mortality that occurs when McKay Station trips offline. FERC indicated that GLHA should consult with the U.S. Fish and Wildlife Service (USFWS), Maine Department of Inland Fisheries and Wildlife (MDIFW), and Maine Trout Unlimited (TU) to determine: 1) what effect the unplanned outages at McKay Station have on the fish and macroinvertebrate populations in the West Branch downstream from McKay Station; and 2) if appropriate, identify potential ways to address fish and macroinvertebrate stranding and mortality downstream from McKay Station. FERC indicated that examples of measures that could be considered to mitigate fish stranding downstream of McKay Station include: 1) a minimum flow that reduces the amount of stranding that is occurring; 2) a battery back-up system that supplies power to a unit or units at McKay Station when the main power source is unavailable, which would reduce the amount of time at the low flow; or 3) automating a gate a Ripogenus Dam so that when McKay Station trips offline, a gate opens to release the present minimum flow to the West Branch downstream of Ripogenus Dam.

In addition to the aforementioned studies required by FERC during the ongoing relicensing proceeding for the Ripogenus Project, via letter dated August 22, 2023,³ FERC's Division of Hydropower Administration and Compliance also requested that GLHA identify and implement interim measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during downramping events, such as unit outages, until the current relicensing process is concluded and a long-term measure is identified, if determined necessary. Accordingly, via letter dated January 19, 2024,⁴ GLHA filed with FERC an interim plan for the protection of aquatic resources during McKay Station outages.

This study report provides an overview of the results of the Fish Stranding Study, McKay Station Ramping Rate Study, GLHA's Interim Plan for the Protection of Aquatic Resources during McKay Station Outages, and an evaluation of potential measures to mitigate the effects of unplanned

³ Accession Number: 20230822-3052

⁴ Accession Number: 20240119-5146

McKay Station outages. The results of these studies and additional analyses conducted by GLHA were used to develop this McKay Station Fish Stranding Mitigation Study Report.

3.0 Study Goals and Objectives

The goals and objectives of this study are to: 1) determine what effect unplanned outages at McKay Station and/or normal operations of McKay Station have on fish and macroinvertebrate populations in the West Branch downstream of McKay Station; and 2) if appropriate, identify and assess measures to minimize the level of fish and macroinvertebrate stranding and mortality that occurs when flows in the West Branch downstream of McKay Station are modified due to normal operation of McKay Station and/or due to unplanned station outages.

4.0 Study Area

The study area includes the West Branch downstream of McKay Station to Nesowadnehunk Deadwater where the potential for fish stranding occurs based on operations or outages at McKay Station.

5.0 Study Methodology

The methodology for the McKay Station Fish Stranding Mitigation Study consisted of the following:

- Provide a general description of the Project and its operations, including a summary of the historical and current procedures for providing flows during a station outage;
- Provide a summary of the results of the Fish Stranding Study and McKay Station Ramping Rate Study;
- Provide a summary of historical and existing fish assemblage in the West Branch downstream of McKay Station and evaluate if operations of McKay Station affect the fish and macroinvertebrate populations in the West Branch;
- Provide a summary of historical evaluations for providing minimum flow during station outages;

- If operations of McKay Station are having a population-level effect on fish and macroinvertebrates in the West Branch downstream of McKay Station, identify proposed mitigation measures to limit or eliminate the effect.

6.0 Results

6.1 Project Description

The Ripogenus Project was originally constructed between the late-19th century and early-20th century to meet the hydromechanical and hydroelectric demands of the Millinocket and East Millinocket Paper Mills, which were constructed in 1900 and 1906, respectively, and fully shuttered in 2008 and 2013, respectively.

FERC issued an original license for the Ripogenus Project on December 20, 1968 (with an effective date of October 1, 1951), which expired on December 31, 1993. The Project operated under an annual license until a new license was issued to Great Northern Paper, Inc. on October 22, 1996. On May 19, 2000, the Commission issued an order transferring the license from Great Northern Paper, Inc. to GNE, LLC, and on August 26, 2002, FERC issued an order amending the license to reflect a change in the Licensee's name from GNE, LLC to Great Lakes Hydro America, LLC (the current Licensee).

McKay Station was constructed and began operation in the mid-1950s. McKay Station currently has three turbine units (Units 1, 2 and 3) with a hydraulic capacity ranging from approximately 400 cfs (with one unit operating) to 3,500 cfs with all three units in operation⁵ (Table 1).

⁵ Historically, the units were capable of operating at a hydraulic capacity ranging from approximately 400 cfs to 1,100 or 1,300 cfs. However, currently the units vibrate significantly at gate positions less than 70% to 80% of maximum hydraulic capacity, depending on the impoundment water surface elevation. Therefore, under typical operations, compared to an extended ramping of the units during startup or shutdown, the units are operated to rapidly move through the vibration zones to avoid damage to the units.

Table 1. Type and hydraulic capacity of turbines at the Ripogenus Project

Unit No.	Turbine Type	Minimum Hydraulic Capacity (cfs)	Maximum Hydraulic Capacity (cfs)
1	Vertical Francis	400	1,100
2	Vertical Francis	400	1,100
3	Vertical Francis	424	1,300
Total		--	3,500

Project Operations

The 1968 license for the Ripogenus Project included two articles related to the operation of the Project.

- Article 32 required that the Project operate in such a manner so as to provide an outflow during the flood season which, when combined with the runoff of the intervening area between the Ripogenus Project and the North Twin Development, will not cause an outflow that would exceed the spillway capacity of the North Twin Development.
- Article 33 required that the Project operate to provide a minimum flow of 200 cfs, as long as any storage remains in Ripogenus Lake, in the West Branch immediately below McKay Station and, following consultation with the MDIFW and the USFWS, take such steps as may be necessary to protect the fishery resources in the river channel between the dam and McKay Station.

Although operations data are not available for the period under the 1968 license, a description of typical Project operations was provided in the 1991 License Application filed with FERC in support of obtaining new licenses for the Projects in 1996. Under the 1968 licenses, McKay Station generated 40 Hz power to power the Millinocket and East Millinocket paper mills, with loads supplied by the grid being mostly large groundwood grinder motors where loads varied significantly during the grinding process. Due to the large size of these loads relative to the 40 Hz system, the system was prone to frequency upsets when the load changes occurred. Individual hydro governor controls on each hydro unit sensed the change in frequency when the load on a grinder motor changed and adjusted generator outputs in terms of flow and generation to compensate for the change and achieve a new balance. These frequency changes and governor responses made it impossible to maintain instantaneous flows at all 40 Hz hydro generators,

particularly at McKay Station, which was the first station to respond to a frequency upset (GNNC 1991). Hence, flows downstream of McKay Station historically varied during mill operations.

The Ripogenus Project operates as a store-and-release development using an annual seasonal drawdown to provide a reliable source of flows downstream of the Project. As presented throughout the relicensing proceeding, the Ripogenus Project is the primary water source that supports flows on the West Branch and main stem of the Penobscot River. Article 402 of the existing license requires minimum flows downstream of McKay Station into the West Branch as specified in Table 2. Flows below McKay Station are provided via the turbines; however, if necessary, GLHA will manually open a gate at Ripogenus Dam to augment flows.⁶

Table 2. Minimum flow requirements downstream of McKay Station for the Ripogenus Project

Date Range	Minimum Flow Requirement ¹
<i>Fish Spawning or Incubation</i>	
September 16 – October 14	1,000 cfs to facilitate drawdown of the North Twin impoundment (part of the Penobscot Mills Project).
October 15 – November 15	At least 1,422 cfs or inflow, but not less than 1,300 cfs ² for salmon spawning.
November 16 – June 7	Greater than 1,422 cfs (or the spawning flow established above for the year) ² for salmon incubation.
<i>Whitewater</i>	
May 1 – September 15 (8:30 AM – 5:00 PM)	Normal hydrologic year ³ : • 2,300 cfs on Saturdays and Sundays • 2,200 cfs on Mondays and Fridays • 2,000 cfs on Tuesdays through Thursdays Wet or dry hydrologic year ³ : • 2,200 cfs on Saturdays and Sundays • 2,000 cfs on Mondays and Fridays • 1,800 cfs on Tuesdays through Thursdays
September 16 – October 1 (8:30 AM – 5:00 PM)	Normal hydrologic year ³ : • 2,300 cfs on Saturdays and Sundays Wet or dry hydrologic year ³ : • 2,200 cfs on Saturdays and Sundays
June 8 – October 14 (5:00 PM – 8:30 AM)	1,000 cfs
<i>Station Outages</i>	
Times of generating unit outage	400 cfs with scheduled minimum flows identified above to be resumed as quickly as possible by releases from Ripogenus Dam if necessary, but in no event in more than three days following the initial outage.

¹ Minimum flow shall be the minimum flows for each hourly period measured on the basis of an hourly average.

² Flows to be established each year in consultation with the USFWS and MDIFW.

³ The whitewater flow for each month from May through September is determined on the first day of each month based on an analysis of Total Available Water as described in the Water Use Plan in the application for new license filed with the Commission on December 17, 1991. The determination of “wet,” “normal,” or “dry” shall remain

⁶ The planned release of any flows from Ripogenus Dam are provided with consideration of public safety within the reach below the dam.

constant during the month based on the first day of the month classification. The range of “normal” available water represents the expected available water during normal hydrologic conditions. It is defined as the range between $x-s$ and $x+s$, where “ x ” is the mean value and “ s ” is the standard deviation. Based on a statistical analysis, total available water would be expected to be within this “normal” range two-thirds of the time and outside of this range (“wet” or “dry” years) one-third of the time.

Flows during McKay Station Outages

On May 3, 1991, following extensive consultation with resource agencies and the desire for a downstream mitigation flow following unplanned station outages, Great Northern Nekoosa Corporation (licensee for the Project at the time) filed with FERC a Plan for Providing Minimum Flow (1991 Plan) that detailed the proposed use of a braking system to provide a flow of approximately 400 cfs into the West Branch during unplanned outages at McKay Station. A copy of the 1991 Plan is provided in Attachment 1 of this study report. At the time of the relicensing, the implementation of the plan, in combination with the development and operation of the Holbrook Side Channel, was determined to provide the necessary mitigation to address the occurrence and frequency of unplanned outages at McKay Station.

As detailed in the 1991 Plan, the braking system was operated by automatically closing the wicket gates when a station trip occurred, which in turn slowed the turbines until the brakes (which were clamped to the turbine shaft discs) could bring the turbines to a complete stop. Once the turbines stopped, the wicket gates automatically reopened to 8 to 9 percent gate, which allowed approximately 400 cfs to pass while the brakes held the turbines in a stationary position. Testing of the system, as detailed in the 1991 Plan, demonstrated that it took approximately 20 minutes for this system to release the full 400 cfs to the West Branch below McKay Station following a station outage.

In May 2016, the braking system malfunctioned during an outage at McKay Station under high head conditions when the Ripogenus impoundment was nearly full. GLHA determined that the high water levels resulted in significant forces that could not be overcome (by the existing braking system) to brake and stop the units. As indicated in a letter to FERC dated February 16, 2018, GLHA identified an improved system for releasing minimum flows during outages at McKay Station which involved spinning (rather than braking) of the units to pass flow, which was tested and found to successfully provide an estimated flow of 479 cfs. The unit spinning system to provide the required flow during an unplanned station outage remains in effect today with flows

of at least 400 cfs provided to the West Branch from McKay Station within a few minutes after a station trip occurs.

6.2 Summary of Fish Stranding Study Results

Over the term of the Project's existing license, the frequency and duration of unplanned McKay Station outages have been greatly reduced. As discussed further in this report, this reduction in unplanned McKay Station outages is the result of upgrades within the powerhouse and transmission system, as well as improved response measures. Currently, unplanned station outages occur infrequently (i.e., an average of 0.7 outages per year), with five documented occurrences from 2018 through 2024 (2 in 2018, 2 in 2021, and 1 in 2023), which, on average, lasted approximately 3.5 hours. To date, there have been no unplanned outages in 2025. During unplanned station outages, GLHA implements a procedure that provides the required 400 cfs outage flow (i.e., via the automated flow from McKay Station in combination with leakage and/or seasonal minimum flows released from Ripogenus Dam) to the West Branch within minutes. The outage minimum flow is provided until the outage is resolved, units are restored to service, or a gate can be safely opened at Ripogenus Dam. For the October 2022 Fish Stranding Study, a typical unplanned station outage was simulated by reducing the flow from McKay Station from approximately 2,200 cfs to 510 cfs, maintaining 510 cfs for 4 hours, and then restoring flow from McKay Station to 2,200 cfs. During the simulated outage, changes in water surface elevation occurred in approximately 15 to 30 minutes in the upper reaches of the study area. River water surface levels stabilized after approximately 1 hour at Telos Bridge and after 3.5 hours at the Nesowadnehunk Deadwater. In the West Branch, the total change in water surface elevation varied from 1.4 feet at the upstream end of the Nesowadnehunk Deadwater to 3.4 feet at Telos Bridge, a high gradient reach that is relatively narrow in some areas. The changes in water surface elevation at Big Eddy and Little A were both approximately 2 feet. Of note, no changes in water surface elevation occurred within the Holbrook Side Channel, an existing mitigation measure implemented to provide landlocked salmon nursery and spawning habitat. Aquatic habitat along the shorelines was exposed during low flow conditions; however, much of the river channel remained wetted.

Stranded fish were observed throughout seven distinct reaches of the West Branch between McKay Station and the Nesowadnehunk Deadwater. Approximately 450 stranded fish were observed during the study, representing 9 species: landlocked salmon, brook trout, slimy sculpin, blacknose dace, common shiner, white sucker, fallfish, yellow perch, and banded killifish. Most stranded fish

were young-of-year landlocked salmon (55%) followed by blacknose dace (31%) and banded killifish (5%). Of the stranded fish observed, approximately half were classified as mortalities. Most stranded fish were small-bodied species and lifestages such as juvenile landlocked salmon, dace, and sculpin. No observations of large adult landlocked salmon or adult brook trout occurred. Of the seven reaches, the Little A Falls had the highest abundance of stranded fish, followed by Big Eddy, and then the West Branch near the Holbrook Side Channel. There was no stranding of fish or macroinvertebrates observed within the Holbrook Side Channel or the Big A Falls reach. Stranded macroinvertebrates observed included crayfish, stonefly larvae, caddisfly larvae, dragonfly larvae, and leeches. Most invertebrates were alive and able to find shelter in wetted areas during the 4-hour-long simulated station outage. A limited number of macroinvertebrate mortalities were observed.

6.3 Summary of McKay Station Ramping Rate Study Results

The McKay Station Ramping Rate Study was conducted by making planned changes in unit operations at McKay Station and observing the study reaches in the West Branch downstream of the station to document changes in water depth and instances of fish or macroinvertebrate stranding.

- During Scenario 1 (July 17, 2024), GLHA operated 3 units at or close to maximum hydraulic capacity (~3,500 cfs) starting at 8:00 AM. At approximately 2:00 PM, GLHA simultaneously shut down 2 units and operated the remaining unit near full hydraulic capacity (~1,000 cfs).
- During Scenario 2 (July 24, 2024), GLHA operated 3 units at or close to maximum hydraulic capacity (~3,500 cfs) starting at 8:00 AM. At approximately 2:00 PM, GLHA shut down 1 unit and continued operating 2 units for 1 hour (until 3:00 PM), then shut down another unit, and operated 1 unit near full hydraulic capacity (~1,000 cfs).

Both operational scenarios resulted in rapid changes to river flow downstream of McKay Station and some stranding of fish and macroinvertebrates along shorelines and exposed habitats. During Scenario 1, water depth in the West Branch was reduced 2.3 feet near the Holbrook Side Channel, 2.4 feet downstream of Big Eddy, and 2.0 feet at Little A. During Scenario 2, total change in water depth in the West Branch was very similar to Scenario 1, but Scenario 2 resulted in a slower overall rate of change in water surface elevation and water depth, particularly at the Big Eddy and Little

A study reaches. The average rate of change in water depth was 0.04 foot/min (0.5 inches/min) during Scenario 1 (3 units to 1 unit) and 0.02 foot/min (0.25 inches/min) during Scenario 2 (3 units to 2 units to 1 unit). Under both scenarios, at 1 unit flow (~1,000 cfs), some aquatic habitat along the shorelines was exposed; however, most of the river channel remained wetted with ample water for fish and invertebrates.

A total of 81 stranded fish during Scenario 1 and 71 stranded fish during Scenario 2 were observed in the three study reaches. There were 23 observed fish mortalities during Scenario 1 and 33 observed fish mortalities during Scenario 2. Stranded fish species included: landlocked salmon young-of-year, slimy sculpin, blacknose dace, white sucker, fallfish, yellow perch, American eel, brown bullhead, and unidentified minnow species. Most stranded fish were small-bodied species and life stages such as juvenile landlocked salmon, small adult dace, and slimy sculpin. Of the total number of fish observed, 37 percent were classified as mortalities. No adult landlocked salmon or adult brook trout were observed in the three study reaches.

Approximately 287 stranded macroinvertebrates were observed during Scenario 1 and 189 during Scenario 2. Stranded macroinvertebrates included crayfish, stonefly larvae, caddisfly larvae, mayfly larvae, damselfly larvae, and leeches. Most invertebrates (97%) were alive and able to find shelter in wetted areas following reductions in river flow and water surface elevation. Very few invertebrate mortalities were documented. Fewer invertebrate strandings were observed during Scenario 2, likely because of the slower rate in which the water level decreased. No freshwater mussels were observed during the study.

The study demonstrated that some stranding of fish and macroinvertebrates occurs when operations are modified from 3 units to 1 unit at McKay Station. However, in comparing the two scenarios, pausing at 2 unit operation for 1 hour limited the overall effects of these operational changes. In total, fewer stranded organisms were observed during Scenario 2 (3 units to 2 units to 1 unit), suggesting the rate of change in water depth allowed more organisms to move out of shallow shoreline habitats and into the free flowing main stem of the river. The study reaches were positioned within 2.6 river miles downstream of McKay Station. The rate of change in water depth and, therefore, fish and invertebrate stranding, would be expected to decrease further downstream in the West Branch.

Review of operational data from 2014 through 2023 demonstrate that rapid changes in unit operation (i.e., modifying operations from 3 units to 1 unit) at McKay Station occur very

infrequently. There have been four occurrences when McKay Station operations were modified from 3,000 cfs or greater to 1,000-1,300 cfs in the past 10 years (i.e., an average of 0.4 occurrences per year) and a total of 350 occurrences when station flow was reduced by greater than 25 percent as compared to the preceding hourly flow. Although the 2024 study demonstrated that stranding occurs when station flow is reduced from 3,500 cfs to 1,000 cfs, the infrequency of these operational changes diminishes the overall effect they have on fish and aquatic communities in the West Branch, which is supported by data and testimonials that the West Branch downstream of McKay Station continues to be one of the premier landlocked salmon fisheries in the State of Maine.

6.4 Summary of Aquatic Resources in the West Branch downstream of McKay Station

The West Branch downstream of McKay Station provides for and supports habitat that is managed by MDIFW as a high-quality, coldwater salmonid fishery. The reach includes an 1,800-foot-long section of steep-sided gorge immediately downstream of McKay Station that transitions into riffle, run, pool, and tributary habitats that provide habitat for spawning, nursery, and adult lifestages for landlocked salmon, brook trout, and other game and non-game fish species. Almost all landlocked salmon in this reach are wild, completing their entire life cycle in the river. This life history is unusual because landlocked salmon generally spawn in tributaries and rear in larger lakes. The West Branch downstream of McKay Station, however, provides adult habitat in large deadwater areas and pools, and it provides ample spawning, rearing, and nursery habitat in flowing reaches.

Based on studies completed during the previous relicensing and data collected by the Midwest Biodiversity Institute (MBI) in 2004, the fish assemblage downstream of McKay Station was known to include at least 23 cold and cool water species, including many salmonid species (e.g., landlocked salmon, brook trout, lake trout, whitefish), suckers, perch, minnows, sculpin, American eel, rainbow smelt, chub, stickleback, and chain pickerel.

GLHA performed fish assemblage sampling downstream of McKay Station in the summer and fall of 2022 and in the spring of 2024 using raft electrofishing and hoop net surveys. Fish assemblage data were analyzed using the Maine Rivers Index of Biotic Integrity (IBI or Maine IBI) (Yoder et al. 2008) to provide an overall measure of the condition of the fish assemblage in the West Branch. Based on IBI scores, the 2022 and 2024 Fish Assemblage Study demonstrated that the existing fish community in the West Branch downstream of McKay is of very good or exceptional quality

with no non-native species exerting invasive effects, a predominance of coldwater attributes, and a high proportion of fluvial specialist and dependent species. Maine IBI scores ranged from 65.0 to 90.8. Indexed to the Biological Condition Gradient (BCG) classes established by the New England Large Rivers fish assemblage assessment, this places the West Branch mostly within the range of BCG Level III (60-80; very good), except the Maine IBI scores of 81.3 and 90.8 which are Level II (exceptional). The data from previous fish assemblage sampling in 2004 and 2009 completed by MBI essentially scored the same as in 2022 with one site (WBR 37) with a score of 91.2 about 10 points higher than any site in 2022. Compared to IBI scores for other Maine and New England Rivers, this reach of the West Branch ranks third in terms of its quality only behind the Allagash and Aroostook rivers in Maine and New England (Yoder et al. 2008, Yoder et al. 2015). The Fulton's condition factor for landlocked salmon varied between 0.65 and 1.40 for adults, with a mean of 0.92, and between 0.66 and 1.48 for juveniles with a mean of 0.95 in 2022. Similar results were obtained in May 2024 ranging from 0.57-1.34 with a mean of 0.89 for adults and a range of 0.60-1.33 and a mean of 1.01 for juveniles. Values of 1.0 are representative of normal growth and condition, while values greater than 1.0 are representative of increased growth and condition and values less than 1.0 are representative of decreased growth and condition.

Via letter dated November 17, 2023, the MDIFW provided information related to the landlocked salmon and brook trout fishery in the West Branch downstream of McKay Station. MDIFW data indicates that catch rates for salmon in the West Branch are very good compared to other similar rivers in the region. Fish catch and size evaluations show that recruitment in the West Branch is robust. MDIFW indicated that these data imply that the low-flow events, which have occurred once or a few times in most years, has an impact, but the impact is not catastrophic for the salmon population in the West Branch. Overall, MDIFW indicated that the low-flow events during station outages do not compromise the salmonid or invertebrate populations in the West Branch; however, each event does cause mortalities, which should be mitigated.

6.4.1 Holbrook Side Channel

As part of the minimum flow improvements and mitigation provided at the Ripogenus Project during the prior relicensing, the licensee constructed the Holbrook Side Channel in 1998, which provides landlocked salmon nursery and spawning habitat. This habitat improvement project is approximately 0.8 mile downstream of McKay Station and created approximately 14.5 acres of instream habitat for landlocked salmon, brook trout, and other fish species. The Holbrook Side

Channel, which is approximately 1,500 feet long, discharges back into the West Branch near Telos Bridge. The design includes two 30-inch-diameter pipes and an associated flow control valve in one of the pipes to divert 35 to 65 cfs (depending on flow conditions in the West Branch) into the side channel through a rock berm. In-river channel bed modifications were made at the outlet of the Holbrook Side Channel where it discharges back to the mainstem of the West Branch and within the large pool in the middle of the side channel. These modifications to the channel bed were made to create a defined and reliable stream outlet from the main river and to provide unobstructed access to the side channel on the downstream end for spawning landlocked salmon.

As a condition of the existing license, the Licensee monitored the success of the Holbrook Side Channel habitat enhancement project for 5 years from 1998 to 2002. Monitoring included annual spawning redd counts and electrofishing surveys. Results of the monitoring demonstrated that landlocked salmon were using the Holbrook Side Channel for spawning and rearing and that the number of redds and juvenile salmon increased substantially after the habitat project was completed. Based on the success of the mitigation project, and in consultation with the agencies, it was agreed to cease monitoring after 2002, but to continue maintaining the Holbrook Side Channel habitat as mitigation for the periodic reduction in flows from McKay Station. GLHA continues to maintain and operate the Holbrook Side Channel to support spawning and rearing habitat for landlocked salmon. More recently, as part of the Fish Stranding Study conducted by GLHA in 2022, it was observed that the Holbrook Side Channel remained fully operational and flowing even when flows in the West Branch downstream of McKay Station were reduced to 510 cfs to simulate an unplanned station outage. As indicated in the FLA filed with FERC on September 30, 2024, GLHA proposes to continue to operate and maintain the Holbrook Side Channel as habitat for landlocked salmon and brook trout. Given that the Holbrook Side Channel is a designed, constructed, and operated mitigation measure, and GLHA is proposing to continue to manage and operate this mitigation measure over the term of the Project's new license, it is GLHA's understanding that the Holbrook Side Channel should continue to be classified as mitigation, in part to address the varying and periodic low flows associated with McKay Station.

6.5 Summary of Measures Evaluated to Provide Minimum Flows during Station Outage to Protect Aquatic Resources

6.5.1 1991 Minimum Flow Evaluation

As indicated in a May 3, 1991 letter filed with FERC (Attachment 1) (and summarized in a January

19, 2024 letter filed with FERC), in 1991, Great Northern Paper evaluated three alternatives for providing the minimum flow at McKay Station during a station outage: 1) automating a gate at Ripogenus Dam so that flows could be released into the Upper Gorge without delay caused by the need to dispatch an operator to manually open a gate; 2) passing a minimum flow at McKay Station by installing a bypass pipe and valve either at the end of the power tunnel or off the penstock for Unit 1; and 3) passing a minimum flow through one or more turbines by using the existing butterfly valves and wicket gates and applying the turbine brakes to prevent rotation.

Alternative No. 1 – Ripogenus Dam Gate Automation

The automating of a gate at Ripogenus Dam to provide a mitigation flow in response to an unplanned station outage was eliminated due to the unacceptable public safety risk, since the reach below Ripogenus Dam is $\frac{3}{4}$ -mile-long, in a remote location, and used by recreational fisherman and other members of the public. In response to FERC's September 19, 2023 SPD, GLHA confirmed that the automation of a gate at Ripogenus Dam is an unviable option due to the public safety risks associated with automated releases of water into the Upper Gorge and the presence of recreational users (e.g., fishermen) in the Upper Gorge. In particular, sudden flow releases into the gorge without warning may not allow enough time for recreational fishermen within the Upper Gorge to escape. Additionally, given the remote location of the Upper Gorge, emergency services are likely not able to arrive in time for a rescue effort resulting from an automated release of water to the Upper Gorge. Due to this public safety risk, GLHA is not proposing or considering the automation of any gates at Ripogenus Dam as a mitigation measure associated with unplanned McKay Station outages.

Alternative No. 2 Bypass Pipe

The construction and operation of a bypass pipe within or upstream (i.e., a tap off of the Project's penstock) of the powerhouse to provide a mitigation flow in response to an unplanned station outage was eliminated in 1991 due to the numerous mechanical and civil limitations and significant construction and operations challenges. In response to the September 19, 2023 SPD, GLHA reviewed the results of the 1991 study relative to McKay Station's current configuration and operations, as well as potential technology improvements and anticipated cost. Based on this review, GLHA has concluded that the results of the 1991 evaluation relative to a bypass pipe (within or upstream of the Project's powerhouse) continue to be valid today. In particular, given that the current mitigation measures provide flows to the West Branch from McKay Station that exceed the required 400-cfs minimum outage flow within minutes of an unplanned outage

(estimated to be 479 cfs during testing in 2018 and 510 cfs during the 2022 station trip simulation), and considering the leakage and seasonal minimum bypassed flows that are released from Ripogenus Dam during normal operations, GLHA concludes that providing a 500 cfs outage flow utilizing a bypass pipe alternative (as considered in the 1991 evaluation) continues to be unwarranted.

Although higher outage flows would be more protective of fish and macroinvertebrate populations in the West Branch downstream from McKay Station (e.g., 1,700 cfs to maintain GLHA's proposed normal operating minimum flow), such flows would significantly increase the technical challenges of installing an automated penstock tap and/or retrofitting the Project's powerhouse to enable higher flow releases. Challenges of constructing a system to automatically release approximately 1,700 cfs at or near the powerhouse include the construction of a bypass pipe that would need to be installed at the dead-end of the tunnel, continue underground (e.g., beneath the parking lot adjacent to the powerhouse), and discharge downstream of the McKay Station at a low enough elevation as to not result in a public safety concern to boaters who access the river in this location. Relative to the 1991 evaluation that raised concerns regarding the water velocities and structural control measures required to automatically release 500 cfs, an increase of the automated release to 1,700 cfs greatly increases the challenges associated with the sizing of the discharge pipe and valve(s), discharge velocities and the means of dissipating the flow at the discharge point, and concerns related to back pressure within the pipe.

If the bypass were to be installed as a tap off of the Project's existing penstock, additional challenges include the requirement of a large valve and pipe access vault to be constructed underground on the upstream (west) side of the Project's powerhouse. The vault would need to be greater than 8,000 cubic feet in size and would require removal of bedrock adjacent to the powerhouse and existing reinforced concrete associated with Penstock No. 1. Consistent with the 1991 evaluation, it is assumed that blasting (which would be inadvisable in this area) would be required to construct the bypass system.

The cost of constructing a bypass system that increases automated outage flows from the current ~500 cfs to 1,700 cfs is much greater than the 1991 estimates. As a AACE International Class V (-50% to +100%) cost estimate, GLHA estimates that the cost of constructing such a bypass system would be in the range of \$3,000,000 to \$6,000,000.

Alternative No. 3 – Turbine Wicket Gate/Braking System

The 1991 evaluation determined that the implementation of a turbine wicket gate/braking system is a feasible option for providing minimum flows from McKay Station during unplanned station outages. As a result of this evaluation and associated stakeholder consultation and FERC approval, this alternative was tested and implemented in 1991 to automatically release 400 cfs. As described above, the system was subsequently improved to a more reliable unit spinning system in 2018 that currently provides automated bypass flows of about 500 cfs to the West Branch at McKay Station during station outages.

6.5.2 2024 Minimum Flow Evaluation

As referenced above, in addition to the studies and consultation being performed in support of the ongoing relicensing, via FERC’s August 22, 2023 letter (provided in Attachment 2 of this study report), GLHA performed consultation with the USFWS, MDIFW, Maine Department of Environmental Protection (MDEP), and the Land Use Planning Commission (LUPC) regarding measures aimed at reducing downstream stranding events associated with Project operations, including unit outages. The letter also requested that GLHA further evaluate measures to provide minimum flows during a station outage. As described above, GLHA has reevaluated the measures identified in the 1991 Plan relative to the Project’s existing configuration and operations, as well as an increase in the automated outage flow. Based on this evaluation, GLHA concluded that the best alternative for minimizing affects to downstream aquatic resources during an unplanned station outage is to continue to implement the previously approved unit spinning system in combination with GLHA’s ongoing system reliability and transmission line maintenance upgrade activities to reduce the frequency and duration of unplanned outages at McKay Station. As noted above, these activities have resulted in reducing the number of unplanned outages to an average of 0.7 outages per year.

In order to reduce the number of unplanned outages, GLHA’s ongoing system reliability and transmission line maintenance activities consist of the following.

- **System Reliability** – GLHA is in the process of implementing a relay coordination study to evaluate reconfiguration of the system relays in order to improve transmission and generation protection. Implementation of the study results will increase the stability and reliability of the system, thereby minimizing outages at McKay Station due to system trips

at other interconnected facilities, which typically result from lightning strikes and local utility outages.

- **Transmission Line Maintenance** – GLHA is in the process of implementing a long-term plan for the repair and upgrade of the Ripogenus Project transmission line to minimize outages of McKay Station caused by transmission line failures. In general, the plan replaces support structures (poles and crossarms) based on periodic inspections aimed at identifying wood rot and structure damage (primarily from woodpeckers). GLHA believes implementation of this plan has been effective, as there have been no station outages caused by transmission line failures since May 2016.

6.5.3 2025 Minimum Flow Evaluation

As described in Section 6.5.1, in response to FERC’s September 19, 2023 SPD, GLHA performed a reevaluation of the alternatives associated with the 1991 Plan. GLHA believes that the 1991 consultation process and the resulting plan included a comprehensive series of alternatives. Section 6.5.1 provides the results of GLHA’s reevaluation of the 1991 alternatives.

In addition to the 1991 alternatives, GLHA evaluated the potential for the installation of a load bank at the Project. A load bank system would accept the electrical load during a failure event and would allow the plant to pass flows at a reduced capacity. While a load bank system may be technically feasible, there would be significant complications related to cost, attempting to provide the station’s normal operating flow of 1,700 cfs, physical space and clearances to install the equipment, unit stability at load, unit availability, and safe heat dissipation. Based on an initial review of this alternative, it is unlikely that such a system would be able to provide flows greater than the existing unit spinning system for the duration of typical outages. Due to these combined factors, in combination with an unknown cost for installation and operation, GLHA does not believe that a load bank system is a suitable alternative.

7.0 Summary and Recommendations

Ripogenus Dam was built in the early 1900s and McKay Station was constructed and operational in the mid-1950s. FERC issued an Original License for the Project in 1968 and a New License in 1996. In 1991, based on agency consultation and an evaluation of various alternatives, the Project’s Licensee implemented a minimum flow procedure during unplanned station outages. As approved

by FERC, the measure provided approximately 400 cfs from McKay Station until such time that normal powerhouse operations could be resumed. In 2018, GLHA identified an improved system for releasing minimum flows during outages at McKay Station which involved spinning (rather than braking) of the units to pass flow; this system was tested and found to be effective in providing the required 400 cfs minimum flow (and measured at about 500 cfs) during station outages. Under GLHA's current operations, this outage flow, in combination with year-round leakage and seasonal bypass flows from Ripogenus Dam, is automatically provided downstream of McKay Station following unplanned station outages.

Over the term of the Project's existing license, the frequency and duration of unplanned McKay Station outages have been greatly reduced. As discussed in this report, the reduction in unplanned McKay Station outages is the result of upgrades within the powerhouse and transmission system, as well as improved response measures. Currently, unplanned station outages occur infrequently (i.e., an average of 0.7 outages per year), with five documented occurrences from 2018 through 2024 (2 in 2018, 2 in 2021, and 1 in 2023), which, on average, lasted approximately 3.5 hours. To date, there have been no unplanned outages in 2025. Unplanned station outages are typically caused by factors unrelated to the Project operations such as lightning strikes.

Fisheries data have been historically collected by the Licensee and MDIFW downstream of McKay Station. A comparison of the historical and current fisheries data collected in the West Branch downstream of McKay Station indicates that the fish assemblage is of very good or exceptional quality. Compared to other Maine and New England Rivers, this reach of the West Branch ranks third in terms of its quality only behind the Allagash and Aroostook rivers in Maine and New England. Similarly, the MDIFW indicated that their long-term angler survey data shows that catch rates for salmon in the West Branch are very good compared to other similar rivers in the region (including the East Outlet of the Kennebec River and the Moose River). Fish catch and size evaluations show that recruitment in the West Branch is robust. MDIFW indicated that these data imply that the low-flow events, which have occurred infrequently, have an impact, but the impact is not catastrophic for and does not compromise the salmon population in the West Branch.

Based on a reevaluation of the measures associated with the 1991 plan, as well as consideration of installing a load bank, GLHA has determined that the current alternative of providing the minimum outage flow using the unit spinning system is the best alternative for providing flows downstream

of McKay Station during a station trip. As discussed above, modifying a gate at Ripogenus Dam to provide an automated release is not a viable option due to public safety concerns related to recreational activities within the Upper Gorge. In addition, the various challenges associated with constructing a bypass pipe to provide a higher outage flow (e.g., 1,700 cfs) or installing a load bank in response to an unplanned station outage makes such alternatives also non-viable options.

Based on the results of the studies completed to date, GLHA proposes the following measures for continued operation of the Ripogenus Project:

- Continue to implement the ongoing system reliability measures and transmission line maintenance activities to reduce the frequency and duration of unplanned station outages at McKay Station.
- Continue to implement the current outage minimum flow procedure, which provides approximately 500 cfs of flow from McKay Station into the West Branch within minutes of an unplanned outage of McKay Station. This automated outage flow is in addition to any leakage and/or seasonal bypass flow being released from Ripogenus Dam at the time of the unplanned station outage.
- Continue to operate and maintain the Holbrook Side Channel, which provides approximately 14.5 acres of instream habitat for landlocked salmon, brook trout, and other fish species about 0.8 mile downstream of McKay Station. The Holbrook Side Channel is an existing mitigation measure resulting from the previous relicensing and is intended to provide stable fisheries and aquatic habitat downstream of McKay Station. During the Fish Stranding Study, it was observed by GLHA and MDIFW that flows in the Holbrook Side Channel were not affected by the reduction in river flows caused by a simulated station outage.
- Provide a year-round minimum flow of 1,700 cfs to the West Branch downstream of McKay Station, which will minimize changes in flows and fish and macroinvertebrate strandings/mortalities during normal operations of McKay Station, particularly during the whitewater boating season, as compared to current license requirements.

8.0 Correspondence and Consultation

As discussed above, in response to FERC's August 22, 2023 letter, GLHA consulted with USFWS, MDIFW, MDEP, and LUPC related to measures to provide flows following unplanned station outages. GLHA's January 19, 2024 filing, which is provided in Attachment 2 of this study report, provides details regarding this consultation.

Consistent with FERC's September 19, 2023 SPD, GLHA is providing a copy of this report to USFWS, MDIFW and TU for review and comment. GLHA requests that any comments related to this report be filed directly with FERC within 30 days of the filing and distribution of this report, with a copy of the comments provided to GLHA. Pending comments, GLHA will update the report and file an updated version with FERC.

9.0 Literature Cited

- Great Northern Nekoosa Corporation (GNNC). 1991a. Ripogenus Project (FERC No. 2572) Application for New License for Major Existing Dam. Great Northern Nekoosa Corporation, FERC No. 2572. December 1991.
- Yoder, C.O., R.F. Thoma, L.E. Hersha, E.T. Rankin, B.H. Kulik, and B.R. Apell. 2008. Maine Rivers Fish Assemblage Assessment: Development of an Index of Biotic Integrity for Non-wadeable Rivers. (Addendum March 31, 2016). MBI Technical Report MBI/2008-11-2. Submitted to U.S. EPA, Region I, Boston, MA. 55 pp. + appendices. <https://midwestbiodiversityinst.org/publications/reports>.
- Yoder, C.O., E.T. Rankin, and Lon E. Hersha. 2015. Development of Methods and Designs for the Assessment of the Fish Assemblages of Non-Wadeable Rivers in New England. MBI Technical Report MBI/2015-3-3. U.S. EPA Assistance Agreement RM-83379101. U.S. EPA, Office of Research and Development, Atlantic Ecology Division, Narragansett, RI and U.S. EPA, Region I, Boston, MA. 152 pp. <http://www.midwestbiodiversityinst.org/>.

Attachment 1
1991 Minimum Flow Evaluation

J.B. Carson

LEBOEUF, LAMB, LEIBY & MACRAE

A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

EASTERN U.S.:

NEW YORK, NY
WASHINGTON, DC
ALBANY, NY
BOSTON, MA
HARRISBURG, PA
HARTFORD, CT
NEWARK, NJ

520 MADISON AVENUE

NEW YORK, NY 10022

(212) 715-8000

FACSIMILE: (212) 715-8500

TELEX: 423416 (OR) 1561363

EUROPEAN COMMUNITY: BRUSSELS, BELGIUM AND LONDON, ENGLAND

DIRECT DIAL

WESTERN U.S.:

LOS ANGELES, CA
SALT LAKE CITY, UT
SAN FRANCISCO, CA

SOUTHERN U.S.:

JACKSONVILLE, FL
RALEIGH, NC

715-8372

May 3, 1991

Mr. J. Mark Robinson
Director
Division of Project Compliance
and Administration
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

Re: Great Northern Nekoosa Corporation
Ripogenus Project, FERC No. 2572
Plan for Providing Minimum Flow

Dear Mr. Robinson:

Enclosed for filing with the Commission on behalf of Great Northern Nekoosa Corporation ("Great Northern"), a wholly-owned subsidiary of Georgia-Pacific Corporation and licensee for Project No. 2572, are three copies of Great Northern's proposal for providing a minimum flow at McKay Station in the event of an unplanned outage of that entire station. This submission supplements Great Northern's filings of July 2 and 26, 1990, which discussed an unplanned outage that occurred at McKay Station on May 1, 1990, and outlined the steps planned by Great Northern to address the issue.

Attached to this proposal, and referenced within, are:

1. a listing of station outages and lost generation since 1985;

Mr. J. Mark Robinson
May 3, 1991
Page 2

2. a summary report of investigations into alternatives for passing a minimum flow at McKay Station; and
3. a Gate Operation Safety Plan for discharging flows, and for safety-related signage in the area affected by such discharges.

Background:

This proposal is occasioned by the station outage that occurred last May 1st when an insulator failure in a substation in Millinocket caused a shutdown at McKay Station. During that outage flows from McKay Station may have fallen below the 200 cfs required by Article 33 of the Project license. As shown on the attached table, Great Northern's records reveal that this is an unusual situation, caused by unforeseeable occurrences, such as a lightning strike or equipment failure.

Historically, whenever planned or unplanned outages occur, the project minimum flow has been provided by dispatching the dam tender to open a gate at Ripogenus dam, which is located approximately 3,900 feet upstream of the McKay Station power-house. The only way that flows from Ripogenus Dam can reach the McKay Station is through what is known as the Upper Gorge. The project has been operated in this manner since before it was licensed by the Commission in 1968.

The context within which studies were conducted was two-fold. Great Northern sought improvements to methods for providing the 200 cfs minimum flow required by its current license, which expires on December 31, 1993. In addition, because studies and agency consultation for relicensing the project were well advanced, Great Northern also sought to provide a minimum flow that would be appropriate for the term of a new license. At this time, Great Northern believes that the results of studies, and the agency consultation record, through second-stage consultation, indicate that a minimum flow of 400 cfs for short-term, unplanned outages will meet the criteria for protection of aquatic biota below McKay Station during the term of the new license.

Options Evaluated:

The consultants retained by Great Northern reviewed three basic alternatives for providing the minimum flow at McKay Station in order to minimize the potential for delay while flows discharged from the dam reach the West Branch McKay Station. First, Great Northern investigated the feasibility of automating a gate at Ripogenus Dam so that flows could be released into the Gorge without the delay caused by the need to dispatch the dam tender to open a gate. Because of the remote location of Ripogenus Dam, and the recreational use of the Gorge by fisherman, Great Northern concluded that automated gate operation would create an unacceptable safety risk.

The second alternative investigated for passing a minimum flow at McKay Station involved installing a bypass pipe and valve, either at the end of the power tunnel which provides flows to the station turbines, or off of the penstock for Unit #1. The third alternative involved passing a minimum flow through one or more turbines by using existing Dow (butterfly) valves and wicket gates and applying the turbine brakes to prevent rotation. A summary report on the technical evaluation of these latter two alternatives is attached.

The bypass pipe alternative, which was estimated to cost approximately \$600,000, was eliminated because of numerous mechanical and civil limitations, and significant construction and operation problems. By contrast, the turbine brake alternative has been found to be feasible: flows can be passed automatically through one or more turbines, provided that electrical controls, circuitry, telemetry, and mechanical system at the powerhouse are modified. These modifications, which are feasible, would cost approximately \$200,000.

To demonstrate the feasibility of using turbines to pass the minimum flow, a series of field tests, including tests using new brake pads and re-machined brake rings on Unit No. 1, were conducted. The field tests were completed on January 17, 1991, and showed that it will be feasible to pass total flows of approximately 400 cfs through the three McKay Station turbines. Field testing has also established that the brakes can be used to hold the turbines stationary without incurring unacceptable mechanical damage, although operational experience will be needed to indicate the limits to the braking period.

Additional work will be needed to make the necessary modifications to the control system to pass the minimum flow when an unplanned outage occurs, and to conduct final field tests of the modifications. Assuming that this approach to providing minimum flows is acceptable to the Commission, final design engineering can be performed this year and the necessary modifications can be completed by 1992.

Proposed Minimum Flow Procedures:

The system will operate as follows: when the station is tripped off line, the wicket gates on the individual turbines will automatically close, the turbines will slow, and the brakes will bring them to a complete stop. During this time, the flows will ramp down. When the automatic monitoring system verifies that each turbine has stopped, the wicket gates on that unit will automatically reopen to 8-9% gate. This will pass a total of approximately 400 cfs through all three turbines while the brakes hold the turbines stationary. Flows will be maintained at or above this level for the remainder of the outage.

The 400 cfs combined flow through all three turbines will not technically be an "instantaneous" minimum flow. Rather, Great Northern has field-tested the turbine brakes and has established that it will take approximately 3-10 minutes for the wicket gates to close and the generating units to come to a complete stop. Because of the variation in the braking systems, flow conditions, and equipment, the actual braking time differs from unit to unit. Thus, the field test show that Units 2 and 3 will already be upramping while Unit 1 is still downramping. It will take approximately 20 minutes in total from the start of the shutdown to release the full 400 cfs flow.

Great Northern believes that this method of discharging a minimum flow is a significant improvement over historical practices for two reasons. First, it is an automated system which is able to release flow directly into the river at McKay Station. Second, it greatly enhances protection of aquatic resources and public safety.

As indicated, the location of McKay Station imposes severe physical constraints on any bypass system intended to operate in the event of an unplanned shutdown of the entire

Mr. J. Mark Robinson
May 3, 1991
Page 5

station. The continuous discharge system described above is the only feasible way to provide a short-term minimum flow. Our fisheries consultants have indicated that the proposed system is a significant enhancement over existing conditions and will not adversely affect the West branch fishery if the system operates as described. Great Northern's field tests indicate that it will do so. The Maine Department of Inland Fisheries and Wildlife has been consulted and concurs in this assessment. Formal consultation on this matter with all environmental agencies is presently ongoing as part of relicensing activities, and their comments should be available soon. In addition, Great Northern has formally requested comments on the proposed minimum flow procedures described above. Agency comments will be forwarded to the Commission promptly.

Supplemental Flows Through Ripogenus Dam:

Concurrent with the investigations into automated discharge of the minimum flow at McKay Station, Great Northern has conducted field tests and other studies to develop means of providing flows from Ripogenus dam through the Upper Gorge while providing reasonable safety measures to protect recreational users of the Upper Gorge, particularly in view of the goals of the Maine Department of Inland Fisheries and Wildlife and the U.S. Fish and Wildlife Service to enhance fishing opportunity in the Upper Gorge through an increased summertime Upper Gorge flow. The studies were undertaken to address both routine discharges of water from the dam, and discharges of flows through the Upper Gorge to supplement the automated minimum flow at McKay Station in the event that unplanned outages at the powerhouse exceed the time limits established for using the braking system.

As a result of these studies, Great Northern is satisfied that current gate operation procedures can be modified to meet the operational requirements associated with delivering flows to McKay Station under foreseeable circumstances. These modified gate operation procedures will enhance the safety of recreational users of the Upper Gorge, together with a program for replacing warning signs and upgrading the current warning siren.

Great Northern has developed a Gate Operation Safety Plan which is attached to this letter. The Plan includes modified gate operation to ramp flows in the Upper Gorge, together with placement

Mr. J. Mark Robinson
May 3, 1991
Page 6

of numerous warning signs and an increase in siren number and capacity. This Plan, which is consistent with the Commission's 1990 Guidelines for Public Safety at Hydropower Projects, will be implemented in conjunction with the establishment of the automatic minimum flow system at McKay Station. The installation of new signs and warning sirens will be completed in 1991.

Although the only currently applicable license requirement is a 200 cfs minimum flow, Great Northern's proposal addresses not only minimum flow concerns under the terms of the existing license, but also, based on extensive consultation and studies conducted to date, similar issues related to the relicensing of the Ripogenus Project. If approved by the Commission, Great Northern is prepared to implement this proposal prior to the issuance of a new license.

Because of the significant capital expense required to implement the proposal, Great Northern cannot implement this proposal without reasonable assurance that the methods it proposes are also acceptable for the term of the new license. Insofar as it is clearly in the public interest to resolve this matter now, and because Great Northern seeks to implement this proposal by 1992, with detailed engineering to be done in 1991, Great Northern respectfully requests that the proposal outlined above be approved as expeditiously as possible. A meeting can be scheduled at your convenience to discuss this proposal.

Sincerely,



Thomas E. Mark
Attorney for
Great Northern Nekoosa Corporation

TEM:nn
Enclosure

cc: Anton J. Sidoti
James B. Carson, Jr.
Jeffrey M. Martin

RIPOGENUS PROJECT
FERC NO. 2572
SUMMARY OF UNSCHEDULED OUTAGES OF MCKAY STATION
FROM 1985 TO DATE

<u>Date</u>	<u>Reason</u>	<u>Length of Outage (Hrs)</u>
<u>1985</u>	No outages	
<u>1986</u>	No outages	
01/19		
<u>1987</u>	No outages	
<u>1988</u>		
04/05	Governor oil pump failure	0.63
07/29	Lightning strike (trans. line)	<u>2.53</u>
	Total 1988	3.16
<u>1989</u>		
02/08	K21, K22, K45 trip	<u>2.18</u>
	Total 1989	2.18
<u>1990</u>		
03/01	Hydraulic system failure	9.00
05/01	Insulator failure at L.I. sub.	7.33
06/03	Insulator failure sub No.2	<u>7.65</u>
	Total 1990	23.98

GREAT NORTHERN NEKOOSA CORPORATION
MILLINOCKET, MAINE

RIPOGENUS PROJECT, FERC NO. 2572

GATE OPERATION SAFETY PLAN

1.0 INTRODUCTION

Operation of the Ripogenus Project requires that flows be discharged from time to time from Ripogenus dam through the Upper Gorge. Typically, such discharges are needed either to provide the required minimum flow below McKay Station when McKay Station is shut down, or to control water levels in the Ripogenus impoundment. The purpose of this Plan, which has been developed with reference to Public Safety at Hydropower Projects, published by the Federal Energy Regulatory Commission (March, 1990), is to define procedures and facilities that will enhance public safety for those who may frequent the Upper Gorge for fishing or other recreational uses.

The Ripogenus Project is located in the northern Maine woods, approximately 37 miles upstream of Millinocket. The Ripogenus Project powerhouse (McKay Station) is remotely controlled from Great Northern Nekoosa Corporation's (Great Northern) dispatch center in Millinocket. As noted below, the 3,900-ft-long Upper Gorge between Ripogenus dam and McKay Station is a steeply-walled gorge that would be naturally hazardous without the project. Great Northern has chosen to maintain manual gate operation by a dam tender in order to have the benefit of the observations, judgements, and warning capabilities of an operator who is familiar with project features and operation and with public safety considerations.

The rugged topography and terrain of the Upper Gorge limit Great Northern's ability to assure the safety of visitors to that area. However, Great Northern does not feel that it is consistent with historical usage or with its obligations as a Licensee to prohibit access to the Upper Gorge.

Details of this Plan, including the use of audible warnings (sirens), activation delay times, signs, a sign inspection program, and other procedures and facilities are consistent with the history of recreational use and site constraints of the Ripogenus Project, as well as with the guidelines of Public Safety at Hydropower Projects.

Great Northern has conducted various studies to investigate ways to maintain a minimum flow below McKay Station whenever operation of the station is interrupted by emergencies or other unplanned circumstances. As part of these investigations, time-of-travel and ramping rate data at various flows were collected along the Upper Gorge at four pool areas historically visited by fishermen.

These data indicate that it takes approximately 17 minutes for 1,000 cfs to reach McKay Station, and 24 minutes for 450 cfs. Data also showed an abrupt rate of rise (in excess of four feet per hour) for both test flows, although the rate of rise was somewhat less at 450 cfs.

Alternatives for modifying equipment operation at McKay Station to pass the minimum flow were also investigated. As a result of these studies, Great Northern believes that the most practical and reliable method for maintaining the minimum flow below McKay Station is by using a sequence of steps involving penstock valves, turbine brakes, and wicket gates. This sequence is designed to deliver the minimum flow automatically whenever McKay Station turbines go off-line.

Since shut-downs of McKay Station may last longer than the time that is desirable to pass flows through stationary units (i.e., more than three days), a back-up method is necessary to provide a supplemental source of flow to the West Branch at McKay Station if needed. The only practical method for providing such flow is through the Upper Gorge from Ripogenus dam. Under terms of the current project license, leakage from the dam provides flows in the Upper Gorge. Flows have historically been discharged into the Upper Gorge only when needed to control the level in the Ripogenus impoundment, or to provide minimum flows at McKay Station.

Based on investigation of time-of-travel and flow ramping impacts in the Upper Gorge, a review of the characteristics of recreational use, access, and topography in the Upper Gorge, safety facilities and flow discharge procedures outlined in Sections 2 and 3 will be implemented during the period May 1 to September 30 annually. During the remaining months of the year, the Upper Gorge does not receive recreational use.

2.0 UPPER GORGE PUBLIC SAFETY FACILITIES

The Upper Gorge is used periodically and informally for various recreational pursuits, primarily fishing, during the summer months. There is no vehicular access to the Upper Gorge, and the nearest vehicle parking is limited to areas near the dam and McKay Station. There are three primary, uncontrolled access points used for hiking into the Upper Gorge: 1) at Ripogenus dam by means of an unused dirt road leading from the dam along the north side of the Upper Gorge, 2) along steep foot trails between the dam access road and Pray's Cabins on the south side of the Upper Gorge, and 3) at McKay Station by means of a trail around the inland side of the powerhouse to the Tailrace Pool just upstream of the powerhouse. From these points, foot access along most of the length of the Upper Gorge is possible, although treacherous because of the rocky terrain and extremely steep sides.

The terrain and topography of the Upper Gorge pose two problems associated with public safety when discharging flows from Ripogenus dam. First, the steep walls and many turns and bends of the channel make it difficult to hear siren warnings. Second, the steep banks, rocky streambed, and rock outcroppings along the channel may make it difficult to leave the area quickly in a safe manner.

In the interest of providing reasonable measures to protect the safety of users of the Upper Gorge, while allowing for the necessity of periodically using the Upper Gorge to discharge flows from Ripogenus dam, Great Northern has installed and maintained signs at McKay Station, Ripogenus dam, and in the Upper Gorge to warn users of flow and water level changes.

To further enhance public safety in the Upper Gorge, Great Northern will provide the following measures and facilities at the project:

1. Warning sirens will be used that are of greater range and strength than the siren now employed. Two new 124-decibel sirens will be installed. Sirens will be aimed into the Upper Gorge and will have a range of nearly one mile. One siren will be located atop Ripogenus dam, the other siren will be located approximately 3,000 ft below the dam atop a ledge outcrop on the east side of the Upper Gorge at McCorsen's Pool for maximum focus into the lower end of the gorge.

Circuitry will allow both sirens to be activated from the dam, or by the power dispatcher. These sirens will not be confused with other ambient sounds in the remote and undeveloped area of the Upper Gorge.

2. Signs giving appropriate warning to users of the Upper Gorge will be installed, with the goal of reinforcing the need for users to heed siren warnings and to evacuate the Upper Gorge upon hearing the sirens. Signs will advise the public that the Upper Gorge is a hazardous area. Signs will also advise users that, upon hearing the siren, they must leave the gorge immediately.

Figure 1 is a map showing the location of signs and sirens to be installed in the area of the dam, powerhouse, and Upper Gorge.

Figure 2 depicts the dimension and wording of the signs.

A sign inspection and maintenance program will be developed. This program will include annual inspections of signs.

3. Literature provided by Great Northern to users of the West Branch District will contain warnings to visitors that use of lakes and rivers may be hazardous and that warning signs and sirens must be heeded.

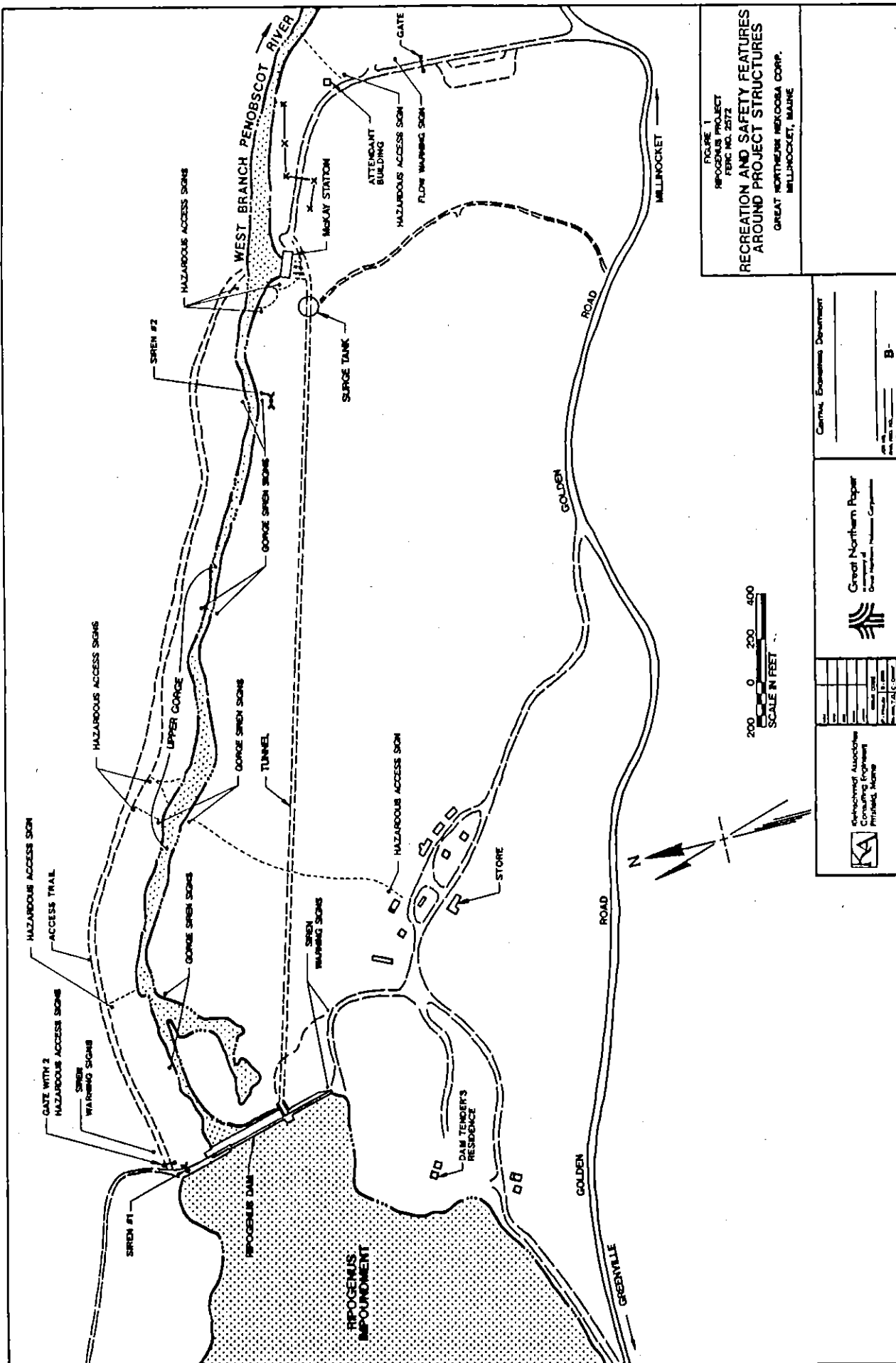
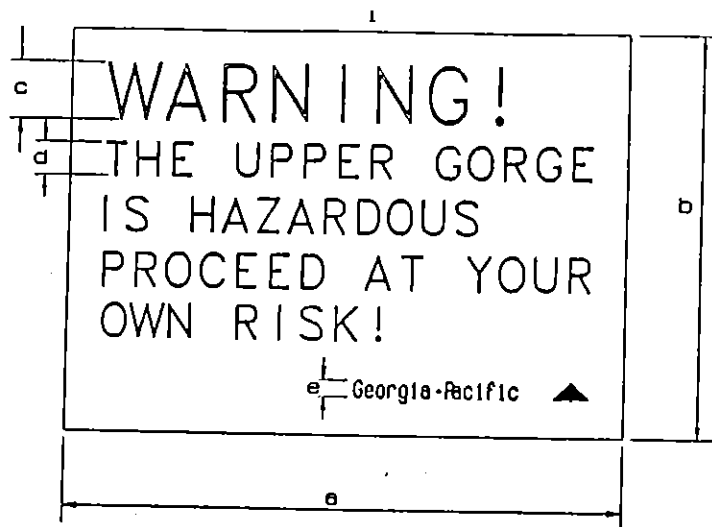
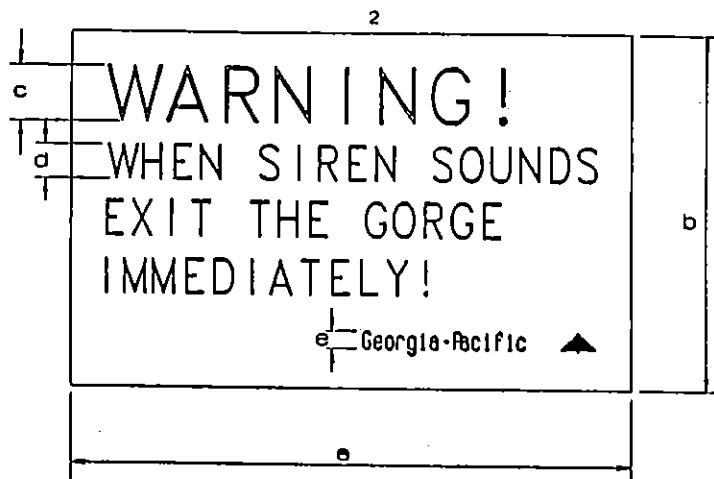


FIGURE 1



Minimum Dimensions: a=48 inches
b=36 inches
c=5 inches
d=3 inches
e=1.5 inches

Colors: Background-(White)
Lettering-WARNING! (Red)
Other Lettering-(Black)
Signature-(Black) With White
Initials Within Triangle



Minimum Dimensions: a=48 inches
b=31 inches
c=5 inches
d=3 inches
e=1.5 inches

Colors: Background-(White)
Lettering-WARNING! (Red)
Other Lettering-(Black)
Signature-(Black) With White
Initials Within Triangle

FIGURE 2

3.0 RIPOGENUS DAM FLOW DISCHARGE PROCEDURES FOR ALL FLOWS

Flows to be released from Ripogenus dam will be ramped in a three-stage sequence as described below.

1. The power dispatcher will notify the dam tender by radio that a release of water is needed at a particular time. The dam tender will proceed to Ripogenus dam. If the dam tender cannot be contacted, or is otherwise precluded from arriving at the dam, alternate operations personnel will be alerted and dispatched to the dam.
2. Prior to arriving at the dam, the dam tender will stop at McKay Station and alert the McKay Station recreation attendant, if he is on duty, or anyone observed in the parking lot area, of the circumstances.
3. The dam tender or his alternate will contact the power dispatcher upon reaching the dam. Unless instructed otherwise by the dispatcher, the dam tender or his alternate will begin the discharge sequence.
4. The propane-powered generator at the dam will be activated and checked for output. Alternative sources of power are available and will be used if necessary.
5. The sirens will be sounded once for a duration of 30 seconds to warn users of the Upper Gorge.
6. After a 15-minute delay, the sirens will be sounded once again for 30 seconds, and a deep gate will be cracked open to discharge up to 60 cfs.
7. After an additional delay of 20 minutes, the sirens will be sounded again for 30 seconds, and the deep gate will be opened for a discharge of up to 400 cfs.
8. After 20 minutes from initial gate opening, the dam tender will open the deep gate to discharge the full amount of flow requested by the power dispatcher, provided that he has no reasonable basis for delaying or aborting such further discharge for public safety reasons. The dam tender will then advise the power dispatcher of the full flow release and await further instructions, if any.

At the end of this sequence, the dispatcher will be responsible for advising the dam tender when to close the gate at the dam. Once the gate is closed, the dam tender will return to McKay Station, and advise the recreation attendant.

Note that these procedures, sequences, and delay times may be modified and refined through operational experience.

GREAT NORTHERN NEKOOSA CORPORATION
RIPOGENUS PROJECT, FERC NO. 2572
MCKAY STATION MINIMUM FLOW ALTERNATIVES
SUMMARY REPORT

1.0 INTRODUCTION

Great Northern Nekoosa Corporation (Great Northern) has investigated methods for releasing a minimum flow from the Ripogenus Project whenever there is an abrupt, unplanned outage of the units at McKay Station, in order to provide protection to aquatic resources in the West Branch of the Penobscot River (West Branch) below McKay Station. The purpose of the studies conducted by Kleinschmidt Associates, in consultation with Great Northern, was to look into the feasibility and cost of methods that would release the minimum flow as quickly as possible upon an outage of the entire station.

2.0 REGULATORY SETTING

The FERC license for the Ripogenus Project requires a minimum flow of 200 cfs below McKay Station. Great Northern's historic practice of providing this flow by releasing water from Ripogenus dam through the 3,900-ft-long Upper Gorge to McKay Station has been in effect since the license was originally issued in 1968. Unplanned outages of McKay Station are extremely rare, but can potentially induce delays in flows reaching the West Branch at McKay Station.

Because the current license expires in 1993, Great Northern needed to make provisions whenever possible in the study to anticipate future minimum flow requirements. Based on agency consultation to date, it appears that fishery concerns can be accommodated by a short-term (2-3 days) minimum flow in the vicinity of 400 cfs. Long-term minimum flows (more than 3 days) are presumed to be closer to the USFWS ABF value of 700 cfs. Although FERC customarily specifies an "instantaneous" minimum flow, it is expected that "instantaneous" simply may not be physically possible. It is also expected

that support from agencies for any non-instantaneous minimum flow release will be needed. Based on informal consultation, Great Northern believes that such support exists.

3.0 REVIEW OF ALTERNATIVES

A total of three alternatives for passing minimum flows were reviewed, and are summarized below. A listing of the considerations for each alternative is presented in the attached Discussion Notes, which derive from a project review meeting of Great Northern and Kleinschmidt Associates personnel on February 19, 1991.

It should be noted that the possibility of automating a gate at Ripogenus dam had been earlier considered by Great Northern but had been rejected, since the remote location of the project, together with the recreational use of the Upper Gorge, indicated that automated gate operation was not in the interests of public safety.

A. Alternative #1 - Through Turbines

This alternative involves the use of turbine/generator brakes, automated controls, and wicket gates positioned at 8-9% opening to pass flows after the turbines have been stopped. Analysis suggests that approximately 300-400 cfs can be passed through three stationary turbines.

Under this alternative, primary consideration is for the safety of equipment and for dependability and reliability. For instance, availability of adequate bearing lubrication, variability of braking force vs. wicket gate settings, and cavitation or excessive wear will need to be addressed. For this alternative, there may be a need for supplemental flows through the Upper Gorge during extended outages. If practice dictates that there is a concern with a time limit on operation of the turbines in non-rotating mode, the dispatch of a dam tender to pass flows through the Upper Gorge needs to be factored in.

Additional braking alternatives were also investigated (e.g., band type brakes on the perimeter of the coupling, or use of dogs applied to the coupling). Based on preliminary evaluations, Great Northern is very uncomfortable with the use of dogs, and feels that band brakes will not be cost-effective. For each additional alternative, concerns for reliability and cost will increase, according to the number and complexity of the alternatives.

This alternative limits the "instantaneous" nature of flow release. A pause of 5-10 minutes is to be expected. Field tests conducted by Kleinschmidt Associates and Great Northern on October 2, 1990, December 14, 1990 and January 17, 1991 indicated that turbine braking times varied such that individual turbines would be expected to shut down, verify complete stop, and re-open wicket gates in a sequential, overlapping pattern.

The preliminary cost estimate of \$200,000 is potentially variable by 20%.

B. Alternative #2 - Tunnel Bypass Valves and Piping

This alternative involves a bypass pipe, valves, and automated controls which are attached to the dead-end of the tunnel, passing underground beneath the parking lot and discharging to the river just downstream of the station.

Cost estimate for this alternative is expected to be approximately \$600,000, with a flow capacity of about 500 cfs.

Velocities through the control valve (expected to be approximately 60 fps) will produce very high decibel levels, and the valve itself may require frequent maintenance due to cavitation. Various means of dissipating the very high head of water (150 ft to 180 ft), other than by taking the full drop across the control valve, have been considered. The

high head dictates the 60 fps velocities and the 500+ cfs flow discharge through a 36-in. valve. A larger valve would simply pass more flows, unless it were throttled.

Installation of an orifice plate upstream of the control valve was discussed, but the hardware required and the potential for failure ruled out this possibility. No pressure reductions can be installed downstream of the control valve, because the back pressure would cause the air inlet immediately downstream of the control valve to be a water discharger instead of a vacuum breaker. The potential for a rupture of the pipe, and the danger of that potential, has raised serious public safety concerns. All components of the bypass pipe and valves would need to be designed very conservatively. Fixed cone valves, which are being proposed for this alternative, are designed for this type of service and they should be reliable.

C. Alternative #3 - Penstock Bypass Valve

This alternative is similar to Alternative #2, but involves a bypass pipe, valves, and controls attached to the penstock for Turbine No. 1, passing underground to the river just upstream of the station.

A large valve and pipe access vault would be built underground on the upstream (west) side of the station. This vault would be approximately 18 ft x 18 ft x 18 ft in dimension. It would necessitate removal of bedrock adjacent to the station, with the potential dangers associated with blasting.

The most serious drawback of this alternative is the need to remove heavily reinforced concrete which surrounds No. 1 penstock, cutting a 55-in.-diameter hole in the side of the penstock, and installing a 54-in.-diameter bypass pipe. A lengthy shutdown of the tunnel and station would be necessary during construction.

Consideration of this alternative is similar to that for Alternative #2, and the conclusions of the Discussion Notes accurately reflect the main points of consideration.

GREAT NORTHERN NEKOOSA
MCKAY STATION MINIMUM FLOW BYPASS

DISCUSSION NOTES

ALTERNATIVE #1 - THROUGH TURBINES

Pros:

- 1.) Minimum Estimated Cost: \$200,000 $\pm$ 20%
- 2.) Use existing facilities and equipment.
- 3.) No outage of station required.
- 4.) Quicker to implement (i.e., no tunnel outage).

Cons

- 1.) Bypass flow capacity limited to 100-145 cfs/unit, or a station capacity of 300-400 cfs if all three turbines are available.
- 2.) Passing flows through non-rotating runners raises some questions regarding wear and vibration.
- 3.) Not instantaneous for the full 400 cfs.
- 4.) Concern for safety of turbine-generator (T-G) equipment and dependability of flow. Braking force vs. wicket gate position may have some variability. If the turbine rotates, wicket gates must close to protect the equipment.
- 5.) All units may not be available.
- 6.) May need to pass supplemental flows in Upper Gorge.

ALTERNATIVE #2 - TUNNEL BYPASS VALVES AND PIPING

Pros

- 1.) Piping connection is easy and straight-forward.
- 2.) End of tunnel serves as valve and pipe vault.
- 3.) Completely independent of penstocks and turbines.
- 4.) Bypass flow capacity of approximately 500 cfs.
- 5.) Supplemental gorge flows should not be required.
- 6.) Safety of T-G equipment is not a concern.
- 7.) Quicker response in passing minimum flow.
- 8.) Dependability of flow.
- 9.) Could be used to shorten the time required to drain the tunnel.

Cons:

- 1.) Entrance to tunnel for inspection or repairs is made more difficult. The 10-year inspection will require more time.
- 2.) Dampness in tunnel will require auxiliary heat to protect hydraulic power unit for valve (\$3,000/yr).
- 3.) Higher estimated cost: \$575,000-\$600,000; 20,000-30,000 BTU; 10 KW.
- 4.) Safety considerations: potential for a pipe rupture will result in closing of headgates.
- 5.) High velocity in valves and pipeline; potential for cavitation, and increased maintenance.
- 6.) High noise level during operation.
- 7.) Potential for leakage if rubber seal is damaged.
- 8.) Short tunnel outage required for installation.
- 9.) Could increase possibility of more frequent tunnel inspections and would definitely increase need for and expense of penstock inspection for new pipe.
- 10.) Stream alteration permit required.

ALTERNATIVE #3 - PENSTOCK BYPASS VALVE

Pros

- 1.) Shorter length of pipeline.
- 2.) Buried and out-of-sight installation.
- 3.) Minimum interference with existing facilities.
- 4.) Bypass flow capacity of approximately 500 cfs.
- 5.) Supplemental gorge flows should not be needed.
- 6.) Dependability of flows.
- 7.) Quicker response in passing minimum flow.
- 8.) Safety of T-G equipment is not a concern.
- 9.) Could be used to shorten the time required to drain the tunnel.

Cons

- 1.) Higher estimated cost: \$650,00 to \$675,000.
- 2.) Longest tunnel outage for installation.
- 3.) Difficult connection to concrete-encased penstock.
- 4.) Confined area for installation.
- 5.) Bedrock removal required close to penstock and powerhouse.
- 6.) Large valve and pipe vault required.
- 7.) Vault dampness will require auxiliary heat.
- 8.) Safety; potential for a pipe rupture will result in closing of headgates.
- 9.) High velocity in valves and pipeline; potential for cavitation, and increased maintenance.
- 10.) High noise level during operation.
- 11.) Potential for leakage if rubber seal is damaged.
- 12.) Could increase possibility of more frequent tunnel inspections and would definitely increase need for and expense of penstock inspection for new pipe.
- 13.) Stream alteration permit required.

Attachment 2

**FERC Correspondence Related to Outage Minimum Flow
Procedure**

FEDERAL ENERGY REGULATORY COMMISSION
Washington D.C. 20426

Office of Energy Projects

Project No. 2572-136—Maine
Ripogenus Hydroelectric Project
Great Lakes Hydro America, LLC

August 22, 2023

VIA FERC Service

Kelly Maloney
Great Lakes Hydro America, LLC
150 Main Street
Lewiston, ME 04240-1398

Subject: October 2021 to April 2022 Flow Deviations, and Allegations of June and October 2022 Flow Deviations and Stranding Effects

Dear Ms. Maloney:

This letter is in reference to your April 28, 2022 filing notifying the Federal Energy Regulatory Commission (Commission) of minimum flow deviations at the Ripogenus Hydroelectric Project No. 2572 that occurred between October 15, 2021 and April 18, 2022. The letter also addresses comments filed between April 28, 2022 through September 23, 2022,¹ made by the Maine Council of Trout Unlimited (Trout Unlimited) and members of the public alleging additional related minimum flow deviations. Minimum flow requirements are established by Article 402 of the project license.²

¹ Commission staff also received multiple phone calls on the matter, through May 19, 2023, from the same parties. No new information was provided during the calls that had not already been filed on the record.

² Order Issuing License (77 FERC ¶ 61,066), issued October 22, 1996.

License Requirements Relevant to the Flow Deviation Allegations***Article 402 – Minimum Flow Releases***

Article 402 requires minimum flow releases into the West Branch of the Penobscot River, below McKay Station, based on salmonid spawning needs, whitewater recreation, and power generation. From September 16 through October 14, you must provide 1,000 cubic feet per second (cfs) to facilitate the drawdown of the North Twin Development of the downstream Penobscot Mills Hydroelectric Project No. 2458. From October 15 through November 15, you must provide salmon spawning minimum flows of at least 1,422 cfs or inflow, but not less than 1,300 cfs. From November 16 to June 7, the minimum flow for salmon incubation must be greater than 1,422 cfs or matching that year's spawning flow. The spawning and incubation minimum flows are established in consultation with the U.S. Fish and Wildlife Service (FWS) and Maine Department of Inland Fisheries and Wildlife (Maine DIFW) each year and may be modified with both agencies' concurrence.

Article 402 also requires minimum flow requirements to be supplemented by whitewater recreation flows established by your 1993 Settlement Agreement.³ Whitewater recreation flow releases vary based on water year type. From May 1 through September 15, between the hours of 08:30 and 17:00 local time, during normal water years,⁴ you must release 2,300 cfs on Saturdays and Sundays, 2,200 cfs on Mondays and Fridays, and 2,000 cfs on Tuesdays through Thursdays. In wet or dry years, you must release 2,200 cfs on Saturdays and Sundays, 2,000 cfs on Mondays and Fridays, and 1,800 cfs on Tuesdays through Thursdays. Further, from September 16 through October 1, between the hours of 08:30 and 17:00 local time, during normal water years, you must release 2,300 cfs on Saturdays and Sundays. During wet or dry years, you are required to release 2,200 cfs on Saturdays and Sundays. From June 8 through October 14, minimum flows during non-peak whitewater boating hours, between the hours of 17:00 and 08:30

³ The Settlement Agreement was executed between the licensee and the Maine Professional River Outfitters on September 2, 1993, and filed with the Commission on September 8, 1993.

⁴ The range of "normal" available water represents the expected available water during normal hydrologic conditions. It is defined as the range between $x-s$ and $x+s$, where "x" is the mean value and "s" is the standard deviation. Based on a statistical analysis, total available water is expected to be within this "normal" range two-thirds of the time, and outside of this ranges ("wet" or "dry" years) one-third of the time.

local time, must remain at or above 1,000 cfs.

Additionally, Article 402 includes provisions that, in the event of failure of generating units at McKay Station, you are only required to provide 400 cfs; however, you must return to the scheduled minimum flows as quickly and practically as possible, but no more than 3 days following the initial outage.

Article 402 allows you to modify minimum and recreational flows temporarily if required by operating emergencies beyond your control, and for short periods upon agreement with the Maine Department of Environmental Protection (Maine DEP) and Maine Land Use Regulation Commission (Maine LURC), and during hydrologic conditions beyond your control upon agreement with the FWS, Maine DIFW, Maine DEP, and Maine LURC. Any such modifications must be reported to the Commission no later than 10 days after each such incident.

Article 406 – Habitat Improvement Plan

Article 406 of the project license requires the licensee to implement a Habitat Improvement Plan (Plan) for landlocked Atlantic salmon at the project's Holbrook Side Channel, in consultation with the FWS, Maine DIFW, and Maine LURC.⁵ The intent of the improvements to the Holbrook Side Channel was to provide rearing habitat for landlocked salmon. The Plan described intended habitat improvements and how the modified habitat would be monitored. The Plan required you to monitor production and outmigration for a minimum of 5 years but included provisions for extending monitoring efforts if projected production or outmigration objectives were not achieved. Your monitoring report filed on December 23, 2002, demonstrated that the Holbrook Side Channel can produce and exceed the projected densities of salmon fry. Based on these results, the Commission approved the discontinuation of monitoring on February 20, 2003.⁶

⁵ Order Approving Habitat Improvement Plan (80 FERC ¶ 62,204), issued September 9, 1997.

⁶ Order Approving Recommendations of Habitat Improvement Plan Under Article 406 (102 FERC ¶ 62,116).

Project Operations

The Ripogenus Project operates as store-and-release, rather than run-of-river, and provided power for papermaking facilities in Millinocket and East Millinocket, Maine, at the time of licensing. Store-and-release operations maximize the combined annual energy generation at Ripogenus and Penobscot Mills⁷ hydroelectric projects by keeping flows within each development's hydraulic capacity. Store-and-release operations also moderate extreme seasonal variation in streamflow, primarily by reducing flood risk associated with high spring flows. This mode of operation further maximizes baseload energy generation, which had been a priority for the papermaking facilities.

Salmon Flow Modifications

On April 28, 2022, you notified the Commission that, after agency consultation, you reduced salmon spawning and incubation flows below 1,300 cfs, as low as 800 cfs, from the project into the West Branch of the Penobscot River below McKay Station, from October 15, 2021 through April 18, 2022, due to severe drought in the watershed limiting inflows to the project.⁸ Target flows were originally set to be 1,100 cfs; however, further reductions were initiated on March 4, 2022, wherein flows could be reduced to 800 cfs. Your filing indicates that the flow reductions were made after consultation with the Maine DIFW, Maine DEP, FWS, and Maine LUPC, and that you were not aware of any adverse effects to aquatic resources resulting from the flow reduction.

⁷ The Ripogenus Project and downstream Penobscot Mills Project were operated as a part of an integrated system developed by Great Northern Paper Company to provided baseload electric power for its Millinocket and East Millinocket paper mills. At the time of licensing, Ripogenus Dam and the Millinocket Lake and North Twin Developments of the Penobscot Mills Project were operated in a store-and-release mode prioritizing power production, while the downstream Millinocket, Dolby and East Millinocket developments were operated in a run-of-river mode to recreate a more natural hydrograph downstream of the mills.

⁸ According to the U.S. National Oceanic and Atmospheric Administration's National Integrated Drought Information System (drought.gov), Maine experienced a significant drought in 2020 that transitioned to a snowpack drought through 2022. Depleted snowpack and groundwater conditions remained after 2020, so even as precipitation returned to normal, water availability remained diminished.

Subsequently, on May 9, 2022, local resident, Mr. Ed Spear, requested that the Commission impose a civil penalty for the flow change, due to prolonged duration and failure to notify the Commission in a timely manner. Mr. Spear alleged that the flow reduction caused the loss of juvenile salmon. On May 31, 2022, Mr. Spear filed photos of the Holbrook Side Channel to support his claim.

On May 12, 2022, Trout Unlimited also requested that the Commission consider the flows from October 15, 2021 through April 18, 2022, a violation of the project license.⁹ Trout Unlimited noted that during the months prior to October 15, 2021, you released flows in excess of the minimum flow requirement, and that operational experience should have better informed your choice to release water that could have been stored for salmon spawning season. Additionally, Trout Unlimited requested public access to operational data and access to the project's Part 12D Dam Safety Inspection Report.¹⁰

On May 26, 2022, Commission staff requested that you respond to the comments described above. In your June 8, 2022 response, you reiterate that you implemented the flow reductions only after consultation with the required resource agencies, and you point out that flows from the Ripogenus Project were necessary for license compliance at the downstream Penobscot Mills Project No. 2458. You also note that flows prior to October 15, 2021 complied with Article 402 and reiterate the severity of the drought during the flow reduction period. Your filing includes operational data covering the duration of the flow reduction (October 15, 2021 through April 18, 2022) demonstrating that flows were maintained at or above 800 cfs throughout the planned flow reduction and that additional flows were provided as available.

⁹ Trout Unlimited's May 12, 2022 filing also included comments related to the relicensing of the project; however, those comments will be addressed by the Commission's Division of Hydropower Licensing under the docket P-2572-133. This applies to any relicensing-related comments included in the filings discussed throughout the rest of this letter as well.

¹⁰ At the time of filing, the most recent 10th Part 12D Dam Safety Inspection Report was issued on May 11, 2022; however, a more recent report was issued May 3, 2023. Information regarding accessing critical energy/electric infrastructure information, such as the dam safety inspection reports, is located in 18 C.F.R. § 388.113(g) and on our website at <https://www.ferc.gov/enforcement-legal/ceii/electronic-ceii-request-form>.

On June 8, 2022, Mr. Jeff Kaine filed comments broadly opposing flow fluctuations at the project and indicating that he witnessed sculpins and macroinvertebrate strandings resulting from rapid downramping. He alleged that these strandings have negatively affected food available to salmon populations.

On June 17, 2022, Mr. Spear filed additional comments. Mr. Spear stated that project inflows increased in April 2022. He believed that, based on Article 402's requirement to provide 1,422 or inflow, salmon incubation flows should have been increased concurrently with inflow. He alleged that the Holbrook Bypass Channel and downstream spawning areas were dewatered, causing adverse effects to salmon populations. Mr. Spear also disagreed with your June 8, 2022 comments suggesting that you could not have anticipated the severity of the drought or managed water more efficiently based on the information available prior to October 15, 2021. He pointed to a February 23, 2022 email included in your April 28, 2022 filing wherein your staff stated that drought-induced water conservation measures had been in place since 2020. He also described how he believed the upstream Storage Project No. 2634 could have been used to redistribute water to maintain Ripogenus outflows.¹¹ Mr. Spear further indicated that recreational boating flows were excessive when peak energy demand typically occurs.

Trout Unlimited filed additional comments on June 24, 2022, expressing similar concerns as Mr. Spear with your June 8, 2022 filing. Trout Unlimited's filing included outflow data that it believed showed peaking operations, which it thought dewatered loon nests and restricted boating activities on Chesuncook Lake,¹² in addition to the alleged effects to salmon discussed in Mr. Spear's June 17, 2022 filing.

In response to your June 8, 2022 letter, Ms. Kathleen Houston filed comments with the Commission on June 27, 2022, also contesting your assertion that the drought necessitated flow reductions and suggesting that the reductions could have been reduced by stopping recreational boating flows at 1700 hours. Ms. Houston also provides a comparison of the actual flows to the minimum flows required during August 2021 and disputes that requirements downstream necessitated the releases provided. Specifically,

¹¹ While Great Lakes Hydro America, LLC is also the licensee for the Storage Project, the projects are licensed and operated separately.

¹² Chesuncook Lake is immediately upstream of Ripogenus Lake. Construction of Ripogenus Dam created Ripogenus Lake, and the increased water levels essentially connected it to Chesuncook Lake, as well as raising the water levels in Caribou Lake and Moose Pond.

Ms. Houston states that if a release of 2,000 cfs, for example, is required from the next reservoir downstream, a release of 2,000 cfs from the Ripogenus Project should provide adequate water.

Additional Comments and Allegations

On June 27, 2022, Ms. Sarah Sindo, who was employed at the Chewonki Foundation at Big Eddy Campground on the West Branch of the Penobscot River, notified the Commission that she observed a low flow event on June 24, 2022, wherein flows, as reported on the SafeWaters website,¹³ were 1,900 cfs rather than the scheduled 3,500 cfs. She indicated that it was a busy fishing weekend and that significant flow decreases adversely affect recreational fishing.

On June 29, 2022, Ms. Julie Puleio, also of the Chewonki Foundation at Big Eddy Campground, indicated that she also observed the June 24, 2022 flow reduction previously reported by Ms. Sindo and was unable to go surfing as intended. She also stated that she has observed other rapid drops in flow that have resulted in strandings of aquatic macroinvertebrates. On July 14, 2022, we requested additional information regarding the June 24, 2022 low flow event.

You responded to our request for additional information on July 21, 2022. Your filing indicates that, at 16:38 on June 24, 2022, a unit at McKay Station tripped offline, resulting in a drop in flows to approximately 1,900 cfs. You identified the cause of the trip to be a transmission line fault, and you state that the project-maintained flows well above the 400 cfs minimum required during a unit trip, pursuant to Article 402. Consequently, you did not report the incident as a deviation from license requirements.

On July 25, 2022, Mr. Paul Heinze filed comments with the Commission, broadly alleging that, in his over 20 years of fishing the West Branch of the Penobscot River, flows have been allowed to fluctuate more dramatically in recent years. Mr. Heinze recalled seeing prolific caddisfly emergences that are no longer occurring, and he attributed the decline to how the Ripogenus Project is operated.

¹³ The SafeWaters website is a recreational resource provided and maintained by Brookfield Renewable U.S. with the intent of improving recreational experiences and safety at the Ripogenus Hydroelectric Project and other hydropower facilities.

Fish Stranding Study

On October 12, 2022, you reported a planned, 4-hour flow reduction that occurred on October 5, 2022, after consultation with the Maine DIFW, Maine DEP, and Maine LUPC, in order to conduct a Fish Stranding Study (Study) as a part of the relicensing process for the project.¹⁴ The minimum flow modification was necessary to conduct the Commission-approved Study, which was required as part of the pending relicensing proceeding. Article 402 permits you to modify flows for short periods of time after consultation with and receiving approval from the resource agencies. Thus, you were permitted to modify flows, and you reported it to the Commission within 10 days, as required.

On April 24, 2023, you filed the results of the Study. While this filing was required pursuant to your relicensing proceedings, the results are pertinent to the comments and allegations of noncompliance discussed above. The Study was originally requested by Trout Unlimited on February 21, 2022. The intent was to determine whether unit outages and the resulting flow reductions result in strandings, and to quantify how frequently outages occur. The Study identified five outages that occurred from 2018 through 2022, averaging 3.2 hours in duration. It verified that you were able to maintain minimum flows of 400 cfs, and therefore, your compliance with Article 402; however, stranded fish and macroinvertebrates were found in large numbers in 7 distinct reaches of the West Branch of the Penobscot River, between McKay Station and the Nesowadnehunk Deadwater. While not all strandings resulted in mortalities, juvenile landlocked salmon were the most commonly stranded species with the highest individual number of mortalities at 105 observed mortalities. The highest mortality rate by percentage of strandings was attributed to the 10 slimy sculpin found stranded, where none survived. Changes in water elevation in the West Branch of the Penobscot River between McKay Station and Nesowadnehunk Deadwater ranged from 1.4 to 3.4 feet, with the greatest change closest to McKay Station. There was no change in water elevation in the Holbrook Side Channel.

Conclusion

Based on our review of the record, the allegations of noncompliance with your license flow requirements are not violations of the project license. The low flow events were associated with unexpected unit trips or were planned reductions implemented only

¹⁴ See May 13, 2023 Study Plan Determination issued under dockets P-2572-133 and P-2458-247.

after consultation with the resource agencies, as required per Article 402. You maintained flows at or above the agreed upon minimums during the October 15, 2021 through April 18, 2022 flow reduction and October 5, 2022 relicensing study. On June 24, 2022, you maintained flows above 400 cfs and notified the pertinent resource agencies in a timely manner, as required by Article 402.

You generally reported deviations in a timely manner, however, you notified the Commission of the October 15, 2021 through April 18, 2022 salmon spawning and incubation flow reductions on April 28, 2022, within 10 days after the flow reduction ceased but approximately six months after the onset of the deviation. Article 402 requires you to notify the Commission of any flow deviations no later than 10 days after each such incident. Commission staff considers the intent of the requirement to notify us within 10 days of the onset of any deviation, rather than within 10 days of the conclusion of any deviation, to keep us apprised of your actions, which did not occur in this case. For future deviations, you must notify the Commission within 10 days of the onset of the deviation. Failure to do so may result in a violation of your license. In instances where deviations last longer than 10 days, we may require a follow-up report documenting the full duration and magnitude of the event as well as any potential effects that may not have been anticipated at the onset of the event. Additionally, in the future, you should file a request for Commission approval of a temporary variance for planned deviations exceeding short periods of time (2 to 3 weeks), prior to implementing the changes. In any such filing, please include documentation of approval from the resource agencies. For additional information on how to request a temporary variance to a license requirement, please see our website at <https://cms.ferc.gov/media/how-apply-temporary-variance>.

As stated above, the Ripogenus Project operates as store-and-release, not run-of-river, resulting in variable outflows. Based on the information filed in the record, it appears that the decrease in prioritizing consistent energy production for the papermaking facilities has resulted in an increase in flow variability to maximize energy production during peak hours. While flow variations departing from the natural hydrograph, particularly steep downramping rates, are technically within the current license requirements, they have resulted in adverse effects to aquatic life not anticipated at the time of licensing, as demonstrated by the numerous fish and macroinvertebrate strandings reported to us. Trout Unlimited and multiple members of the public have provided observations, including photographic evidence, of fish and macroinvertebrate mortalities resulting from unit outages at your project, despite your compliance with the current license. The Commission may address adverse effects resulting from conditions not foreseeable at the time of licensing. Standard Article 15 of the license, in relevant

part, states that “that licensee shall, for the conservation of development of fish and wildlife resources... comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion... after notice and opportunity for hearing.” Therefore, as discussed below and based on the record, we direct you to determine, in consultation with appropriate agencies, whether there are interim protection measures for aquatic resources that would prevent or minimize adverse environmental effects.

Accordingly, we are requesting that you consult with the FWS, Maine DIFW, Maine DEP, and Maine LURC to identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during downramping events, such as unit outages, until the current relicensing process is concluded. Examples of possible measures include: increasing the frequency at which staff are present at McKay Station to respond to low flow events more quickly; a battery back-up system to reduce the instances and/or durations of outage-caused flow reductions; or automating a gate at Ripogenus Dam to release a preset minimum flow to the West Branch of the Penobscot River when McKay Station trips offline. By requesting interim protection measures, we are not prejudging requirements or other protection measures that may be determined during the relicensing process.

Please file, for Commission review and approval, proposed interim protection measures agreed upon by the resource agencies, documentation of agency consultation, and a plan and schedule for implementing the measures, within 90 days of the date of this letter. If you are unable to reach concurrence with the resource agencies within 90 days, please request for an extension of time, including a status update and a proposal, with justification, for a new, reasonable deadline within 90 days of the date of this letter.

This letter is issued under authority delegated to the Director and constitutes final agency action. Requests for rehearing may be filed within 30 days of the date of issuance of this letter, pursuant to 18 C.F.R. § 385.713 (2022).

Thank you for your cooperation. We look forward to your response, **due November 20, 2023**. If you have any questions regarding this letter, please contact Alicia Burtner at (202) 502-8038 or alicia.burtner@ferc.gov.

Sincerely,

CarLisa Linton
Director
Division of Hydropower Administration
and Compliance

January 19, 2024

FERC Project 2572-136

Debbie-Anne A. Reese
Acting Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Electronically Filed

Subject: Ripogenus Project, FERC No. 2572; Interim Plan for Aquatic Resource Protection during McKay Station Outages

Dear Secretary Reese:

Great Lakes Hydro America, LLC (GLHA), licensee for the Ripogenus Project (Project) located on the West Branch of the Penobscot River in Maine (West Branch), submits this letter in reply to Commission correspondence dated August 22, 2023, in which the Commission requests that GLHA propose interim protection measures for West Branch aquatic resources that would prevent or minimize adverse environmental effects at the Project. Specifically, the Commission requests that GLHA:

“consult with the FWS, Maine DIFW, Maine DEP, and Maine LURC to identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during down ramping events, such as unit outages, until the current relicensing process is concluded.”

The Commission further requested that GLHA submit the proposed interim protection measures (as agreed upon by the resource agencies) within 90 days (or by November 20, 2023¹), including a plan and schedule for implementing the measures.

Background

The issue of providing flows to the West Branch during outages of McKay Station is not new, and dates back to at least the early 1990's and the previous relicensing of the Project. On May 3, 1991, and following extensive consultation with resource agencies, Great Northern Nekoosa Corporation (“Great Northern”, licensee for the Project at the time) filed a *Plan for Providing Minimum Flow* (“1991 Plan”) to the Commission that detailed the proposed use of a braking system to provide a flow of approximately 400 cfs during outages at McKay Station. Prior to that, the Ripogenus Project FERC license (dated December 20, 1968) only required that a minimum flow of 200 cfs be provided below McKay Station to protect fishery resources.

¹ On November 20, 2023, GLHA submitted a 60-day time extension request to the Commission for filing the proposed interim protection measures.

As detailed in the 1991 Plan, the braking system was operated by automatically closing the wicket gates when a station trip occurred, which in turn slowed the turbines until the brakes (which were clamped to the turbine shaft discs) could bring them to a complete stop. Once the turbines stopped, the wicket gates automatically reopened to 8 – 9% gate, which allowed approximately 400 cfs to pass while the brakes held the turbines in a stationary position. Testing of the system, as detailed in the 1991 Plan, demonstrated that it took approximately 20 minutes for this system to release the full 400 cfs to the West Branch below McKay Station following a station outage.

The 1991 Plan described six station outages that occurred between 1988 and 1990 at the Ripogenus Project, which in large part prompted the development of the automated system for providing flows from McKay Station during an outage. Great Northern promoted this method of providing a 400 cfs outage flow to the West Branch as a significant improvement over historical practices, which for many years had involved dispatching a dam tender to open a gate at Ripogenus Dam, a process that typically took much longer than 20 minutes to restore flows to the river below McKay Station (especially if the dam tender was not in the immediate area). This was due to the time needed for the dam tender to drive to Ripogenus Dam, conduct the siren procedure (to warn any recreationists in the Upper Gorge), and then open a gate. Additionally, water travel time was entailed with this process, as flow releases from the dam must first pass through the ¾-mile long Upper Gorge before they reach McKay Station in order to benefit downstream aquatic resources.

Great Northern detailed the benefits of the braking system in the 1991 Plan, first and foremost pointing out that it was an automated system that was able to release flows directly into the West Branch at McKay Station, rather than manually from the upstream dam using a dam tender. In addition, the system greatly enhanced public safety (specifically for any recreationists that may be in the Upper Gorge downstream of Ripogenus Dam) and the protection of West Branch aquatic resources. Great Northern further stated in the 1991 Plan that its fisheries consultants supported the proposed system as a significant enhancement over existing conditions, with the consultants stating that it would not adversely affect the West Branch fishery if the system operated as described. The 1991 Plan also indicated that the Maine Department of Inland Fisheries and Wildlife (Maine DIFW) concurred with the assessment of Great Northern's fisheries consultants regarding the benefits of the automated flow release system to the West Branch fishery. The Commission approved this enhanced system for providing minimum flows and incorporated the 400 cfs minimum outage flow as a requirement in the 1996 FERC license.

As detailed in correspondence to the Commission dated December 30, 2016, GLHA implemented remedial measures in 2016 to improve the braking system after it malfunctioned during a May 13, 2016, outage at McKay Station. GLHA stated that a high-water level in the Ripogenus impoundment likely contributed to the malfunction due to the increased forces needed to brake and stop the units under the greater head. The remedial measures included the addition of a second braking system to increase the clamping forces on the turbine units, replacement of all air and oil piping to the units, and periodic cleaning and inspection of the brake pads and discs. In addition, GLHA stated that it would keep a sluice gate open at Ripogenus Dam until testing could be performed at a high impoundment level to demonstrate that the system would function properly during subsequent station outages.

On June 29, 2017, GLHA provided an update to the Commission after testing was performed at a high impoundment level. The testing demonstrated that the minimum flow braking system passed about 350 cfs at an impoundment level that was just under one foot below full pond. In order to ensure that the 400 cfs minimum flow would be passed during a station outage, GLHA stated that it would open the dam's log sluice when the impoundment level exceeded 930.8 feet (about 10.8 feet below full pond). The Commission accepted these modifications for providing the 400 cfs outage flow on September 18, 2017.

Since the modified operational procedure for braking the units required that flow be released from the dam, and since the use of the braking system was undesirable due to the significant forces that must be overcome to stop the units, GLHA began working in 2017 to develop and test an alternative system for providing the 400 cfs minimum flow during an outage. This system, which involved spinning (rather than braking) of the units to pass flow, was successfully tested and found to provide higher outage flows (an estimated 479 cfs) versus the 350 cfs released using the modified braking system. Thus, and as a result of the successful testing that was performed on all three hydro units at McKay Station, the modified system to pass minimum flows at the Ripogenus Project by spinning (rather than braking) the units was implemented on February 9, 2018, and the log sluice gate was closed.

On February 16, 2018, GLHA provided an update to the Commission regarding this improved system for releasing minimum flows during outages of McKay Station. On February 26, 2018, the Commission acknowledged (via e-mail) the improvements that GLHA had made to the outage flow system and stated that the release of minimum flow by spinning (rather than braking) the units met the outage flow license requirement. Since then, minimum outage flows (calculated at around 500 cfs, depending on the Ripogenus impoundment water level) have been successfully provided during station trips via the automated method of spinning the units,² and the improved system has worked as designed and approved by the Commission. All subsequent station trips, which have been caused by outside forces such as lightning strikes, and therefore were out of GLHA's control, have triggered the automatic minimum flow. GLHA has reported each of these events to the resource agencies and in no case has been in violation of the Ripogenus license requirements.

Agency Consultation

The required agency consultation to identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during unit outages was initiated with a Teams call on October 4, 2023 between GLHA, the Maine Department of Environmental Protection (Maine DEP), the Maine Land Use Planning Commission (Maine LUPC, formerly the Maine Land Use Regulation Commission), and the United States Fish and Wildlife Service (USFWS). Maine DIFW was invited but was not able to participate. GLHA emphasized the following points during this call:

- Public safety must continue to be the foremost consideration for any protection measures for fish and macroinvertebrates that are identified.

² GLHA notes that the flow being passed through the units during an outage cannot be further increased due to the risk of the units going into a speed no load condition, which would damage the units.

- The 1991 Plan should be utilized as a basis for identifying protection measures, as it evaluated various options for providing outage flows and had the same basic purpose (i.e., how to protect West Branch aquatic resources during McKay Station outages) that the Commission is requesting of GLHA today.
- The current Commission and agency-approved approach of providing flows directly through the units at McKay Station during an outage has been in place for over 30 years; the initial implementation of this approach in 1991, coupled with the improvements made in 2018, have enhanced the licensee's ability to quickly release outage flows into the West Branch, and thus, they have presumably enhanced protection measures for fish and macroinvertebrates during station outages over pre-1991 conditions.
- Since the October 2022 fish stranding study (which simulated a station outage) demonstrated that fish and macroinvertebrate impacts still do occur when McKay Station trips offline, GLHA intends to continue its focus on reducing the frequency and durations of these station outages.

The resource agencies were in general agreement with these points, especially the need to prioritize public safety for any interim protection measures that are identified. They further suggested that GLHA consider a continuous flow release from Ripogenus Dam as an interim protection measure and a synchronized bypass valve at McKay Station as a potential long-term measure. GLHA expressed concern with a continuous flow release, noting that (1) the amount of flow necessary to protect fish and macroinvertebrates during an outage is unknown and unproven, (2) a continuous flow release could potentially attract recreationists into the hazardous Upper Gorge area downstream of Ripogenus Dam, and (3) the water release could result in lower Ripogenus impoundment water levels, thereby potentially impacting impoundment stakeholders. GLHA further noted that the synchronized bypass valve approach was considered and dismissed in the 1991 Plan.

On October 19, 2023, GLHA distributed a draft of this Interim Plan for agency review (see attached). Each of the agencies provided comments (attached), with the Maine DEP, Maine LUPC, and USFWS each recommending that GLHA provide a continuous minimum flow from Ripogenus Dam of 1,422 cfs as an interim protection measure for fish and macroinvertebrates until GLHA implements more permanent protection measures.

Maine DIFW noted in their letter that they are the agency responsible for the protection and management of the inland fisheries resources in the State of Maine, and they made several points, including (1) low flow events in the West Branch below McKay Station occur in most years due to both planned and unplanned occurrences, (2) the low flow events cause fish and macroinvertebrate mortalities, (3) despite the low flow events, landlocked catch rates on the West Branch are very good (compared to similar rivers in the region), and landlocked salmon recruitment in the river is robust, (4) GLHA has acted in good faith to improve the system that is in place for automatically releasing minimum flows when the station trips offline, and (5) releasing a continuous minimum flow of 600 cfs from Ripogenus Dam would make the Upper Gorge unfishable, would reduce angling opportunities in this stretch, and would likely exacerbate low water levels in the Ripogenus impoundment.

MDIFW recommended that GLHA's proposals be implemented as interim measures through the remainder of the relicensing process, but they also recommended that GLHA mitigate for salmonid and macroinvertebrate mortalities during this interim period through monetary penalties for each low flow occurrence. These penalties would be scaled to the severity/duration of each event and determined through consultation between GLHA and Maine DIFW. The monetary penalties would be placed in a mitigation fund for fisheries restoration and improvement projects in the region.

A final Teams meeting was held between GLHA and the resource agencies on January 17, 2024 to provide a final opportunity for comment on GLHA's interim plan to protect aquatic resources in the West Branch during McKay Station outages. Each of the agencies indicated that they had no change in position from their previous written comments.

After due consideration of the various proposals, GLHA has concluded that, even as an interim measure, a continuous 1,422 cfs minimum flow from the dam is an excessive and unreasonable measure to address station trips, which, while unfortunate, are relatively rare in occurrence and short in duration. Any flows passed at the dam cannot be utilized for energy generation and, as noted above, such a high flow in the Upper Gorge raises very real and serious public safety concerns.

While imperfect, the current minimum flow system, which was developed in consultation with the resource agencies, has worked as designed. GLHA believes that, in combination with the new measures outlined below, the existing minimum flow system will continue to provide adequate protection as an interim measure. Further, permanent mitigation and enhancement measures will be analyzed and proposed as part of the relicensing process for the Ripogenus Project.

Interim Plan for Reducing Fish and Macroinvertebrate Strandings

During the current interim period prior to issuance of a new license for the Ripogenus Project, GLHA proposes to (1) continue the current approach of automatically releasing flows directly through the units at McKay Station during an outage, (2) implement measures to improve system reliability, (3) continue its ongoing long-term maintenance and upgrade project for the Ripogenus transmission line, (4) retain an engineering consultant to update the 1991 Plan based on current technology, and (5) make monetary payments to Maine DIFW for any unplanned excursions that occur at the Ripogenus Project due to unit trips at McKay Station.

Automatic Unit Flow Releases during McKay Station Outages

When an outage occurs at McKay Station, each of the three units are programmed to automatically pass flows to the West Branch downstream of the Station. The sequence of events when an outage occurs are as follows:

- Each of the units receives a shutdown command via the Station's programmable logic controller (PLC).
- The wicket gates and inlet gate dow valves for each of the units close.
- Once the PLC receives confirmation that the valves have closed, the wicket gates automatically open to a 13% gate position and the dow valves reopen.

Together, these steps take just a few minutes to occur, and they result in an outage flow of approximately 500 cfs (160 cfs through both Unit 1 and Unit 2, and 190 cfs through Unit 3).

System Reliability

Reducing the overall number of system trips would greatly improve existing conditions by directly reducing the number of minimum flow events. GLHA intends to implement a relay coordination study, with the intent being to reconfigure system relays in order to improve transmission and generation protection. This will increase the stability and reliability of the system, thereby minimizing outages at McKay Station due to system trips at other interconnected facilities (which typically result from lightning strikes and local utility outages, either of which can “ripple through” GLHA’s generating stations on the upper Penobscot). GLHA proposes to reconfigure the system relays by March 31, 2024.

GLHA also intends to install a back-up PLC system at McKay Station (by September 30, 2024), which will also improve system reliability and reduce station outages by enabling PLC functions to continue should the primary PLC crash or malfunction.

Transmission Line Maintenance

Since 2008, GLHA has implemented a long-term plan for repairing and upgrading the Ripogenus Project transmission line. The primary purpose of this work is to minimize outages of McKay Station caused by transmission line failures. In general, the work is targeted and prioritized to specific support structures (poles and crossarms) based on periodic inspections aimed at identifying wood rot and structure damage (primarily from woodpeckers). GLHA intends to continue this long-term maintenance plan on an annual basis, which has been effective in reducing outages at McKay Station (i.e., no station outages have occurred due to transmission line failure since a cross arm failed on the Ripogenus Project transmission line in May of 2016).

Update of 1991 Plan for Providing Minimum Flow

The 1991 Plan was developed following several unplanned outages at McKay Station that caused flows to drop below the 200 cfs minimum flow that was in place at the time. Great Northern stated that their purposes for developing the 1991 Plan were to improve methods for providing the existing 200 cfs minimum flow and to lay out a means for releasing a higher flow (400 cfs) during unplanned outages for the term of a new FERC license.

The consultants retained by Great Northern evaluated three basic alternatives in the 1991 Plan for providing unplanned outage flows:

- Alternative 1 - automation of a gate at Ripogenus Dam (to reduce the delay caused by the time needed to dispatch a dam tender to manually open a gate).
- Alternative 2 – installation of a bypass pipe and valve, either at the end of the tunnel that provides flows to the station turbines, or off of the penstock for Unit #1.
- Alternative 3 - passing flow through the turbines by using existing Dow valves and wicket gates and by applying brakes to prevent turbine rotation.

Alternative 1 was eliminated, as Great Northern concluded that automated gate operation would create an unacceptable public safety risk, while Alternative 2 was ruled out due to the numerous mechanical and civil limitations, along with significant construction and operation issues. As indicated previously, Alternative 3 was found to be feasible, and it was implemented in 1991.

As indicated during the October 4, 2023, agency consultation meeting, GLHA proposes to reevaluate the 1991 Plan based on current technology to determine if the Alternative 3 approach (i.e., automatically passing flow through the units) remains the preferred option for providing flows to the West Branch during unplanned outages of McKay Station. The results of this updated alternatives analysis will be provided to the Commission as part of the Ripogenus Project's application for new license, together with GLHA's proposal for long-term protection of aquatic resources during unit outages.

Mitigation Payments

As recommended by Maine DIFW, GLHA will make monetary payments to Maine DIFW (with the amounts determined through consultation between GLHA and Maine DIFW) for any unplanned excursions below 1,000 cfs³ that occur at the Ripogenus Project due to unit trips at McKay Station, up to a total of five excursions per year. These payments would be placed in a mitigation fund for fisheries restoration and improvement projects in the region, to be utilized at Maine DIFW's discretion after consultation with USFWS and Maine DEP.

Conclusion

As indicated in the Commission's August 22, 2023 letter, the referenced low flow events and associated allegations of noncompliance are not violations of the Ripogenus Project license. The automated system for providing flows from McKay Station during an outage functioned as designed during these events to ensure compliance with Project minimum flow requirements.

As directed by the August 22, 2023 letter, GLHA has consulted with resource agencies to identify and propose measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during unit outages, until the current relicensing process is concluded. Although GLHA and Maine DIFW are in agreement regarding these interim measures, GLHA could not reach consensus with the other agencies, specifically in regards to their recommendation that GLHA provide a continuous minimum flow from Ripogenus Dam as an interim protection measure. In addition to GLHA's primary public safety concern (i.e., that a continuous flow release could potentially attract recreationists into the hazardous Upper Gorge area), GLHA agrees with Maine DIFW that releasing the suggested continuous minimum flows from Ripogenus Dam would make the Upper Gorge unfishable, would reduce angling opportunities in this stretch, and would likely exacerbate low water levels in the Ripogenus impoundment. GLHA also notes that the current Ripogenus Project license requires a 100 cfs minimum flow from Ripogenus Dam during the months of July, August, and September, specifically to increase fishing opportunity in the Upper Gorge. As Maine DIFW notes, this license enhancement would be negated by higher and continuous minimum flows from Ripogenus Dam.

³ 1000 cfs is the lowest licensed minimum flow for the Project, other than the 400 cfs outage flow

As indicated above, GLHA intends to propose more permanent and long-term protection measures for aquatic resources through the ongoing Project relicensing process. However, in the meantime, GLHA believes that the protection measures proposed in this plan satisfy the Commission's request that GLHA identify temporary solutions aimed at reducing instances of fish and macroinvertebrate strandings downstream of McKay Station following unit outages during the current interim period until a new license is issued for the Project.

Please e-mail me at kevin.bernier@brookfieldrenewable.com or call me at (207) 951-5006 if you have any questions or need additional information.

Sincerely,

Kevin Bernier

Kevin Bernier
Senior Compliance Specialist

Cc: N. Stevens, C. Goodhart, D. Bates, D. Heidrich, S. Michaud, S. Farrington, R. Dill, M. Osborne, T. Mapletoft, R. Dorman, L. Macomber, P. McNelis, P. Wainwright, S. Hill, R. Smith, S. Nelson, K. Pocquette, S. Hofacker, C. Karam; GLHA
A. Burtner; FERC DHAC – Washington
T. Obrey, J. Perry; MDIFW
J. Rosset, B. Sojkowski, A. Cross; USFWS
L. Paye, R. Mohlar; MDEP
B. Way, B. Godsoe, B. Theriault; LUPC

GLHA File: GLHA/Licensing & Compliance/Ripogenus 2572/01 Brookfield Corres



JANET T. MILLS
GOVERNOR

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



MELANIE LOYZIM
COMMISSIONER

November 15, 2023

Kevin Bernier
Senior Compliance Specialist
Great Lakes Hydro America
Kevin.Bernier@brookfieldrenewable.com

Via email

RE: Ripogenus Project No. 2572 – Department Comments on “Draft Interim Plan for Aquatic Resource Protection during McKay Station Outages”

Dear Mr. Bernier:

On August 22, 2023, the Federal Energy Regulatory Commission (FERC) Division of Hydropower Administration and Compliance directed Great Lakes Hydro America (GLHA), a subsidiary of Brookfield Renewable, to consult with the U.S. Fish and Wildlife Service (FWS), Maine Land Use Planning Commission (LUPC), Maine Department of Inland Fisheries and Wildlife (DIFW), and Maine Department of Environmental Protection (Department) to, “identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station [the hydroelectric generating facility at the Ripogenus Project (Project)] during downramping events, such as unit outages, until the current relicensing process is concluded.”

On October 4, 2023, at the Department’s request, GLHA staff met with representatives from the LUPC, FWS, and the Department to discuss potential interim measures to reduce fish and macroinvertebrate strandings. In this meeting, Department staff informed GLHA that adequate minimum flows from Ripogenus Dam would be the only potential measure that will reduce fish and macroinvertebrate stranding caused by McKay Station outages. As noted in this meeting, the example measures FERC provided in the August 22, 2023 directive—additional staff presence, battery backup system, and automating a gate at Ripogenus Dam—would each result in a delay between a dewatering event and corrective action, and would, therefore, not reduce fish and macroinvertebrate stranding. In other words, even a delay in providing additional flows that is shorter than what is operationally feasible (in large part due to the need to check for recreation users in the upper gorge prior to releasing additional flows) would dewater the West Branch of the Penobscot River and would likely cause fish and macroinvertebrate stranding similar to the events that prompted FERC’s August 22, 2023 directive.

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
207-941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

On October 19, 2023, GLHA provided a draft of their plan to address McKay Station outages (draft plan). Department staff have reviewed the draft plan. Contrary to both FERC's specific direction and comments provided to GLHA at the October 4, 2023 meeting with agencies, the draft plan lacks any tangible new measures to address fish and macroinvertebrate stranding. Instead, it primarily appears to be a justification for why the current situation is acceptable and why GLHA proposes no immediate changes or interim measures.

Additionally, GLHA rules out additional minimum flows in its draft plan, speculating that providing additional flows from Ripogenus Dam could create a safety hazard by attracting additional recreation use to the upper gorge (bypassed reach). Department staff disagree that additional minimum flows would cause an unacceptable safety hazard for two reasons: 1) providing consistent minimum flows would actually be safer than providing flows on an emergency basis because the primary safety risk in the bypassed reach is associated with sudden increases in flows causing rising waters, and 2) as the 1991 "Plan for Providing Minimum Flow"¹ provided by GLHA notes, some safety risk below Ripogenus Dam is acceptable due to historical use patterns in the area and the existing safety measures in place (e.g. signage and sirens).

Department staff note that determining the minimum flows from Ripogenus Dam that are necessary to reduce fish and macroinvertebrate stranding is challenging due to a lack of information on project operations. There is currently no gage in the vicinity, and GLHA has not yet provided detailed information on how it operates the Project during the ongoing FERC relicensing process.² As FERC suggests in its August 22, 2023 directive, project operations have changed since the paper mill closed. When the mill was open, the previous licensee operated the Project to provide a steady supply of power for papermaking activities, thus providing a steady flow of water from McKay Station. Since the mill closed, the Project has been operated in a less consistent manner as GLHA sells energy on the open market, and this change has resulted in less consistent flows from McKay Station regardless of whether an outage occurs. Department staff interpret FERC's August 22, 2023 directive to address not only unplanned outages, but also any "downramping event" such as daily pulsing or peaking operations and whitewater boating flow releases.

The only information currently available to the Department that could inform potential minimum flow requirements indicates two things: 1) that stranding occurs when flows are reduced to 500 cubic feet per second (cfs) (as documented by the Fish Stranding Study conducted in 2022), and 2) that currently GLHA is required to release a seasonal minimum flow of 1,422 cfs to prevent fish and macroinvertebrate stranding. It is possible that minimum flows somewhere in the range of 500-1422 cfs would reduce fish and macroinvertebrate stranding, and Department staff recommend that GLHA modify currently planned relicensing studies or conduct an additional study, if necessary, to determine which minimum flows or range of flows are necessary.

¹ GLHA provided a "Plan for Providing Minimum Flow" written in 1991 by Great Northern Paper (previous licensee) that discusses options for providing flows during McKay Station outages. Department staff have reviewed this report and find that it generally lacks sufficient detail to guide decision-making today but note here that the report does not provide any evidence to support GLHA's assertion that additional minimum flows would create an unacceptable safety hazard in the bypassed reach.

² Department staff notes that GLHA is required to conduct a USGS Gage Feasibility Study and an Operations Model Study as part of the relicensing process.

Unless additional information is provided that demonstrates the adequacy of lower minimum flows, the Department recommends that GLHA provide a flow from Ripogenus Dam of 1,422 cfs as an interim measure until GLHA implements permanent measures.

Department staff appreciate GLHA's willingness to meet and discuss this matter and stand ready to continue to devote staff resources to working collaboratively with GLHA, FERC, and other agencies to address effects on fish and macroinvertebrates in order to ensure that the Project can attain State water quality standards related to aquatic life and habitat.

If you have any questions about this matter, please contact me at kyle.olcott@maine.gov or (207) 641-9012.

Sincerely,

A handwritten signature in blue ink, appearing to read "Kyle Olcott".

Kyle Olcott
Hydropower Coordinator
Maine Department of Environmental Protection

From: [Godsoe, Benjamin](#)
To: [Olcott, Kyle](#); [Bernier, Kevin](#); [Paye, Laura](#); [Mohlar, Robert C](#); [Way, Bryan C](#); [Theriault, Billie J](#); [Obrey, Tim](#); [Rosset, Julianne](#); [Sojkowski, Bryan](#); [Cross, Amanda S](#); [Wood, Robert](#)
Cc: [Dorman, Randy](#); [Michaud, Steve](#); [Stevens, Nate](#); [Goodhart, Cameron](#); [Bates, David S](#); [Heidrich, David](#); [Farrington, Stephen](#); [Dill, Richard](#); [Osborne, Michael](#); [Mapletoft, Thomas](#); [Macomber, Lance](#); [McNelis, Patrick](#); [Wainwright, Paul](#); [Hill, Shane](#); [Smith, Russell](#); [Nelson, Scott](#); [Pocquette, Kayla](#); [Hofacker, Stephen](#); [Karam, Chris](#)
Subject: RE: Draft interim plan for aquatic resource protection during McKay Station outages, Ripogenus Project, FERC No. 2572
Date: Thursday, November 16, 2023 9:16:19 AM

Hi Kevin,

The Land Use Planning Commission staff concurs with the Department of Environmental Protection's comments on the draft interim plan.

Thanks,

Ben Godsoe

Ben Godsoe

Planning Manager

Land Use Planning Commission

22 State House Station, Augusta, Maine 04333-0022

Phone (Direct): (207) 592-6429

Email: Benjamin.Godsoe@maine.gov

From: [Rosset, Julianne](#)
To: [Godsoe, Benjamin](#); [Olcott, Kyle](#); [Bernier, Kevin](#); [Paye, Laura](#); [Mohlar, Robert C](#); [Way, Bryan C](#); [Theriault, Billie J](#); [Obrey, Tim](#); [Sojowski, Bryan](#); [Cross, Amanda S](#); [Wood, Robert](#)
Cc: [Dorman, Randy](#); [Michaud, Steve](#); [Stevens, Nate](#); [Goodhart, Cameron](#); [Bates, David S](#); [Heidrich, David](#); [Farrington, Stephen](#); [Dill, Richard](#); [Osborne, Michael](#); [Mapletoft, Thomas](#); [Macomber, Lance](#); [McNelis, Patrick](#); [Wainwright, Paul](#); [Hill, Shane](#); [Smith, Russell](#); [Nelson, Scott](#); [Pocquette, Kayla](#); [Hofacker, Stephen](#); [Karam, Chris](#)
Subject: Re: [EXTERNAL] RE: Draft interim plan for aquatic resource protection during McKay Station outages, Ripogenus Project, FERC No. 2572
Date: Thursday, November 16, 2023 11:07:55 AM

Hi Kevin,

The United States Fish and Wildlife Service also concurs with the Department of Environmental Protection's comments, provided via their November 15, 2023 email.

Please let me know if you have any questions or would like to discuss further.

Kind regards,
Julianne

Julianne Rosset (she/her)

Hydropower Coordinator | Maine Field Office

United States Fish and Wildlife Service

306 Hatchery Road, East Orland, ME 04431

207-298-3080 | julianne_rosset@fws.gov

fws.gov/office/maine-ecological-services | facebook.com/usfwsnortheast/



STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
353 WATER STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041



Via Electronic Filing

November 17, 2023

Kevin Bernier
Senior Compliance Specialist
Great Lakes Hydro America
1024 Central Street
Millinocket, ME 04462

**Re: MDIFW Comments on Interim Measures for the Ripogenus Hydroelectric Project
(FERC No. 2572)**

Dear Mr. Bernier:

August 22, 2023, FERC requested that Great Lakes Hydro America, LLC (GLHA) consult with the US Fish and Wildlife Service (USFWS), the Maine Department of Inland Fisheries and Wildlife (MDIFW), the Maine Department of Environmental Protection (MDEP), and the Maine Land Use Planning Commission to identify interim measures aimed at reducing the instances of fish and macroinvertebrate strandings in the West Branch of the Penobscot River downstream of McKay Station (Ripogenus Hydroelectric Project, FERC No. 2572) during downramping events until the current relicensing process is concluded. FERC issued the order after complaints from the public about fish stranding during low flow events that occurred recently on the river. FERC determined these events were not the fault of GHLA but noted that stranding did occur and resulted in fish mortalities. The interim measures would be implemented until a new license is issued sometime in 2026. MDIFW staff met with GHLA staff via Teams on November 2, 2023, to discuss options identified by both GHLA and MDIFW. MDIFW is the agency responsible for the protection and management of the inland fisheries resources in the State of Maine, and we have been actively involved in all stages of the current relicensing of the Ripogenus Project.

MDIFW has reviewed the flow data provided to the stakeholders in May 2023 to determine the frequency and duration of low flow events below Ripogenus Dam. We determined that flows less than the minimum flow occur in most years. While some events were planned and consultation occurred ahead of time (i.e., due to drought), many were unplanned and occurred from lightning strikes and other acts of nature. We estimate that flows less than 500 cfs occurred in 17 of 23 (74%) years since 2000. There were multiple events in some years, for a total of 40 events of flows 500 cfs or less during this period. Presumably, the flows never dropped below 500 cfs after 2018 when GHLA improved the automatic release procedure at McKay Station. We would anticipate a range of mortalities of fish, primarily young landlocked salmon, when these events occurred, especially prior to 2018, based on results of the Stranding Study, with some areas of the river impacted to a greater degree, while other areas impacted to a lesser degree.

MDIFW staff were on-site during the Stranding Study conducted on the West Branch of the Penobscot River on October 5, 2022. They were stationed at the Holbrook Side Channel study site, which was one of the most severely impacted areas during the Study. The Stranding Study showed a spectrum of impacts in the river that occurred when the flow decreases from the normal daily flow (~2,000 cfs) to the ~500 cfs that is automatically released when McKay Station trips offline. There were mortalities at the Holbrook site due to its shallow topography and quality rearing habitat for young landlocked salmon. The salmon mortalities observed were young-of-the-year salmon and parr. Yet, just upstream and downstream, and directly across the river from this site, there were minimal impacts on salmon because the river is deeper and the shoreline much steeper. Most of the river, including the thalweg, remained wetted in this area. The Stranding Study report details the range of impacts at all the Study sites.

MDIFW monitors the landlocked salmon and brook trout fishery in the West Branch of the Penobscot River using voluntary record books and, more recently, survey boxes placed at angler access points along the river. MDIFW utilizes angler survey boxes on many rivers throughout the State, including nearby at the East Outlet of the Kennebec River and the Moose River. Both rivers are similar to the West Branch in terms of clientele and type of fishery. The data were presented in comments already filed by MDIFW and are present again below. The results show that catch rates for salmon in the West Branch are very good compared to other similar rivers in the region. Fish catch and size evaluations show that recruitment in the West Branch of the Penobscot is robust. This implies that the low flow events which have occurred once or a few times in most years, while an impact, are not catastrophic for the salmon population in the West Branch of the Penobscot River.

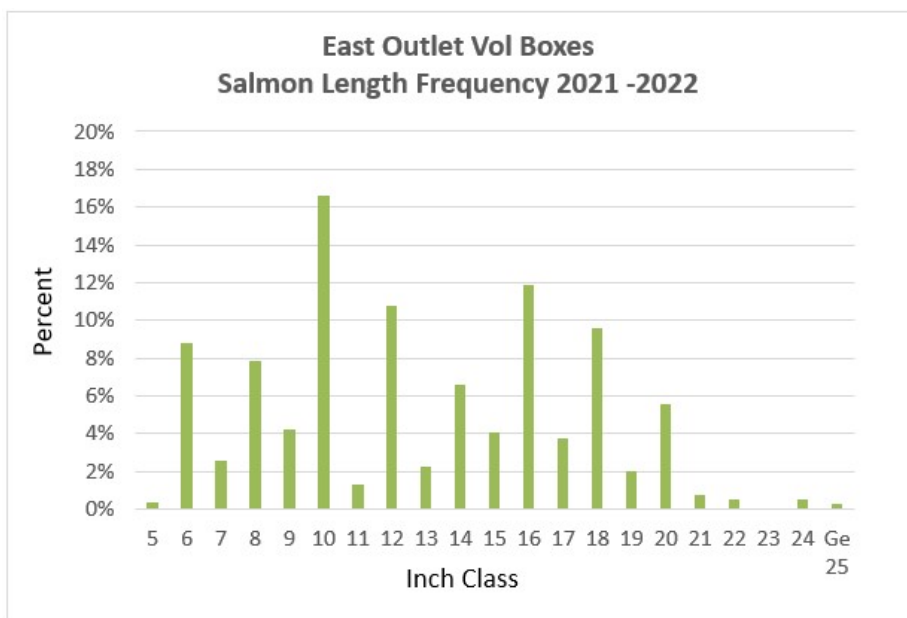
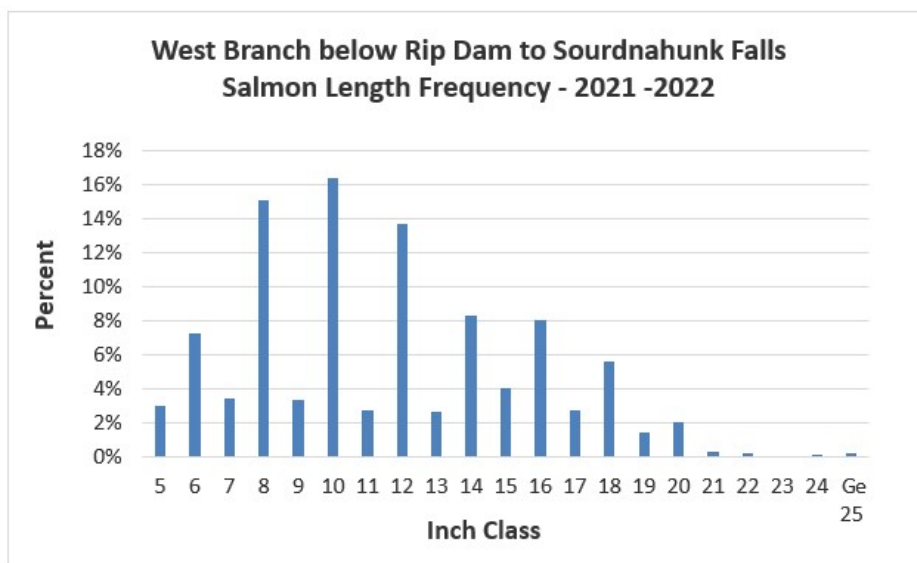
Data Summary from West Branch of Penobscot angler boxes

	2021	2022
Parties	356	216
Anglers	612	358
Total Hours	1545	762
Salmon Kept	1	0
Salmon Released	863	748
Brook Trout Kept	4	1
Brook Trout Released	178	75
All Salmon/hr.	0.76	0.99
All Brook Trout/hr.	0.15	0.13

For comparison, below are the catch rates for landlocked salmon and brook trout in 2021 and 2022 from the nearby Moose River and East Outlet of the Kennebec River, both which have similar fisheries and similar clientele:

	<u>Moose River</u>	<u>East Outlet</u>
All Salmon/hr.	0.37	0.49
All Brook Trout/hr.	0.14	0.22

Below is the length frequency from angler caught fish reported in the voluntary boxes in the West Branch in 2021 and 2022. It is typical of a river system with all life stages of salmon present:



It is MDIFW's position that low flow events should be avoided when possible, and we believe that GLHA has acted in good faith by improving the system in 2018 so that 500 cfs is automatically released when the system trips off-line. However, these low flow events do cause fish and invertebrate mortalities.

During our November 2 consultation with GLHA we discussed several options. Firstly, MDIFW concurs that any automated flow releases through Ripogenus Dam should be avoided due to public safety concerns. The gorge area is very difficult to access, and any unscheduled releases could trap anglers when flows increase.

We discussed the possibility of a constant release from Ripogenus Dam to buffer against low flow events. Releasing 600 cfs through the dam at all times would achieve this, since McKay Station will automatically release 500 cfs during a station trip, bringing the total flow to the license requirement of 1,100 cfs minimum flow. However, there are drawbacks to this option. For example, one of the key issues identified so far in the relicensing process is the need to retain more water in the impoundment and releasing an extra 600 cfs at all times would likely exacerbate the issue of low water in the lake. FERC would likely have to further mandate that the excess flow be subtracted from the normal operating flow. This would be very cumbersome and likely difficult to enforce. This type of flow management could also lead to unintended consequences by overly restricting GHLA's ability to manage the water. MDIFW also believes that 600 cfs through Ripogenus Dam would make this stretch unfishable and we would lose angling opportunities due to excessive flows.

GHLA has proposed to complete a relay coordination study to improve the system's reliability and reduce outages at McKay Station due to events at other connected facilities. Although this is not new, GHLA will continue with their successful efforts to minimize transmission line issues. Based on MDIFW's long-term angler surveys, MDIFW does not believe the low events of 500 cfs *compromise* the salmonid or invertebrate populations in the West Branch; however, each event does cause mortalities which should be mitigated. MDIFW recommends moving forward with GHLA's proposals through the remainder of this relicensing process, but we recommend a monetary penalty for each future event that is scaled to the severity/duration of the event. This penalty would be placed in a mitigation fund for fisheries restoration and improvement projects in the region, to be utilized at MDIFW's discretion after consultation with USFWS and MDEP. GHLA and MDIFW would negotiate the amount for each event and present it to FERC for approval. We believe this option would provide incentive to GHLA to minimize low flow events while keeping interim measures in proportion to the biological impacts.

We appreciate GLHA's ongoing commitment to work through these important issues. Please feel free to contact my office if you have any questions regarding this information, or if I can be of any further assistance.

Best regards,

A handwritten signature in blue ink, appearing to read 'John Perry', with a stylized flourish at the end.

John Perry
Environmental Review Coordinator

Cc: Francis Brautigam, Joe Overlock—MDIFW Fisheries Division, Augusta Headquarters
Tim Obrey, Jeff Bagley—MDIFW Fisheries Division, Region E
Kevin Dunham, Kevin Gallant—MDIFW Fisheries Division, Region F
Kyle Olcott, MDEP
Julianne Rosset, USFWS

From: [Bernier, Kevin](#)
To: [Olcott, Kyle](#); [Paye, Laura](#); [Mohlar, Robert C](#); [Godsoe, Benjamin](#); [Way, Bryan C](#); [Theriault, Billie J](#); [Perry, John](#); [Obrey, Tim](#); [Rosset, Julianne](#); [Sojkowski, Bryan](#); [Cross, Amanda S](#)
Cc: [Dorman, Randy](#); [Michaud, Steve](#); [Stevens, Nate](#); [Goodhart, Cameron](#); [Bates, David S](#); [Heidrich, David](#); [Farrington, Stephen](#); [Dill, Richard](#); [Osborne, Michael](#); [Mapletoft, Thomas](#); [Macomber, Lance](#); [McNelis, Patrick](#); [Wainwright, Paul](#); [Hill, Shane](#); [Smith, Russell](#); [Nelson, Scott](#); [Pocquette, Kayla](#); [Hofacker, Stephen](#); [Karam, Chris](#)
Subject: Draft interim plan for aquatic resource protection during McKay Station outages, Ripogenus Project, FERC No. 2572
Date: Thursday, October 19, 2023 7:28:00 PM
Attachments: [20230822 FERC reply to allegations of Ripogenus flow deviations and fish strandings.PDF](#)
[1991_05_03 Plan to FERC for providing minimum flow.pdf](#)
[image001.gif](#)
[20231019 Ripogenus interim plan for outage flows.pdf](#)

Please find attached for your review Great Lakes Hydro America, LLC's (GLHA's) draft response to FERC correspondence dated August 22, 2023 (attached), in which FERC requests that GLHA *"consult with the FWS, Maine DIFW, Maine DEP, and Maine LURC to identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during downramping events, such as unit outages, until the current relicensing process is concluded."* McKay Station is part of the Ripogenus Project (FERC No. 2572), which is licensed to GLHA and has a FERC license that is scheduled to expire in October 2026. A *"Plan for Providing Minimum Flow"*, which is referenced in GLHA's draft response and was filed with FERC by Great Northern Nekoosa Corporation in 1991, is also attached.

Since FERC further requests that GLHA submit its proposed interim protection measures within 90 days (or by November 20, 2023), please provide any comments to me **by November 19, 2023**.

Thank you, and feel free to contact me with any questions.

Kevin Bernier
Senior Compliance Specialist

Brookfield Renewable
1024 Central Street, Millinocket, ME 04462
C 207 951 5006
kevin.bernier@brookfieldrenewable.com
www.brookfieldrenewable.com



This message, including any attachments, may be privileged and may contain confidential information intended only for the person(s) named above. If you are not the intended recipient or have received this message in error, please notify the sender immediately by reply email and permanently delete the original transmission from the sender, including any attachments, without making a copy. Thank you.

-----Original Appointment-----

From: Olcott, Kyle <Kyle.Olcott@maine.gov>

Sent: Friday, September 29, 2023 12:44 PM

To: Olcott, Kyle

Cc: Bernier, Kevin; Dorman, Randy; Michaud, Steve; Stevens, Nate; Paye, Laura; Mohlar, Robert C; Garland, Wendy; Godsoe, Benjamin; Way, Bryan C; Theriault, Billie J; Perry, John; Obrey, Tim; Rosset, Julianne; Sojkowski, Bryan

Subject: Ripogenus interim measures

When: Wednesday, October 4, 2023 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).

Where: Microsoft Teams Meeting

Microsoft Teams meeting

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

Meeting ID: 261 373 301 039

Passcode: ZVKvci

[Download Teams](#) | [Join on the web](#)

Or call in (audio only)

[+1 207-209-4724,,669643187#](#) United States, Portland

Phone Conference ID: 669 643 187#

[Find a local number](#) | [Reset PIN](#)



[Learn More](#) | [Meeting options](#)

June 21, 2024

FERC Project 2572-136

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Electronically Filed

Subject: Ripogenus Project, FERC No. 2572; Interim Plan for Aquatic Resource Protection during McKay Station Outages; Response to FERC Additional Information Request

Dear Acting Secretary Reese:

On January 19, 2024, Great Lakes Hydro America, LLC (GLHA), licensee for the Ripogenus Project (Project) located on the West Branch of the Penobscot River in Maine (West Branch), filed a letter in reply to Commission correspondence dated August 22, 2023, in which the Commission requested that GLHA propose interim protection measures for West Branch aquatic resources that would prevent or minimize adverse environmental effects at the Project. Specifically, the Commission requested that GLHA:

“consult with the FWS, Maine DIFW, Maine DEP, and Maine LURC to identify measures aimed at reducing the instances of fish and macroinvertebrate strandings downstream of McKay Station during downramping events, such as unit outages, until the current relicensing process is concluded.”

In correspondence dated May 24, 2024, the Commission requested additional information on GLHA’s interim plan for aquatic resource protection during outages at McKay Station. Below are the Commission’s requests/questions and GLHA’s responses:

FERC: *While we concur that automating a gate on Ripogenus Dam to provide outage flows would not be timely enough to prevent strandings and that warmer releases from the reservoir surface are not ideal for salmonid conservation, your Plan did not adequately address the other potential interim measures suggested in our August 22, 2023 letter. Please clarify why staffing McKay Station and installing a battery backup (or other redundant energy source) were deemed not feasible as interim mitigation measures. Please also respond to the public comments suggesting that you could prioritize having personnel on site only during forecasted weather likely to result in outages or during periods of heightened biological sensitivity.*

GLHA: Although having onsite personnel at McKay Station would reduce the amount of time it takes to restore full river flow, GLHA does not believe that staffing of the station would appreciably reduce fish mortalities during an outage. The reason for this is because an onsite crew would first attempt to troubleshoot and correct the root cause of any trip before attempting to restart the station, i.e., restarting McKay Station after a station trip is more involved than simply flipping a switch or pushing a button. If the crew was unsuccessful in re-energizing the station, then they would travel to Ripogenus Dam to initiate the public safety process for opening a gate. In either case, it is unlikely that river flows could be restored quickly enough to protect fish that are stranded out of water, as the 2022 fish stranding study demonstrated that these dewatered fish expire quickly. This is one of the main reasons (along

Brookfield

Renewable U.S.

with public safety) as to why an automated approach that quickly releases flows directly into the West Branch at McKay Station during outages has been utilized at the Project since 1991.

McKay Station has battery backup through a 120 Vdc battery bank and a diesel generator; thus, the on-site PLC (Programmable Logic Controller) remains in operation during an outage, and its internal battery provides additional backup for local operations and data retention during an outage. The retention of local station service and PLC operations are critical for activation of the Project's minimum flow system during a station outage.

The more typical reason for station outages and for losing remote operation capability is the loss of communications between McKay Station and the sub-station in Millinocket due to a communications failure (e.g., lightning strike) involving the line equipment (installed by RFL Communications, Inc) that is used to transmit data to and from the station. Historically, structural failures of the transmission line (e.g., pole and cross arm failures) were common causes of outages; however, as indicated in the January 19th filing, GLHA's long-term plan for repairing and upgrading the Ripogenus Project transmission line (implemented in 2008) has greatly reduced this type of outage, with none occurring since a cross arm failure in May of 2016. And finally, GLHA is in the process of installing satellite-based (Starlink) communications at McKay Station, which will link the station directly to Brookfield's National System Control Center (NSCC) via satellite to provide a redundant means of communication and data transfers.

FERC: *Please respond to Mr. Spear's request for additional information pertaining to how remote control of the project may be enhanced. Please also clarify how the PLC works and how emergency river flows are verified when there is no station power.*

GLHA: GLHA utilizes a radio-based river monitoring system and (as indicated above) data-carrying line equipment for remote operation of McKay Station from Brookfield's NSCC. When communications are lost, controlling authority for the operation of McKay Station is transferred to local Operations, and the station is manned. However, as indicated above, the PLC remains in operation during an outage, as it is on battery backup through a 120 Vdc battery bank, an internal battery to the PLC, and a diesel generator.

As indicated above, a redundant means of communications/data transfer (Starlink communications) is currently being installed to improve remote operation of McKay Station. This is being done in lieu of the PLC replacement described in GLHA's January 19th letter to the Commission, as communication line disruptions (rather than PLC failures) have been the primary cause of outages at McKay Station since 2016. Although the installation of satellite technology will provide a redundant means of communication with McKay Station, it will not in itself reduce station trips and outages. However, NSCC operators will be able to better "see" and respond to what is happening at McKay Station during an outage.

Continued PLC operations during an outage together with manning of the station typically allow river flows to be verified during communication outages, with river flows calculated based on engineered curves. Going forward, the installation of satellite-based technology for communications will provide an additional means for verifying flows and station operations.

GREAT LAKES HYDRO AMERICA, LLC

1024 Central Street, Millinocket, ME 04462

T +1 207.723.4341 F +1 207.723.4597 brookfieldrenewableUS.com

FERC: *Your Plan acknowledges that a synchronized bypass valve at McKay Station was considered in 1991 and states that it was dismissed due to mechanical and civil limitations, as well as construction and operation issues. Please clarify what these issues were and whether they remain concerns now.*

GLHA: As indicated in the Commission's May 24th letter, the interim measures being requested are only intended to address adverse effects to aquatic species until appropriate long-term measures can be determined in the relicensing process and implemented. The Commission goes on to state that interim measures should be quick, and not require significant resources to implement.

GLHA considers a synchronized bypass valve to be a potential long-term measure requiring substantial resources. Although GLHA has not analyzed the current feasibility of a synchronized bypass valve, the previous licensee eliminated it as an option in the 1991 plan due to "numerous mechanical and civil limitations, and significant construction and operation problems". As part of its interim plan, GLHA has proposed to re-evaluate the 1991 plan based on current technology and file the updated alternatives analysis with the Commission as part of the Final License Application (FLA) for the Project (which is due by September 30, 2024); this re-evaluation would allow GLHA to determine if the synchronized bypass valve issues identified by the licensee in 1991 remain relevant today. However, it is now apparent that this updated alternatives analysis (along with GLHA's proposal for long-term protection of aquatic resources during station outages) will need to be filed subsequent to the FLA submittal, as the schedule for re-evaluating the 1991 plan is dependent on the Commission's approval of this interim plan.

FERC: *If approved, please explain how you would ensure that the Plan's mitigation funds would be used toward mitigation projects with a project nexus. Additionally, in response to Mr. Hulbert's comments, please provide a justification for limiting payments to the first five incidents a year, and in response to Mr. Spear's questions, please provide your best estimate of how your contributions to the fund would be determined.*

GLHA: As indicated in their November 17, 2023 comment letter, the Maine Department of Inland Fisheries and Wildlife (MDIFW) recommended "a monetary penalty for each future event that is scaled to the severity/duration of the event. This penalty would be placed in a mitigation fund for fisheries restoration and improvement projects in the region, to be utilized at MDIFW's discretion after consultation with USFWS and MDEP. GLHA and MDIFW would negotiate the amount for each event and present it to FERC for approval." GLHA agreed to this recommendation and incorporated mitigation payments into its final interim plan for aquatic resource protection during outages at McKay Station. Further, as indicated in their comments, MDIFW has committed to using the mitigation funds for projects in the Ripogenus Project region.

As indicated in the Fish Stranding Study portion of the Initial Study Report for the Ripogenus Project, which was filed with the Commission on April 24, 2023, there were five unplanned outages at the Project between 2018 (when the current method of providing outage flows was implemented) and 2022, two in 2018, one in 2020, and two in 2021. Since then, three unplanned station outages have occurred (on July 7, September 7, and September 16, 2023) due to lightning strikes and Tropical Storm Lee, none of which resulted in reportable excursions (i.e., sufficient flows were released during each of these events to meet Project flow requirements).

GLHA's rationale for limiting payments to five outage incidents per year is based on the infrequency of these events (i.e., averaging about one per year since 2018) and the likelihood that GLHA would be expending resources to correct a deficiency if more than five station outages occurred in a single year. As was done at the Brassua Project (FERC No. 2615) in 2023¹, GLHA would determine an appropriate mitigation payment through consultation with MDIFW, and then this payment agreement would be submitted to the Commission for approval. In that case, the co-licensees for the Brassua Project (one of which, like GLHA, is an affiliate of Brookfield Renewable U.S.) agreed to annual payments of \$15,000 for 3 years to mitigate an approximate 17-hour extreme low flow event and the associated potential impacts to fisheries in the Moose River. The Commission approved these mitigation payments in their August 29, 2023 response to the excursion, and MDIFW is utilizing these payments towards landlocked salmon and brook trout stocking/improvement projects in the Brassua/Moosehead Lake region.

FERC: *Lastly, please clarify whether you deviated from your Article 402 flow requirements between October 28 and November 2, 2022. In your response, please explain the meaning of the zero flow records and how you verify flows when this occurs. If you find that one or more unreported deviations occurred in this time frame, please report the cause of the deviation, the duration and magnitude, any pertinent operational data, and a summary of your response.*

GLHA: There was no deviation from flow requirements during the October 28 – November 2, 2022 period. The zero flow records were caused by the failure of a communications card associated with the PLC; this in turn resulted in no data being recorded during this outage. However, the communications issue did not affect operation of the units, which ran normally during this period. Due to the loss of communications, GLHA manned McKay Station full time during the outage period to provide continuous monitoring of station operations and to ensure that licensed flows were being released.

As indicated above, GLHA intends to propose more permanent and long-term protection measures for aquatic resources through the ongoing Project relicensing process. However, in the meantime, GLHA believes that the protection measures proposed in its January 19th plan satisfy the Commission's request that GLHA identify temporary solutions aimed at reducing instances of fish and macroinvertebrate strandings downstream of McKay Station following unit outages during the current interim period until a new license is issued for the Project. In addition, and unlike some of the solutions proposed by resource agencies and stakeholders (e.g., structural modifications; revisions to minimum flow requirements), the interim protection measures proposed by GLHA would not require an amendment to the Ripogenus Project license and/or a modification of the Project's Water Quality Certification; GLHA further notes that an amendment process for the Project license at the present time would be occurring simultaneously with active and ongoing relicensing efforts, and with the Project's Final License Application due to the Commission in about 3 months (i.e., by September 30, 2024).

¹ See excursion report filed with the Commission on April 28, 2023 (<https://elibrary.ferc.gov/eLibrary/filedownload?fileid=F08BF6CD-5509-C1A2-9DC0-87C946100000>) and the Commission's August 29, 2023 response (<https://elibrary.ferc.gov/eLibrary/filedownload?fileid=6100D1FE-3D25-C189-9464-8A422C500000>)

Please e-mail me at kevin.bernier@brookfieldrenewable.com or call me at (207) 951-5006 if you have any questions or need additional information.

Sincerely,

Kevin Bernier

Kevin Bernier
Senior Compliance Specialist

Cc: N. Stevens, C. Goodhart, D. Bates, D. Heidrich, S. Michaud, N. Weaver, R. Dill, M. Osborne, T. Mapletoft, R. Dorman, L. Macomber, J. Grevstad, P. Wainwright, S. Hill, R. Smith, S. Nelson, K. Pocquette, S. Hofacker, C. Karam, M. Scarzello; GLHA
A. Burtner; FERC DHAC – Washington
T. Obrey, J. Perry; MDIFW
K. Olcott, B. Sojkowski, A. Cross; USFWS
L. Paye, R. Mohlar; MDEP
B. Way, B. Godsoe, B. Theriault; LUPC

GLHA File: GLHA/Licensing & Compliance/Ripogenus 2572/01 Brookfield Corres

Appendix D

Model Run Results from Scenarios requested by Ripogenus Camp Owner Associations

Ripogenus Hydroelectric Project (FERC No. 2572) & Penobscot Mills Hydroelectric Project (FERC No. 2458)
Summary of Alternative Operating Scenarios Requested by Stakeholders and FERC AIR # 5

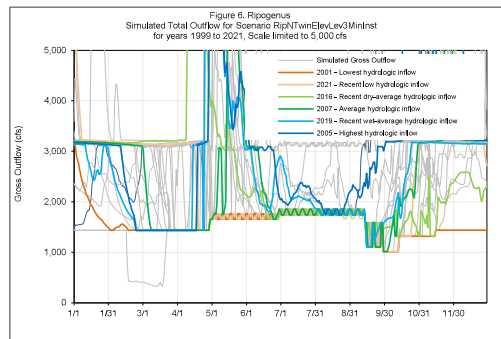
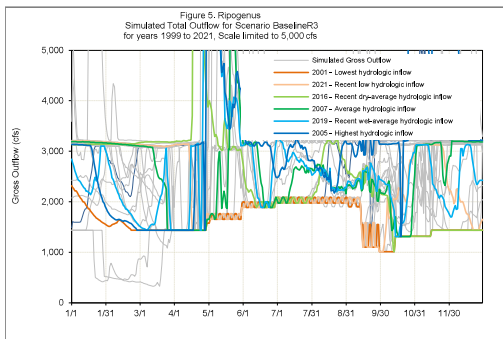
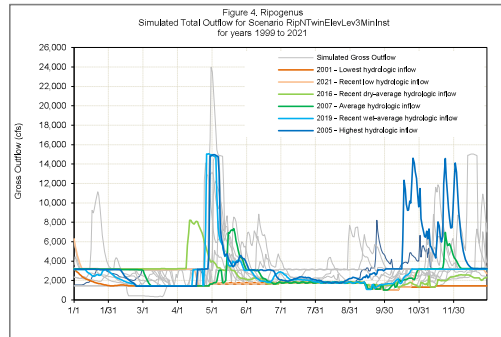
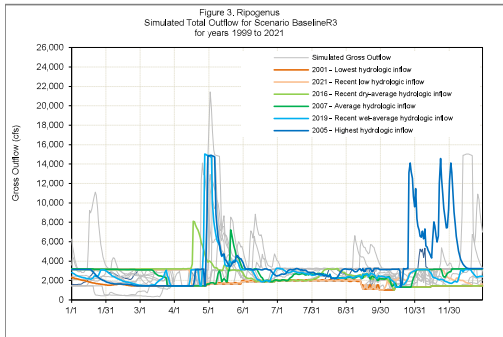
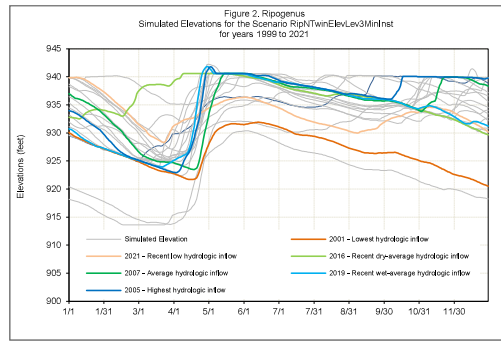
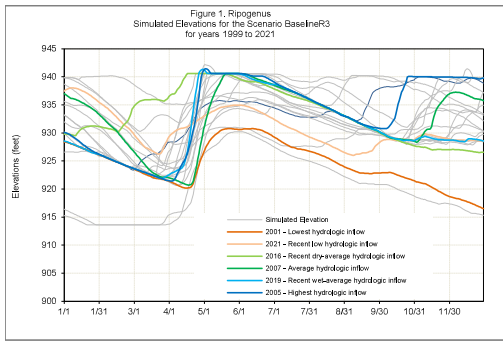
Scenario Code Name in Model	Requestor(s)	Project Area	Summary of Requested Scenario	GLHA Assumptions Related to Requested Scenario	Scenario Results Overview Summary
RipNTwinElevLev3MinInst	Caribou and Chesuncook Lake Camp Owners Assoc.	Ripogenus & North Twin Impoundment El and North Twin Min Flows	BaselineR3 scenario with: - Ripogenus Impoundment Elevation: - Target Elevation Schedule (feet NGVD 29): 1/1 - 929.6 2/1 - 927.1 3/1 - 925.1 4/1 - 925.1 5/1 - 935.0 5/10 - 940.1 6/1 - 940.1 7/1 - 939.1 8/1 - 938.1 9/1 - 937.1 10/1 - 936.1 10/15 - 935.6 11/1 - 934.1 12/1 - 932.6 12/31 - 929.6 - North Twin Impoundment Elevation: - Target Elevation Schedule (feet NGVD 29): 1/1 - 483.0 2/1 - 483.0 3/1 - 482.0 4/1 - 482.0 5/1 - 488.7 5/10 - 490.4 6/1 - 490.4 7/1 - 490.4 8/1 - 489.9 9/1 - 489.0 10/1 - 488.6 11/1 - 486.0 12/1 - 484.0 12/31 - 483.0 - North Twin Minimum Flow: - From 8/22 – 10/15, provide 3000 cfs as long as NT impoundment elevation is >488.42 feet and Ripogenus impoundment elevation meets criteria above; otherwise, provide 1500 cfs. - From 10/16-8/21, provide 1500 cfs.	- Impoundment elevations coded as “Target Elevations” vs “Minimum Elevations”; therefore, minimum flows continue to be met at the expense of impoundment elevations. Except at North Twin, where for this scenario, the “Target Elevations” will take priority over the minimum flow when the minimum flow at North Twin is 3000 cfs. When the minimum flow at North Twin is 1500 cfs, the minimum flow will take priority over the upstream impoundment elevations. - Assumed 12/31 target elevation to be the same as 1/1.	2.7% loss in system total average annual generation, 2.2% loss in Ripogenus Project average annual generation, and 3% loss in Penobscot Mills Project average annual generation. - Increased Ripogenus Impoundment elevations due to higher target elevations and lower minimum flow requirements at North Twin. - Higher Ripogenus Impoundment elevations throughout the year result in an overall increase in spill at Ripogenus dam with the greatest increase in spill occurring in the fall consisting of a 58% increase in spill in September, a 378% increase in spill in October, a 151% increase in spill in November, and a 54% increase in spill in December; totaling an average annual increase of 43% or approximately 9.4 additional days of spill per year on average. - Spill events at Ripogenus dam due to higher Ripogenus Impoundment elevations typically occur more frequently and for a longer duration when compared to the BaselineR3 scenario (for example see graphs from 2013 in the Model Output Results). - Depending on the timing and magnitude of the increased spill events at Ripogenus dam, spill events may more often preclude whitewater boating in the river due to high/unsafe spill flows, impact campers at the Big Eddy Campground downstream of the Ripogenus Project, preclude recreational fishing downstream of the Ripogenus Project, and impact fish spawning habitat within the West Branch downstream of the Ripogenus Project. - Significant increased drawdown of the North Twin Impoundment resulting from lower target elevations, most notably in the November through March period when the additional drawdown ranges from 1.5 to 2.3 feet, and in August when the North Twin Impoundment elevation is on average 0.7 feet lower than the BaselineR3 scenario (for example see graphs from 2013 in the Model Output Results). - During drought periods, lower minimum flows from North Twin result in the ability to maintain higher North Twin Impoundment elevations, especially during the most significant drought. During this drought of 2001-2003, North Twin can maintain at least 1,500 cfs throughout almost the entire period. - At the North Twin impoundment, spill occurrence at North Twin dam decreases by 18% in January and 38% in April as the lower impoundment elevations provide available storage to buffer some of the spill events from Ripogenus, but increased spill events occur at North Twin dam in the May to November period with the greatest increases in August (67% increase) and October (39% increase). - Spill events at North Twin dam due to higher North Twin Impoundment elevations typically occur more frequently and for a longer duration when compared to the BaselineR3 (for example see graphs from 2013 in the Model Output Results). - At the Millinocket impoundment, changes in spill occurrence varies throughout the year, but most notably increases by 871% in February, 108% in March, 86% in October, 58% in November, and 130% in December or approximately 12.6 additional days of spill per year on average.

Ripogenus Hydroelectric Project (FERC No. 2572) & Penobscot Mills Hydroelectric Project (FERC No. 2458)
Summary of Alternative Operating Scenarios Requested by Stakeholders and FERC AIR # 5

Scenario Code Name in Model	Requestor(s)	Project Area	Summary of Requested Scenario	GLHA Assumptions Related to Requested Scenario	Scenario Results Overview Summary
FLA_Proposal_RipNT_LVL3	FERC AIR#5	Ripogenus & North Twin Impoundment El	FLA_Proposal scenario with: - Ripogenus Impoundment Elevation: - Target Elevation Schedule (feet NGVD 29): 1/1 - 929.6 2/1 - 927.1 3/1 - 925.1 4/1 - 925.1 5/1 - 935.0 5/10 - 940.1 6/1 - 940.1 7/1 - 939.1 8/1 - 938.1 9/1 - 937.1 10/1 - 936.1 10/15 - 935.6 11/1 - 934.1 12/1 - 932.6 12/31 - 929.6 - North Twin Impoundment Elevation: - Target Elevation Schedule (feet NGVD 29): 1/1 - 483.0 2/1 - 483.0 3/1 - 482.0 4/1 - 482.0 5/1 - 488.7 5/10 - 490.4 6/1 - 490.4 7/1 - 490.4 8/1 - 489.9 9/1 - 489.0 10/1 - 488.6 11/1 - 486.0 12/1 - 484.0 12/31 - 483.0	- Impoundment elevations coded as “Target Elevations” vs “Minimum Elevations”; therefore, minimum flows continue to be met at the expense of impoundment elevations. - Assumed 12/31 target elevation to be the same as 1/1.	2.7% loss in system total average annual generation, 0.1% increase in Ripogenus Project average annual generation, 4.6% loss in Penobscot Mills Project average annual generation. - Increased Ripogenus Impoundment elevations due to higher target elevations. - Higher Ripogenus impoundment elevations throughout the year result in an overall increase in spill at Ripogenus dam with the greatest increase in spill occurring in the fall consisting of a 29% increase in September, a 378% increase in October, a 78% increase in November, and a 50% increase in December; totaling an average annual increase of 43% or approximately 6.4 additional days of spill per year on average. - Spill events at Ripogenus dam due to higher Ripogenus Impoundment elevations typically occur more frequently and for a longer duration when compared to the BaselineR3 (for example see graphs from 2013 in the Model Output Results). - Depending on the timing and magnitude of the increased spill events at Ripogenus dam, spill events may more often preclude whitewater boating in the river due to high/unsafe spill flows, impact campers at the Big Eddy Campground downstream of the Ripogenus Project, preclude recreational fishing downstream of the Ripogenus Project, and impact fish spawning habitat within the West Branch downstream of the Ripogenus Project. - Significant increased drawdown of the North Twin Impoundment resulting from lower target elevations, most notably in the November through March period when the additional drawdown ranges from 1.7 to 2.9 feet, and in August when the North Twin Impoundment elevation is on average 0.7 feet lower than the BaselineR3 scenario (for example see graphs from 2013 in the Model Output Results). - Approximately double the number of days that the Ripogenus Project is not able to maintain the required minimum flows through the 2001-2003 drought as compared to the BaselineR3 scenario.

Scenario 25

RipNTwinElevLev3MinInst



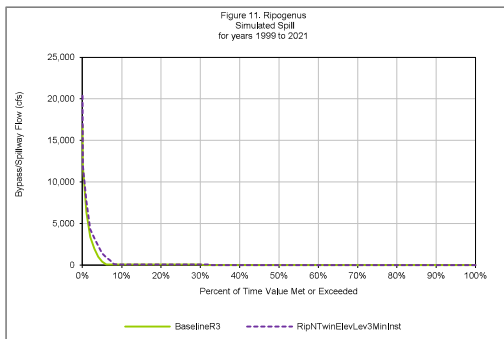
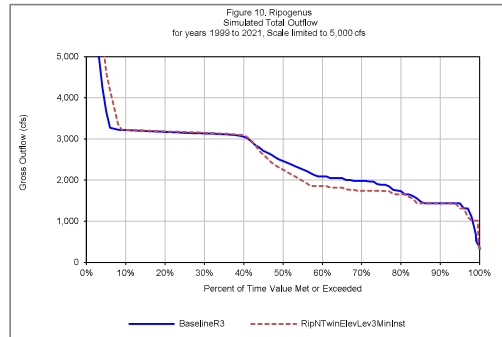
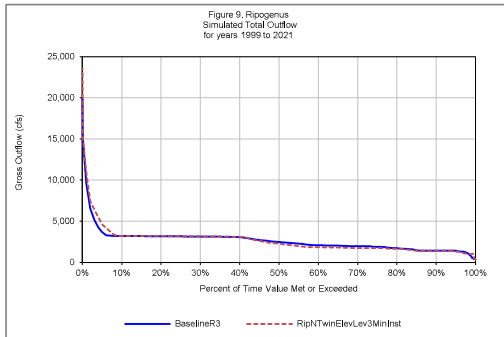
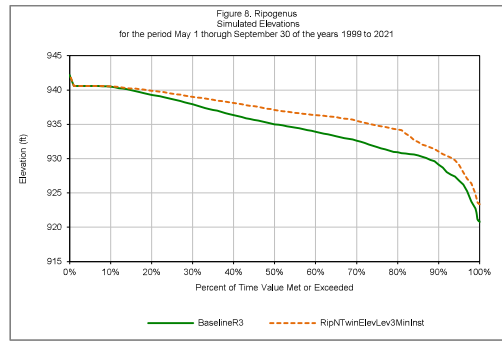
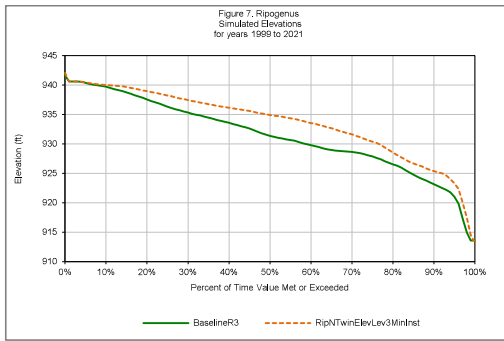


Table 1.

Ripogenus Monthly Average Days of Spill (Days)				
Scenarios simulated for 1999 - 2021				
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3	Percent difference from BaselineR3
January	1.2	1.5	0.3	30%
February	0.3	0.3	0.0	-
March	0.0	0.0	0.0	-
April	0.9	1.3	0.4	48%
May	10.3	11.6	1.3	13%
June	2.8	3.3	0.5	17%
July	0.3	0.3	0.0	-
August	0.0	0.3	0.3	#DIV/0!
September	1.3	2.1	0.8	58%
October	0.4	1.9	1.5	378%
November	2.0	4.9	3.0	151%
December	2.3	3.6	1.3	54%
Annual	21.8	31.3	9.4	43%

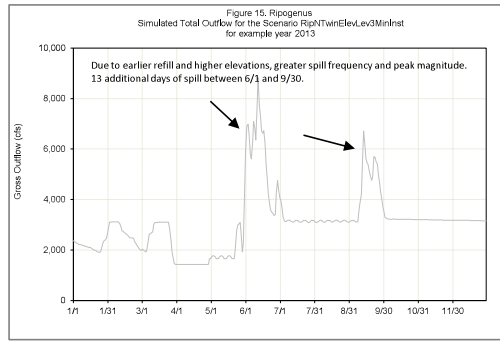
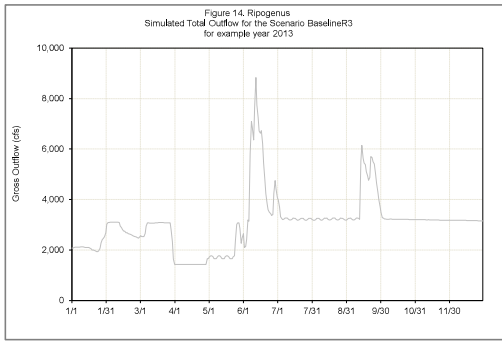
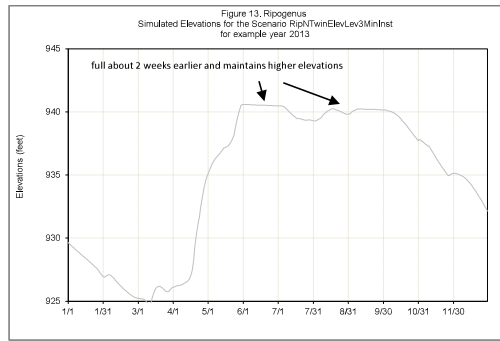
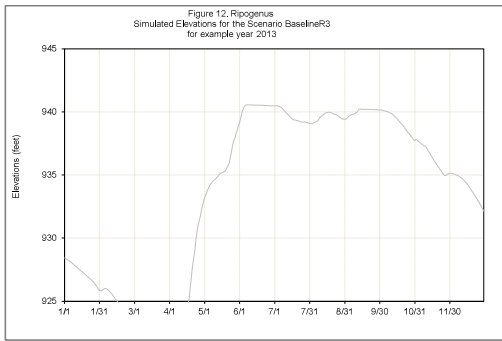
*A percent difference of #DIV/0! in the table above is due to a BaselineR3 monthly value of zero and therefore the percent difference is not applicable for that month.

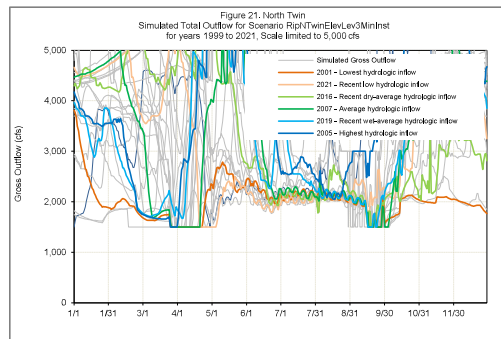
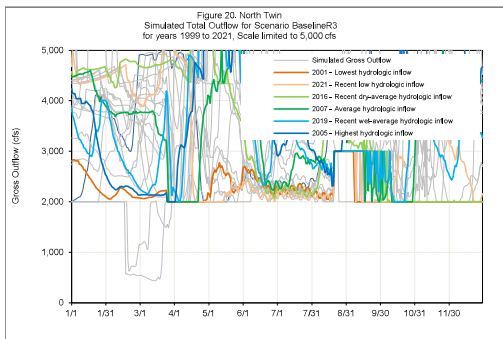
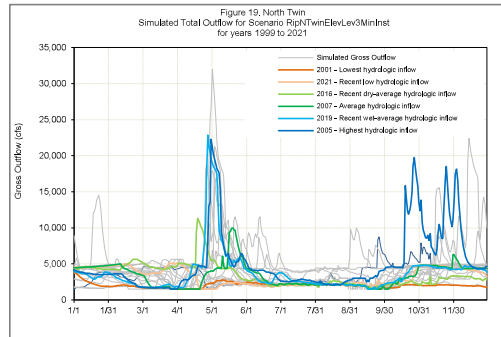
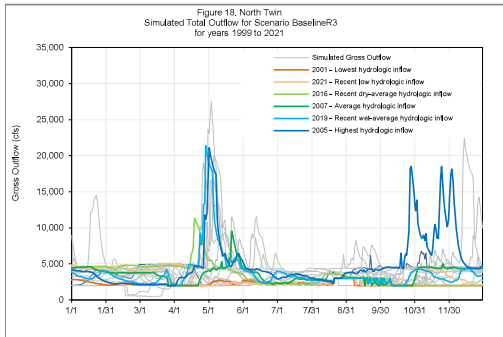
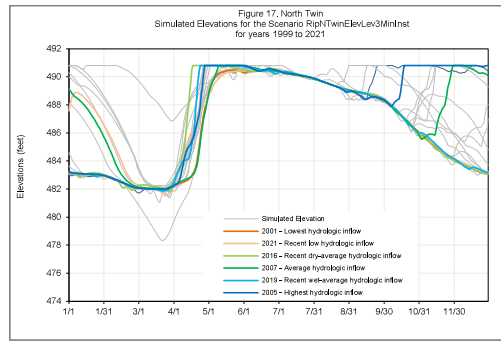
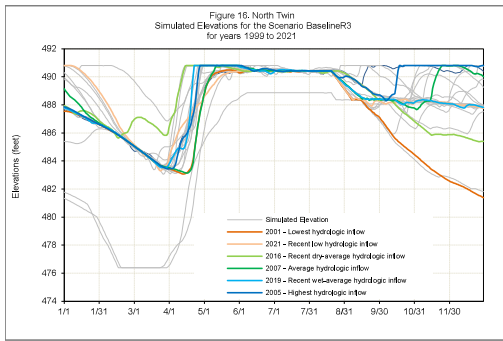
Table 2.

Ripogenus Monthly Average Elevation			
Scenarios simulated for 1999 - 2021			
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3
January	930.2	932.1	2.0
February	927.1	928.8	1.7
March	924.5	926.3	1.8
April	927.8	929.4	1.7
May	937.0	937.7	0.7
June	937.2	938.0	0.8
July	935.1	936.5	1.4
August	933.2	935.6	2.4
September	931.4	934.7	3.3
October	930.2	934.6	4.4
November	931.2	934.9	3.8
December	931.7	934.2	2.6
Annual	931.4	933.6	2.2

BaselineR3 simulated Ripogenus total outflow of less than 1,000 cfs for 102 days in the period of record, 1999 - 2021.

RipNTwinElevLev3MinInst simulated Ripogenus total outflow of less than 1,000 cfs for 34 days in the period of record. Approximately one third as many days as the BaselineR3 scenario.





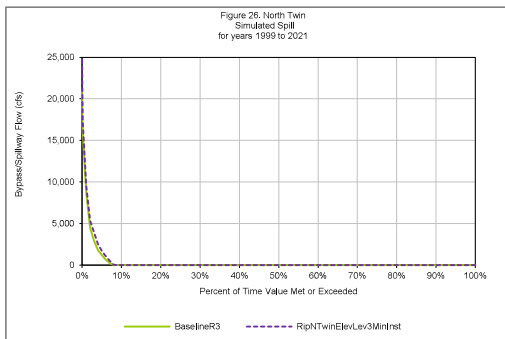
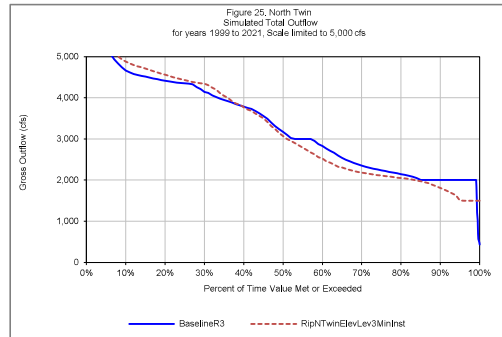
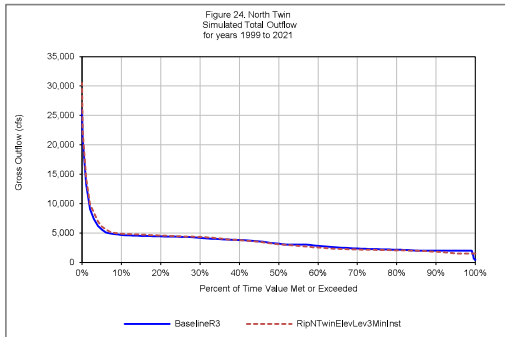
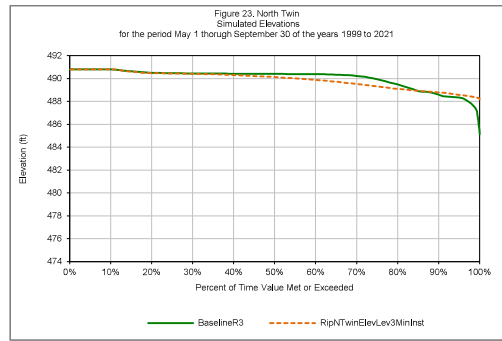
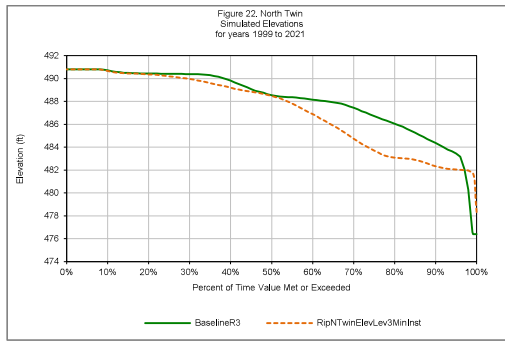


Table 3.

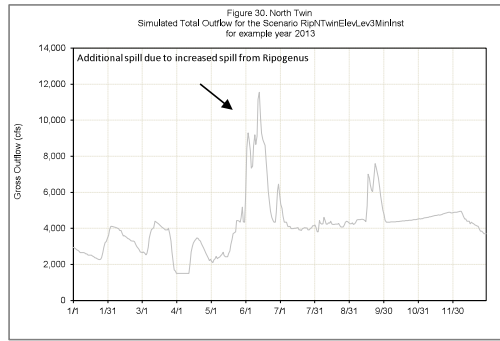
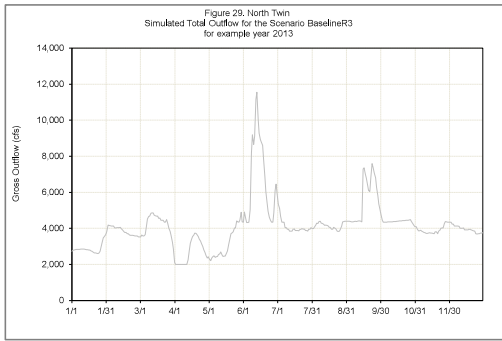
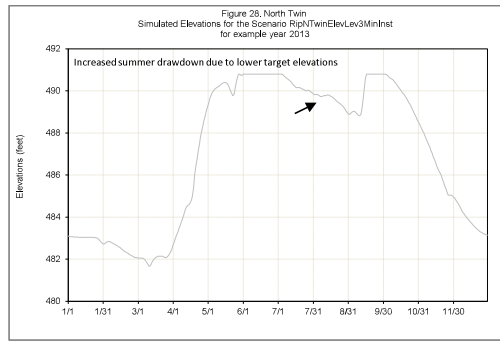
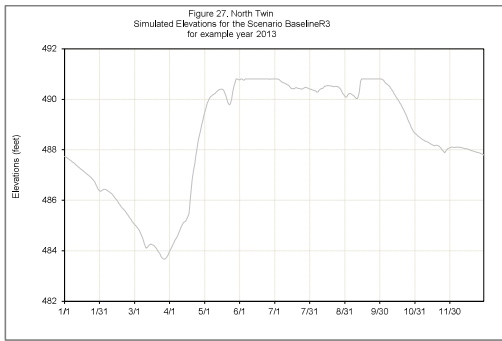
North Twin Monthly Average Days of Spill (Days)				
Scenarios simulated for 1999 - 2021				
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3	Percent difference from BaselineR3
January	1.5	1.2	-0.3	-18%
February	0.3	0.3	0.0	-
March	0.0	0.0	0.0	-
April	2.3	1.4	-0.9	-38%
May	12.1	12.7	0.6	5%
June	2.4	2.6	0.1	5%
July	0.3	0.3	0.0	-
August	0.1	0.2	0.1	67%
September	1.6	1.7	0.1	5%
October	1.2	1.7	0.5	39%
November	3.7	3.8	0.1	2%
December	4.0	3.9	-0.1	-3%
Annual	29.7	29.8	0.2	1%

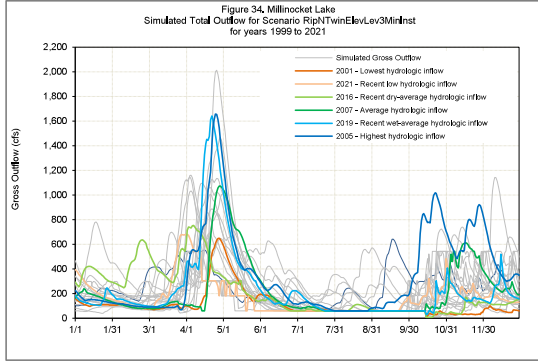
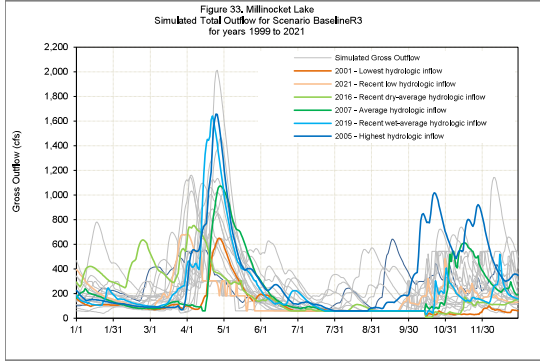
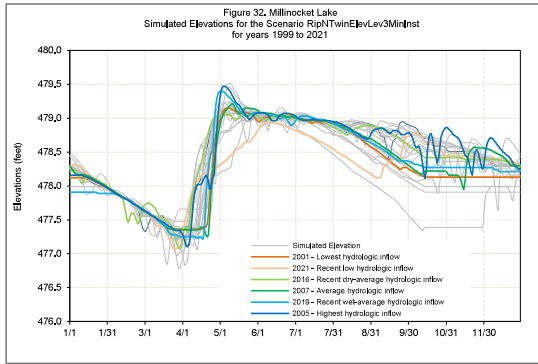
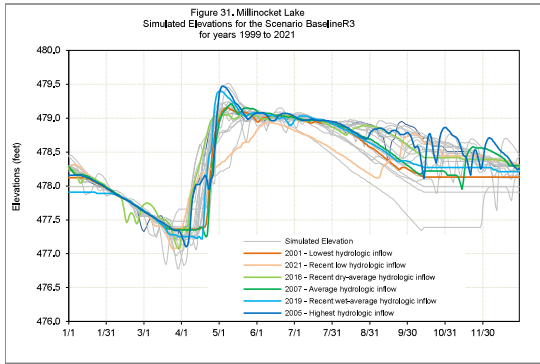
Table 4.

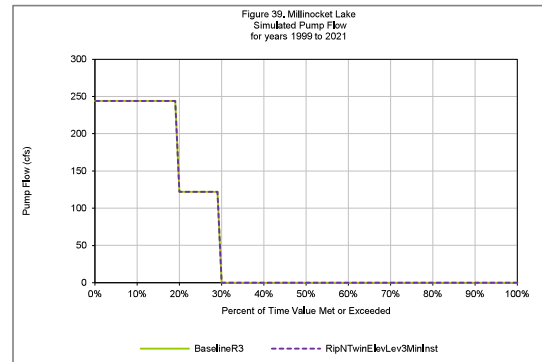
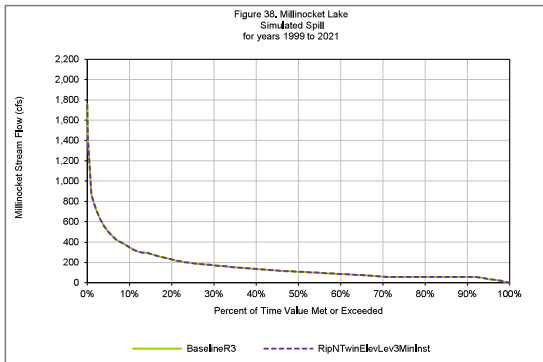
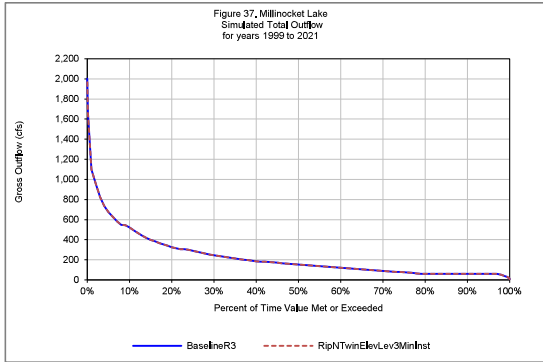
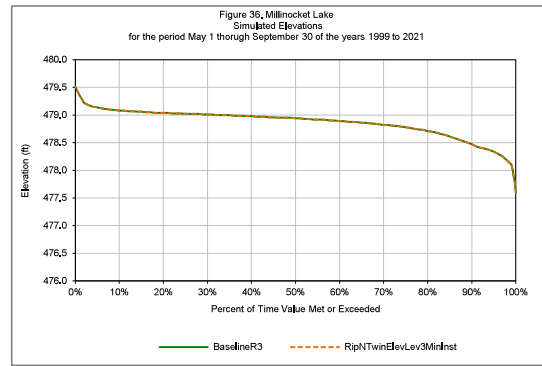
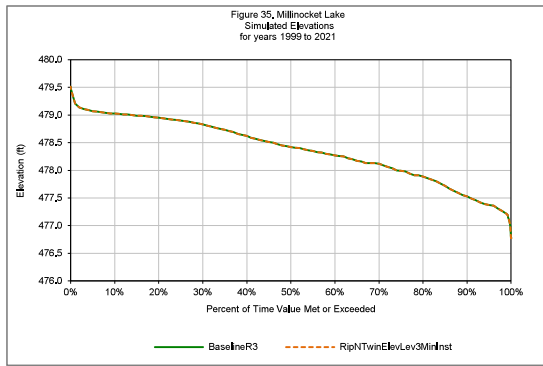
North Twin Monthly Average Elevation			
Scenarios simulated for 1999 - 2021			
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3
January	487.3	485.1	-2.3
February	485.6	483.5	-2.0
March	483.9	482.2	-1.6
April	485.9	485.5	-0.4
May	490.2	490.4	0.2
June	490.4	490.5	0.1
July	490.4	490.2	-0.2
August	490.2	489.5	-0.7
September	489.0	488.9	-0.1
October	488.2	487.8	-0.5
November	488.2	486.7	-1.5
December	488.2	485.9	-2.3
Annual	488.1	487.2	-0.9

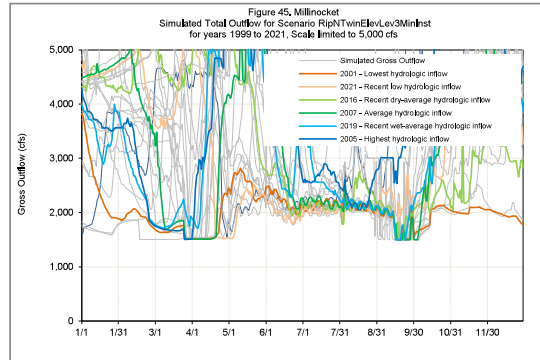
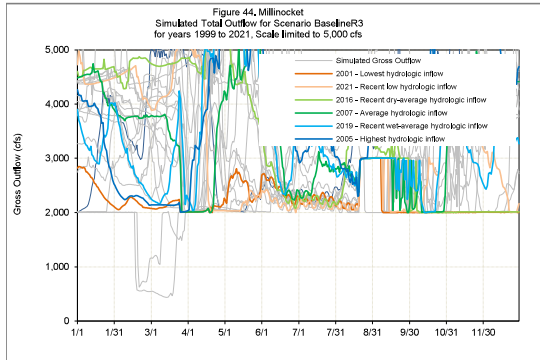
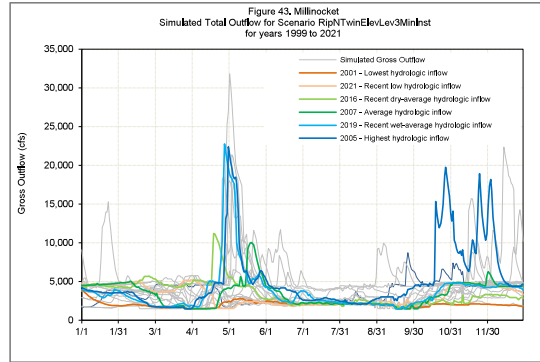
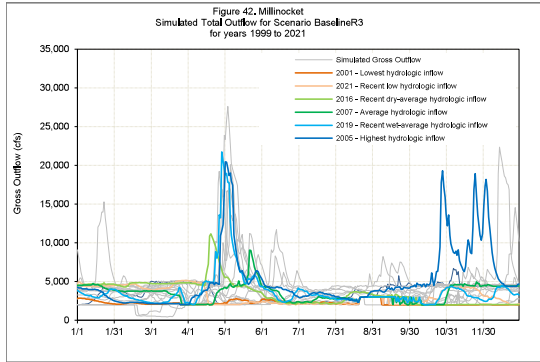
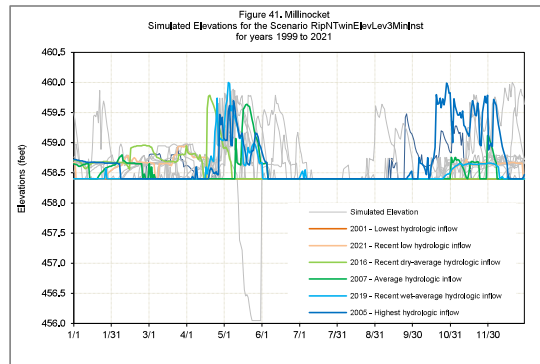
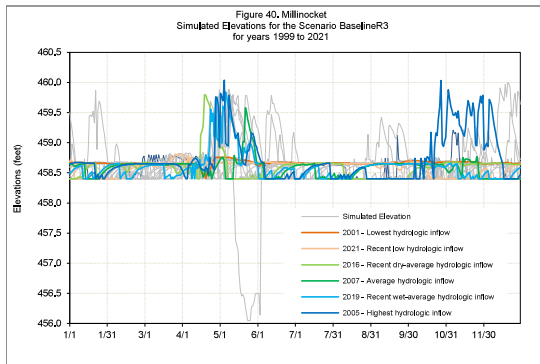
BaselineR3 simulated North Twin total outflow of less than 1,000 cfs for 42 days in the period of record, 1999 - 2021.

RipNTwinElevLev3MinInst simulated North Twin total outflow of less than 1,000 cfs for 0 days in the period of record.









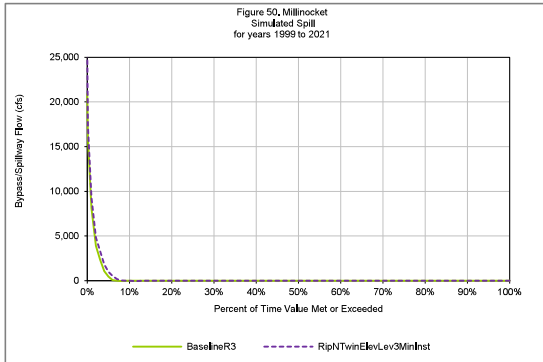
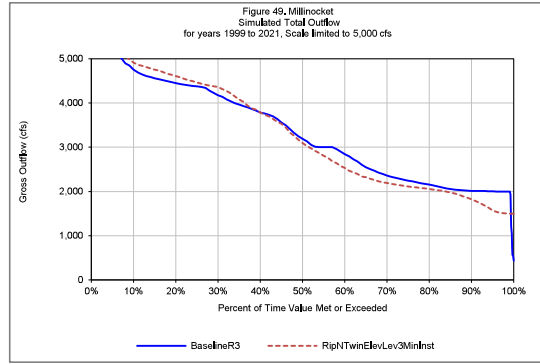
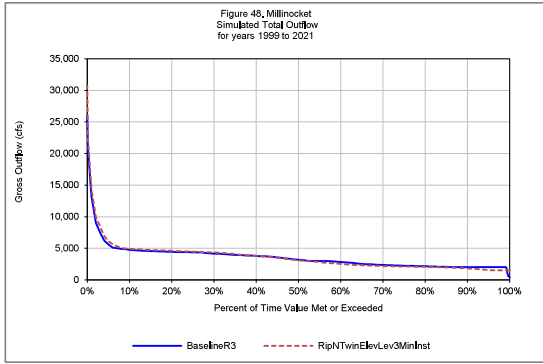
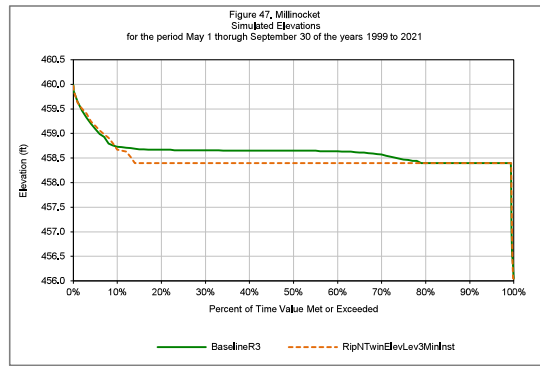
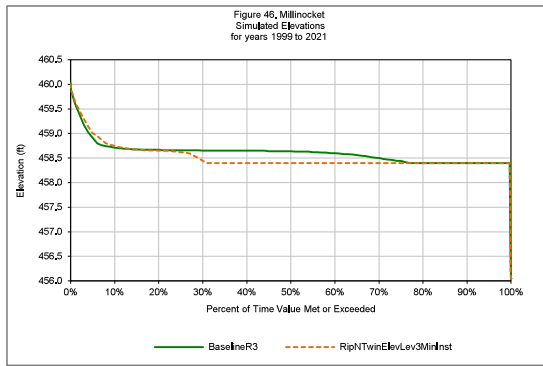


Table 5.

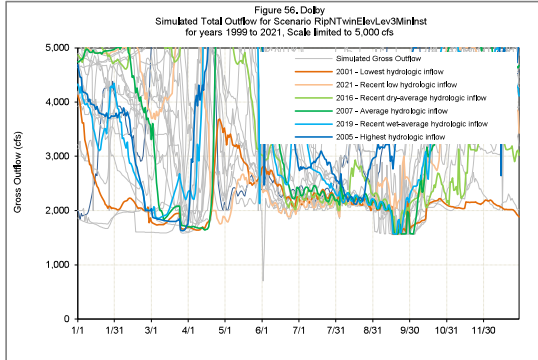
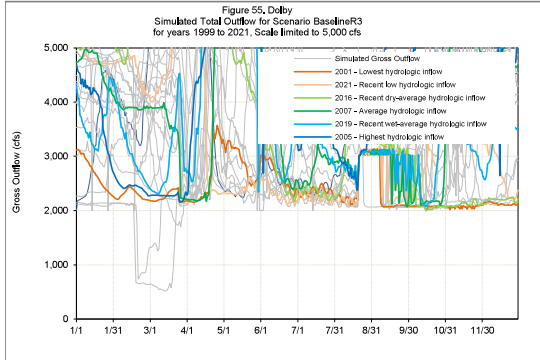
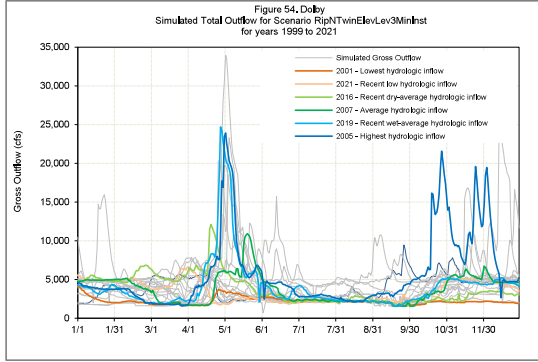
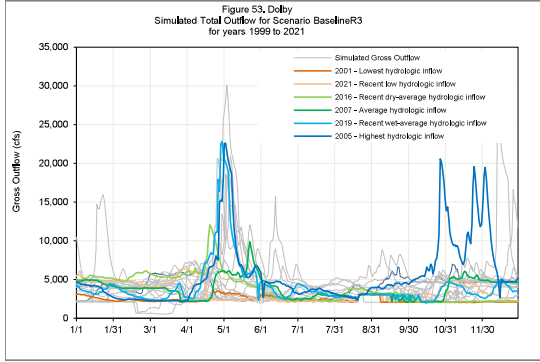
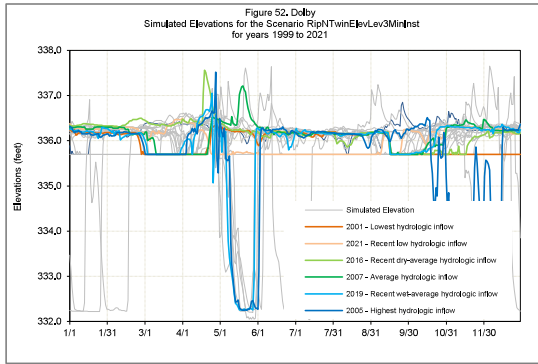
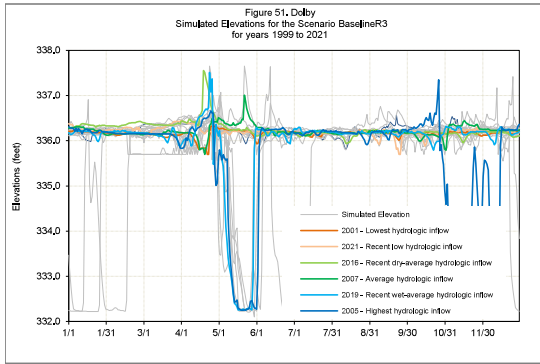
Millinocket Monthly Average Days of Spill (Days) Scenarios simulated for 1999 - 2021				
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3	Percent difference from BaselineR3
January	1.3	1.3	0.0	3%
February	0.3	3.0	2.7	871%
March	2.6	5.3	2.8	108%
April	5.5	4.8	-0.7	-13%
May	10.7	11.6	0.9	8%
June	1.9	2.2	0.3	14%
July	0.2	0.2	0.0	-
August	0.1	0.0	-0.1	-67%
September	1.6	1.8	0.2	14%
October	1.0	1.8	0.8	86%
November	3.1	5.0	1.8	58%
December	3.0	6.9	3.9	130%
Annual	31.3	43.9	12.6	40%

Table 6.

Millinocket Monthly Average Elevation Scenarios simulated for 1999 - 2021			
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3
January	458.6	458.5	0.0
February	458.6	458.5	-0.1
March	458.6	458.5	-0.1
April	458.7	458.5	-0.1
May	458.8	458.7	-0.1
June	458.6	458.5	-0.1
July	458.6	458.4	-0.2
August	458.6	458.4	-0.2
September	458.6	458.5	-0.1
October	458.6	458.5	-0.1
November	458.6	458.6	0.0
December	458.6	458.6	0.1
Annual	458.6	458.5	-0.1

BaselineR3 simulated Millinocket total outflow of less than 1,000 cfs for 41 days in the period of record, 1999 - 2021.

RipNTwinElevLev3MinInst simulated Millinocket total outflow of less than 1,000 cfs for 0 days in the period of record.



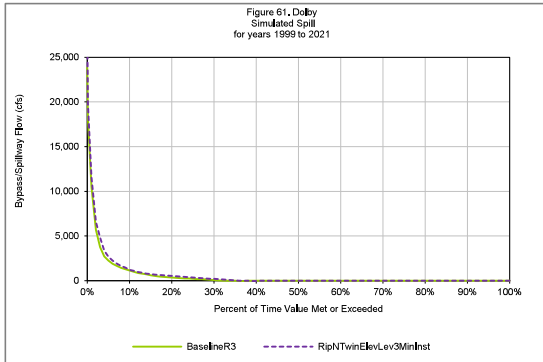
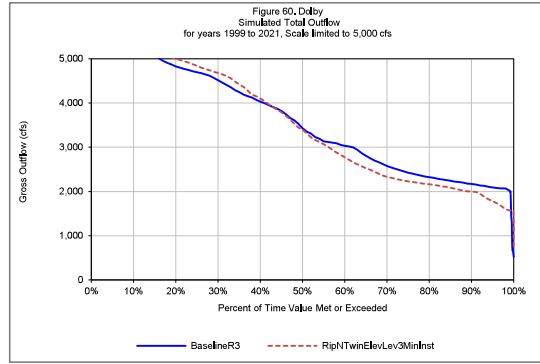
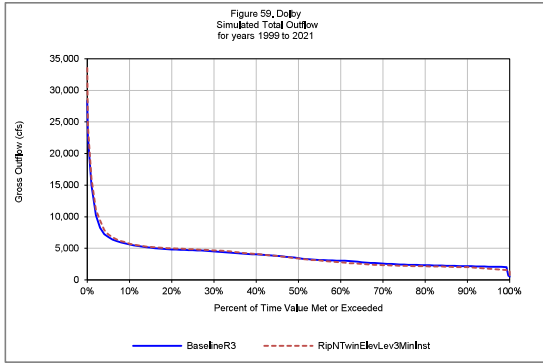
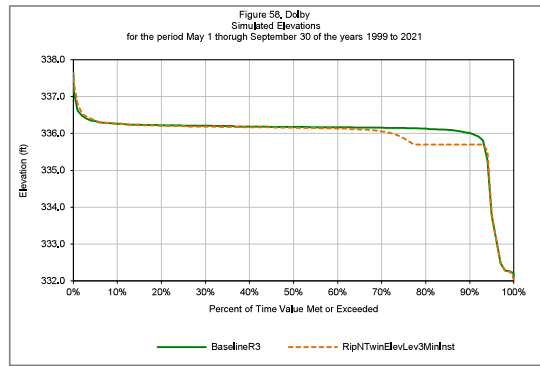
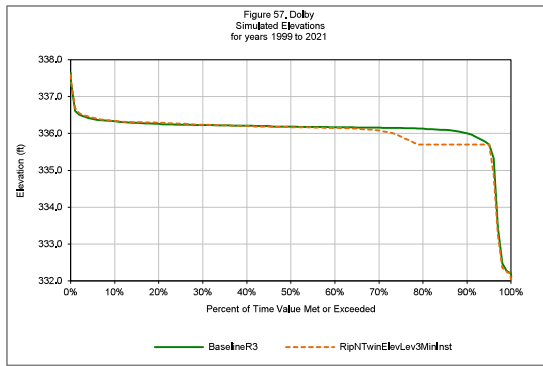


Table 7.

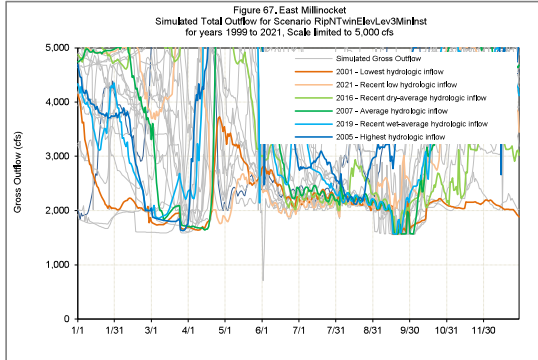
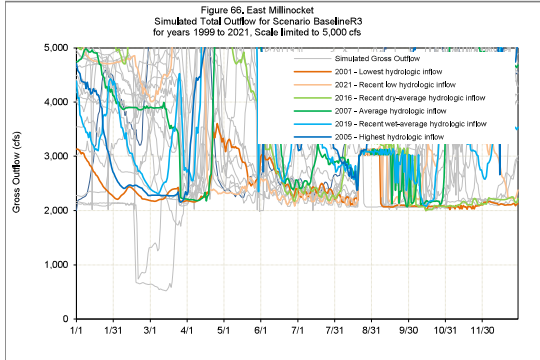
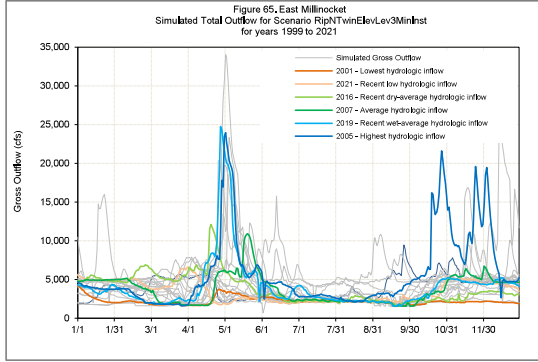
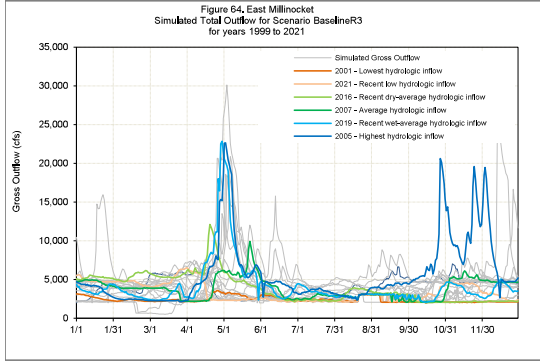
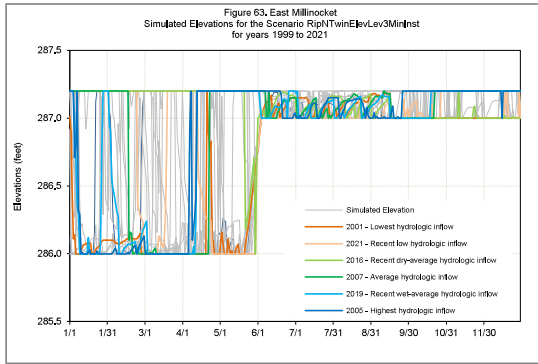
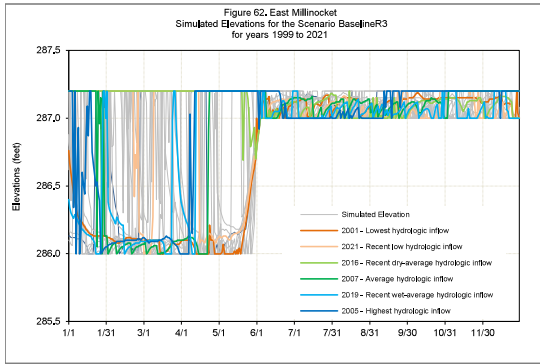
Dolby Monthly Average Days of Spill (Days) Scenarios simulated for 1999 - 2021				
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3	Percent difference from BaselineR3
January	16.5	18.4	1.9	12%
February	9.7	14.9	5.2	53%
March	13.6	11.7	-1.9	-14%
April	16.6	17.4	0.8	5%
May	17.0	16.5	-0.5	-3%
June	7.2	6.9	-0.3	-4%
July	2.9	2.6	-0.3	-12%
August	3.5	3.8	0.3	10%
September	4.9	3.6	-1.3	-27%
October	9.1	9.7	0.6	7%
November	16.3	20.6	4.3	26%
December	18.5	23.0	4.5	24%
Annual	135.8	149.1	13.3	10%

Table 8.

Dolby Monthly Average Elevation Scenarios simulated for 1999 - 2021			
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3
January	336.0	335.9	0.0
February	336.1	336.1	0.0
March	336.2	336.1	-0.1
April	336.2	336.2	-0.1
May	335.5	335.5	0.0
June	336.0	336.0	0.0
July	336.1	336.0	-0.1
August	336.2	336.1	-0.1
September	336.2	336.0	-0.2
October	336.2	336.0	-0.2
November	336.1	336.0	-0.1
December	336.1	336.1	-0.1
Annual	336.1	336.0	-0.1

BaselineR3 simulated Dolby total outflow of less than 1,000 cfs for 40 days in the period of record, 1999 - 2021.

RipNTwinElevLev3MinInst simulated Dolby total outflow of less than 1,000 cfs for 1 day in the period of record.



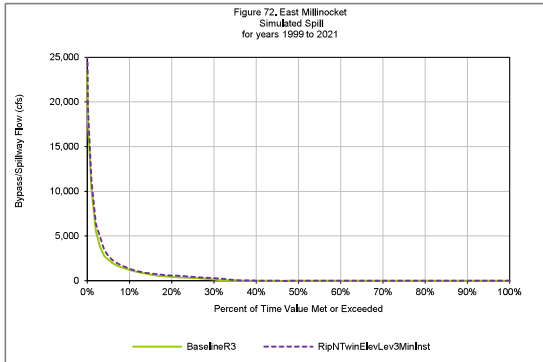
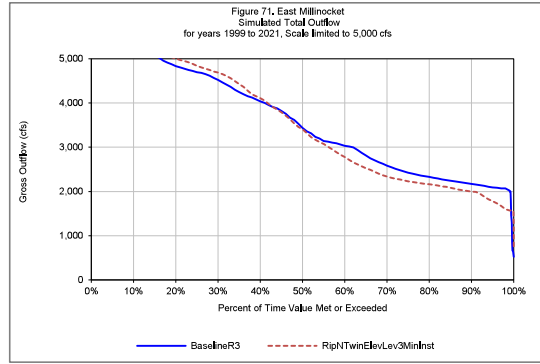
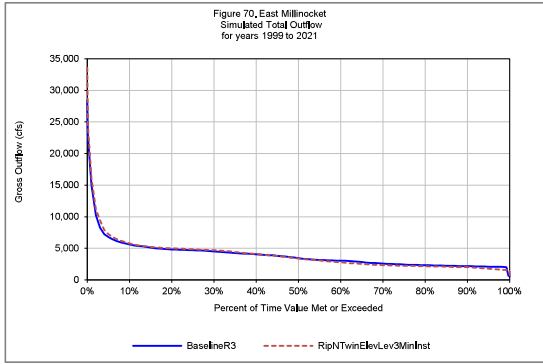
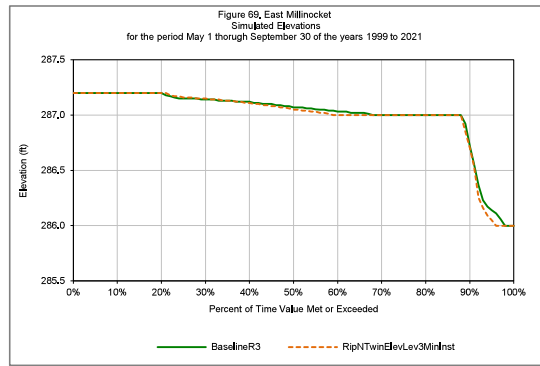
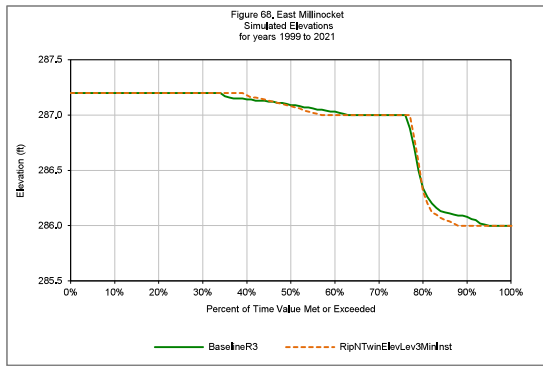


Table 9.

East Millinocket Monthly Average Days of Spill (Days)				
Scenarios simulated for 1999 - 2021				
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3	Percent difference from BaselineR3
January	15.9	16.0	0.2	1%
February	9.3	11.7	2.4	26%
March	12.4	9.9	-2.5	-20%
April	15.6	16.3	0.7	4%
May	16.5	16.1	-0.4	-2%
June	11.7	11.1	-0.5	-4%
July	10.7	5.5	-5.2	-49%
August	9.9	6.3	-3.6	-37%
September	11.6	6.8	-4.8	-41%
October	14.1	19.2	5.1	36%
November	21.0	25.7	4.7	22%
December	22.0	27.3	5.3	24%
Annual	170.7	172.0	1.3	1%

Table 10.

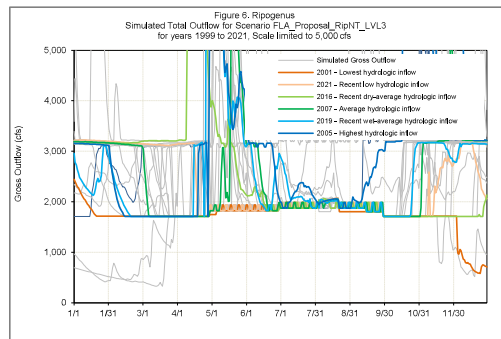
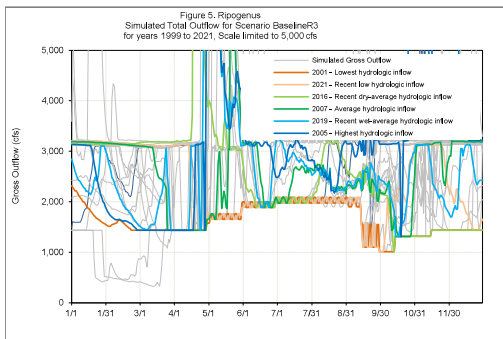
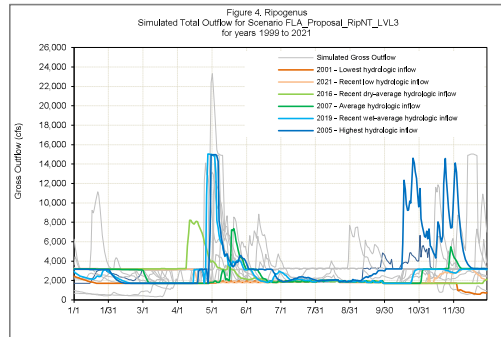
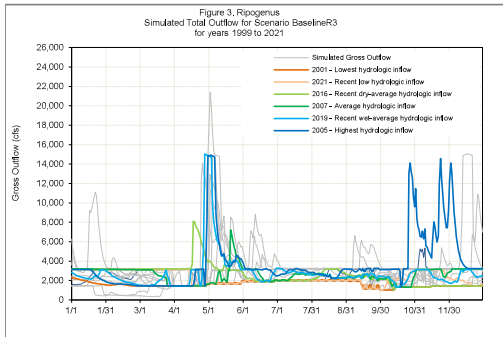
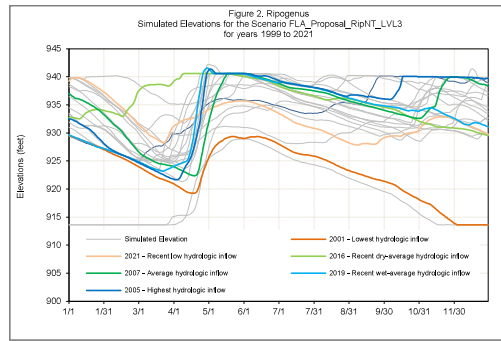
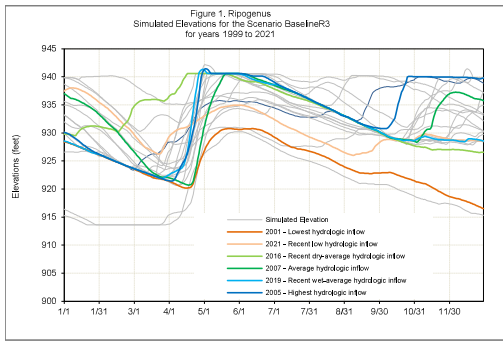
East Millinocket Monthly Average Elevation			
Scenarios simulated for 1999 - 2021			
Month	BaselineR3	RipNTwinElevLev3MinInst	Difference from BaselineR3
January	286.7	286.7	0.0
February	286.5	286.6	0.1
March	286.5	286.4	-0.1
April	286.6	286.7	0.0
May	286.7	286.7	0.0
June	287.1	287.1	0.0
July	287.1	287.1	0.0
August	287.1	287.1	0.0
September	287.1	287.1	0.0
October	287.1	287.1	0.0
November	287.1	287.1	0.0
December	287.1	287.2	0.0
Annual	286.9	286.9	0.0

BaselineR3 simulated East Millinocket total outflow of less than 1,000 cfs for 40 days in the period of record, 1999 - 2021.

RipNTwinElevLev3MinInst simulated East Millinocket total outflow of less than 1,000 cfs for 1 day in the period of record.

Scenario 26

FLA_Proposal_RipNT_LVL3



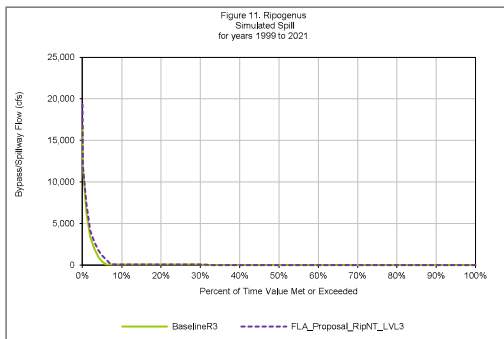
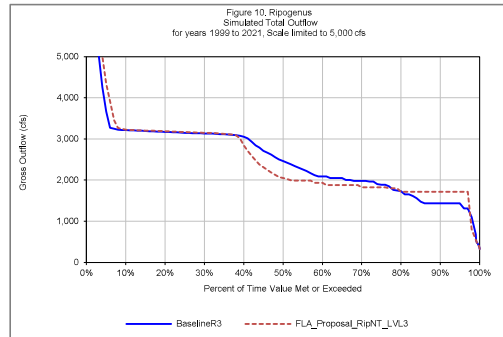
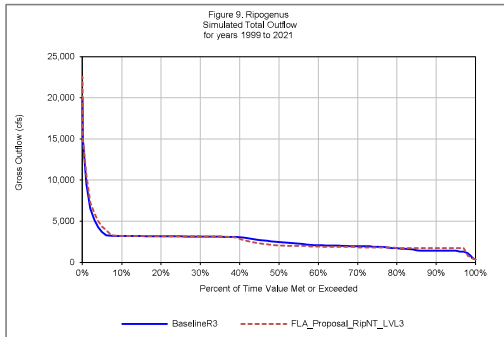
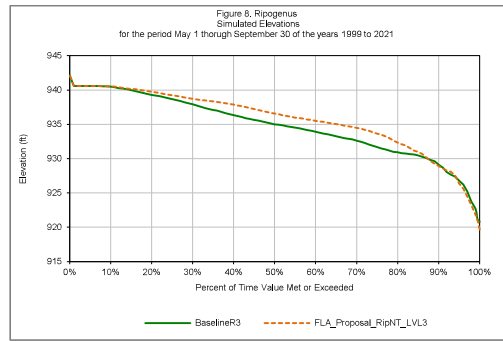
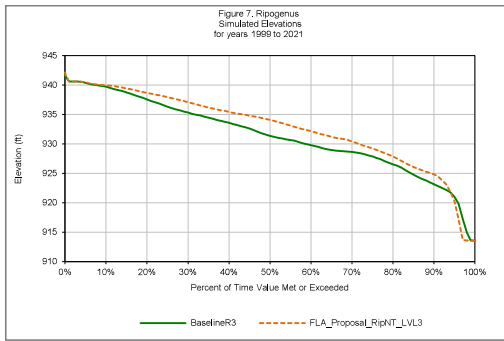


Table 1.

Ripogenus Monthly Average Days of Spill (Days)				
Scenarios simulated for 1999 - 2021				
Month	BaselineR3	FLA_Proposal_RipNT_LVL3	Difference from BaselineR3	Percent difference from BaselineR3
January	1.2	1.2	0.0	4%
February	0.3	0.3	0.0	-
March	0.0	0.0	0.0	-
April	0.9	1.3	0.3	38%
May	10.3	11.3	1.0	10%
June	2.8	3.0	0.2	6%
July	0.3	0.3	0.0	-
August	0.0	0.3	0.3	#DIV/0!
September	1.3	1.7	0.4	29%
October	0.4	1.9	1.5	378%
November	2.0	3.5	1.5	78%
December	2.3	3.5	1.2	50%
Annual	21.8	28.2	6.4	29%

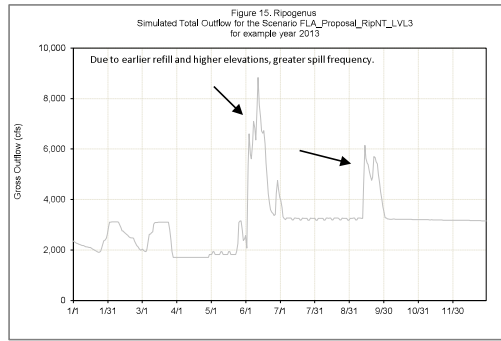
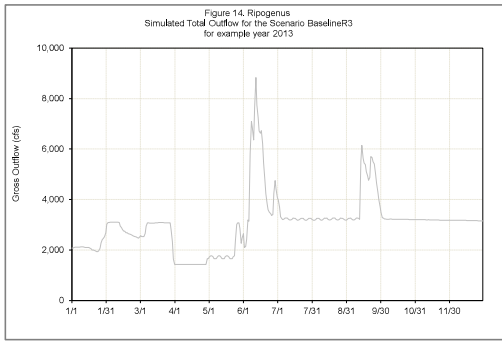
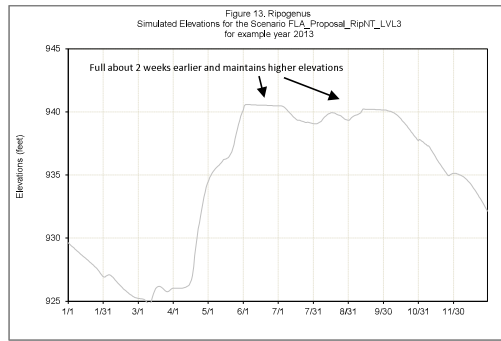
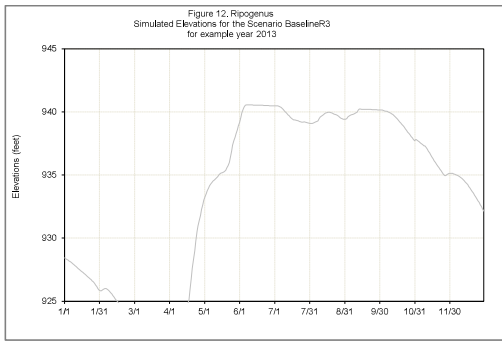
*A percent difference of #DIV/0! in the table above is due to a BaselineR3 monthly value of zero and therefore the percent difference is not applicable for that month.

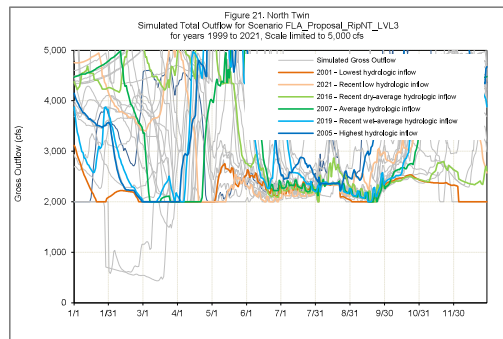
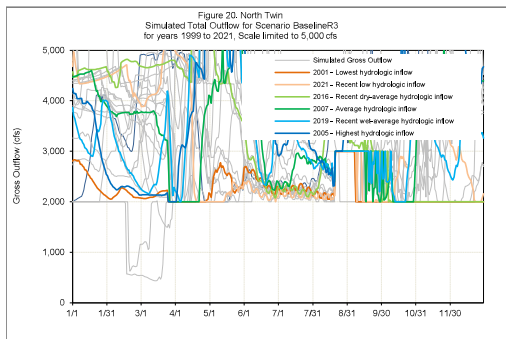
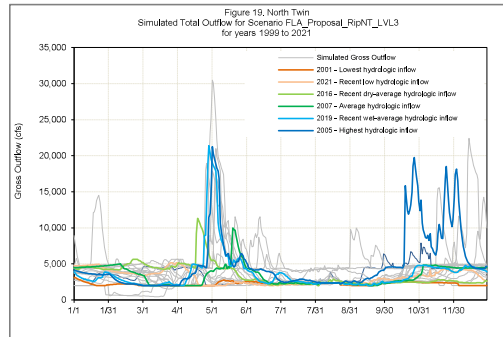
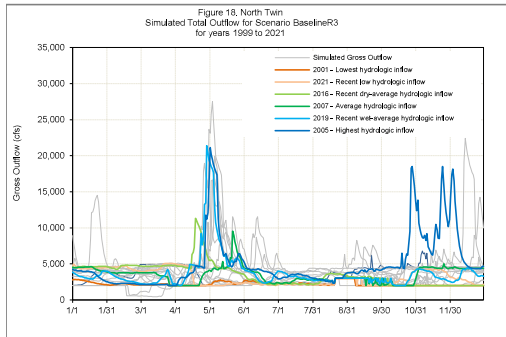
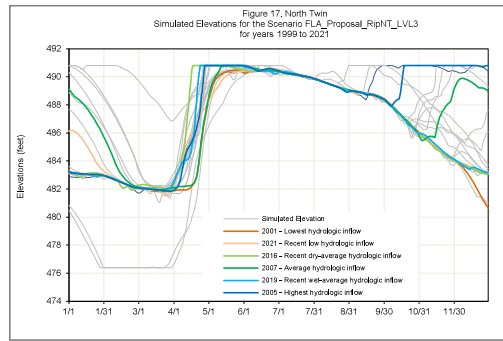
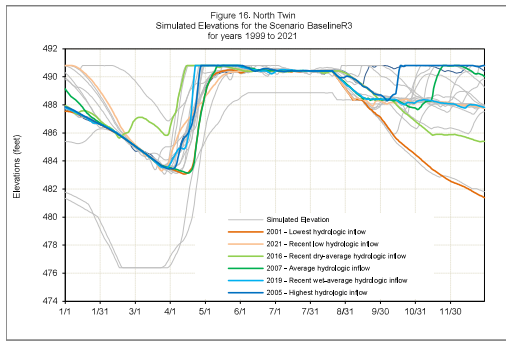
Table 2.

Ripogenus Monthly Average Elevation			
Scenarios simulated for 1999 - 2021			
Month	BaselineR3	FLA_Proposal_RipNT_LVL3	Difference from BaselineR3
January	930.2	931.6	1.4
February	927.1	928.5	1.4
March	924.5	926.1	1.5
April	927.8	928.9	1.1
May	937.0	937.3	0.2
June	937.2	937.4	0.3
July	935.1	935.8	0.6
August	933.2	934.6	1.4
September	931.4	933.4	2.0
October	930.2	932.7	2.5
November	931.2	933.4	2.2
December	931.7	933.2	1.5
Annual	931.4	932.8	1.4

BaselineR3 simulated Ripogenus total outflow of less than 1,000 cfs for 102 days in the period of record, 1999 - 2021.

FLA_Proposal_RipNT_LVL3 simulated Ripogenus total outflow of less than 1,000 cfs for 199 days in the period of record. Approximately twice as many days as the BaselineR3 scenario.





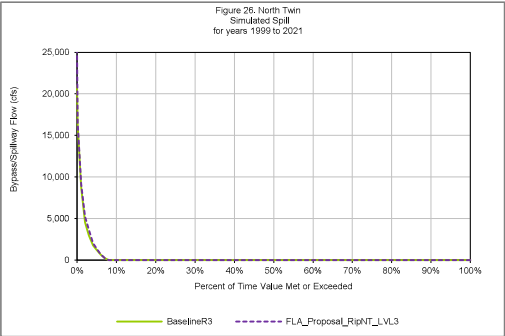
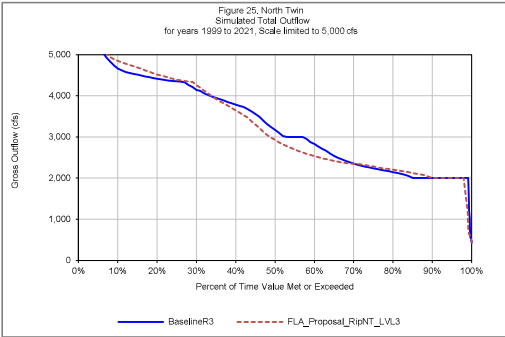
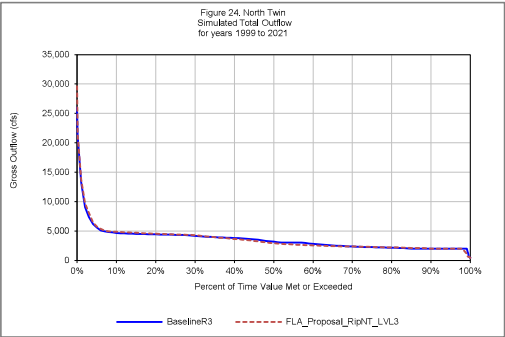
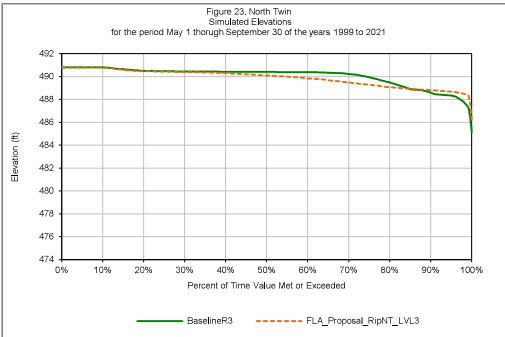
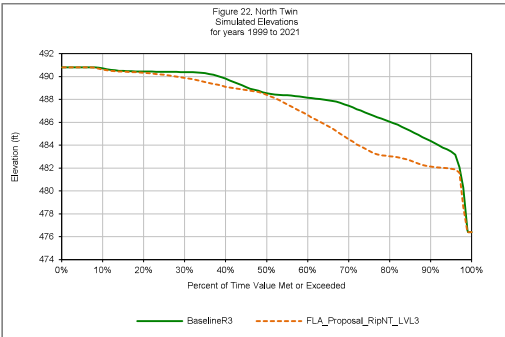


Table 3.

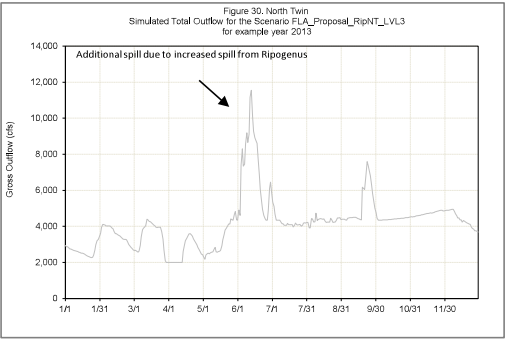
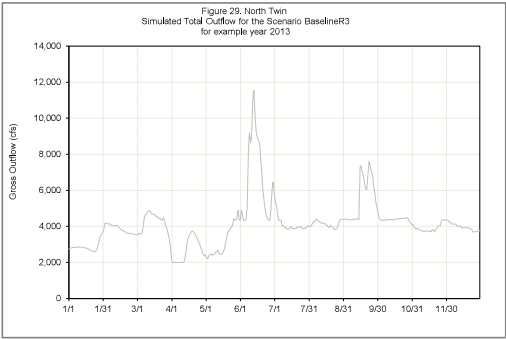
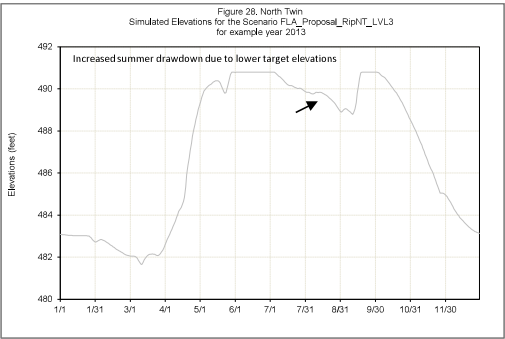
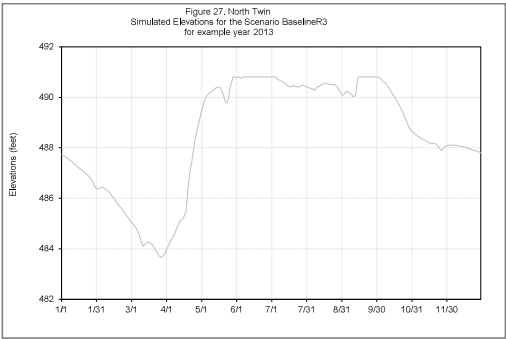
North Twin Monthly Average Days of Spill (Days)				
Scenarios simulated for 1999 - 2021				
Month	BaselineR3	FLA_Proposal_RipNT_LVL3	Difference from BaselineR3	Percent difference from BaselineR3
January	1.5	1.2	-0.3	-18%
February	0.3	0.3	0.0	-
March	0.0	0.0	0.0	-
April	2.3	1.3	-1.0	-45%
May	12.1	12.6	0.4	4%
June	2.4	2.5	0.1	4%
July	0.3	0.3	0.0	-
August	0.1	0.1	0.0	-
September	1.6	1.4	-0.2	-14%
October	1.2	1.7	0.5	39%
November	3.7	2.7	-1.1	-29%
December	4.0	3.5	-0.5	-13%
Annual	29.7	27.5	-2.1	-7%

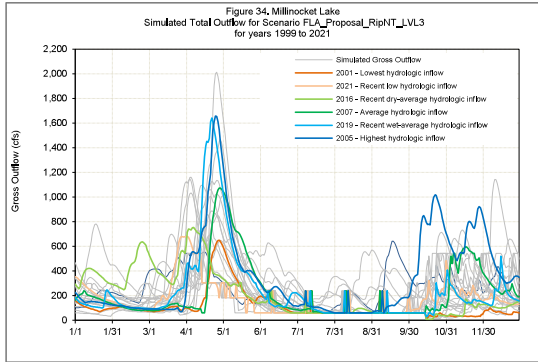
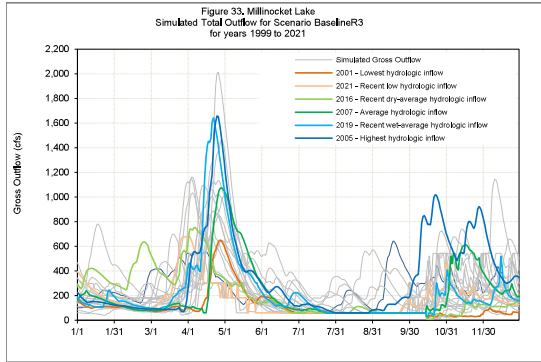
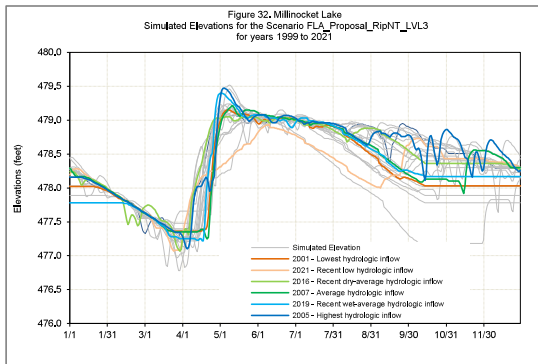
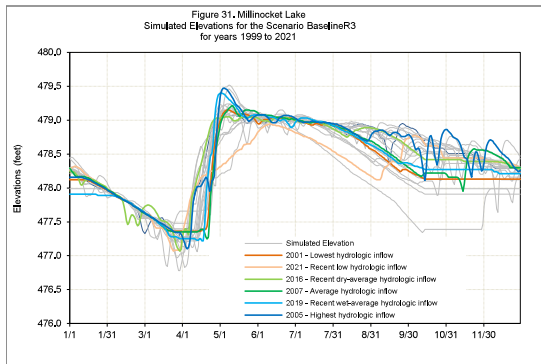
Table 4.

North Twin Monthly Average Elevation			
Scenarios simulated for 1999 - 2021			
Month	BaselineR3	FLA_Proposal_RipNT_LVL3	Difference from BaselineR3
January	487.3	484.5	-2.9
February	485.6	482.9	-2.7
March	483.9	481.8	-2.0
April	485.9	485.0	-0.9
May	490.2	490.3	0.1
June	490.4	490.5	0.1
July	490.4	490.2	-0.2
August	490.2	489.5	-0.7
September	489.0	488.9	0.0
October	488.2	487.7	-0.5
November	488.2	486.5	-1.7
December	488.2	485.6	-2.5
Annual	488.1	487.0	-1.2

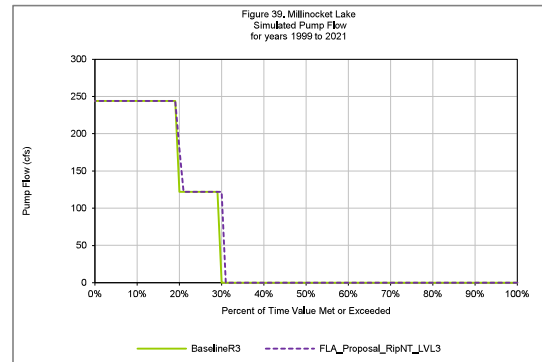
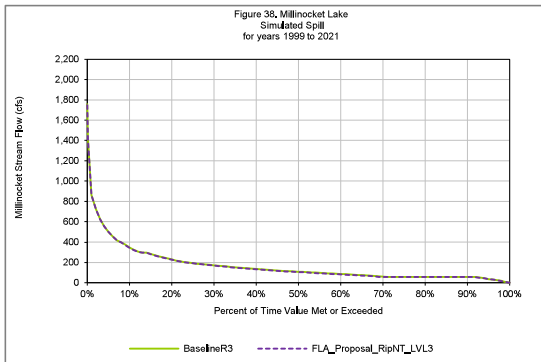
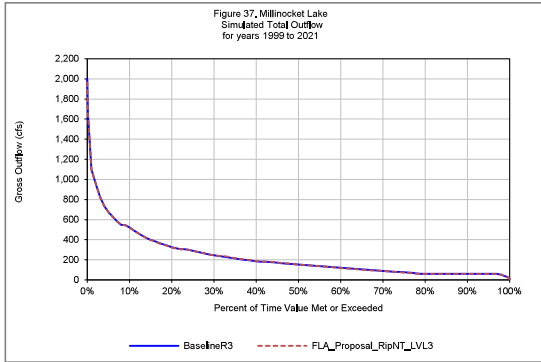
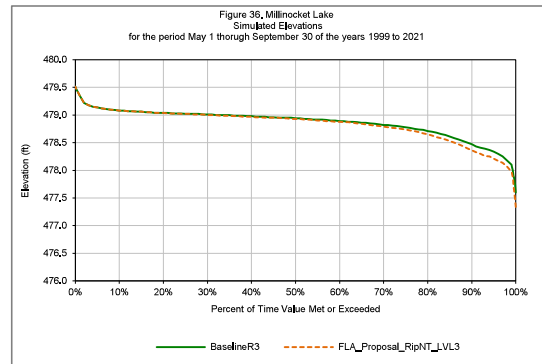
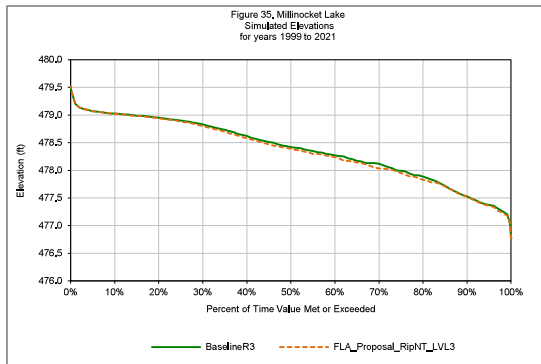
BaselineR3 simulated North Twin total outflow of less than 1,000 cfs for 42 days in the period of record, 1999 - 2021.

FLA_Proposal_RipNT_LVL3 simulated North Twin total outflow of less than 1,000 cfs for 79 days in the period of record. Approximately twice as many days as the BaselineR3 scenario.

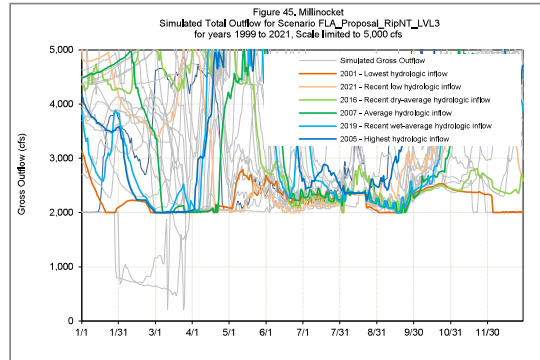
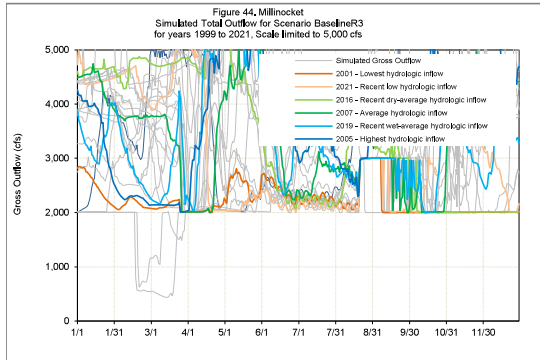
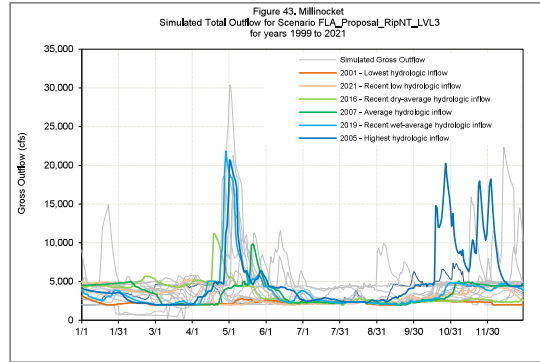
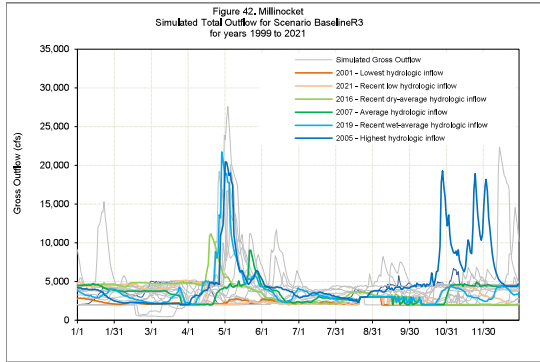
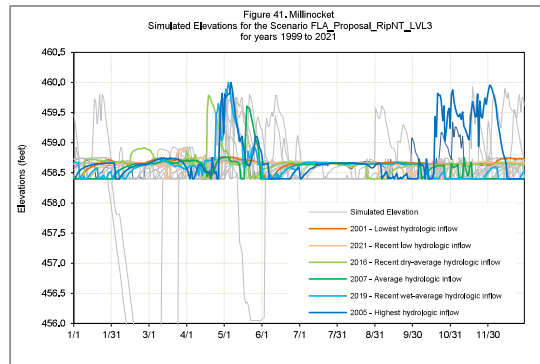
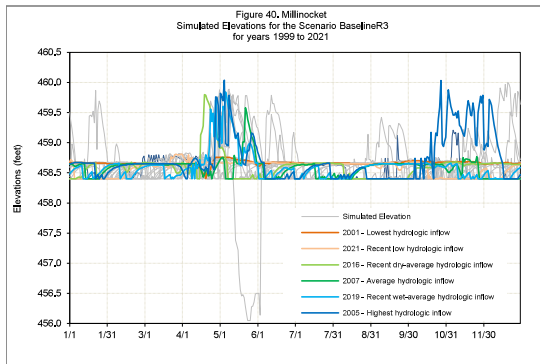




Simulated **BaselineR3** and alternative operations scenario **FLA_Proposal_RipNT_LVL3** comparison figures and tables.



Figures are based on simulated end of day elevations and daily average flows.



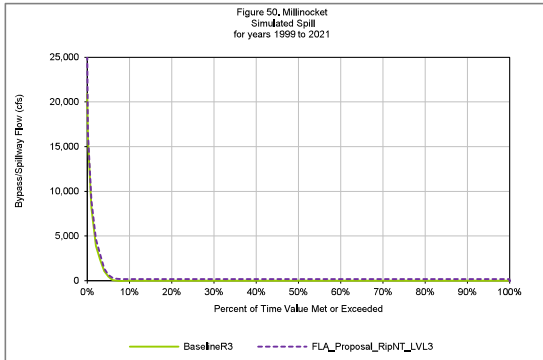
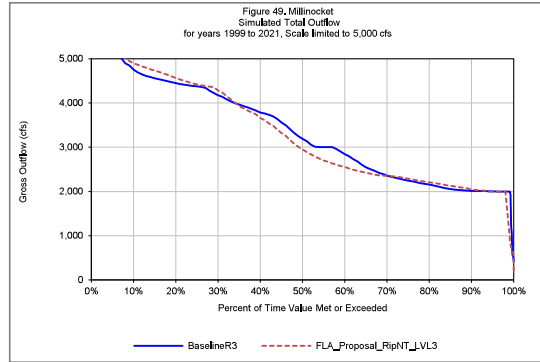
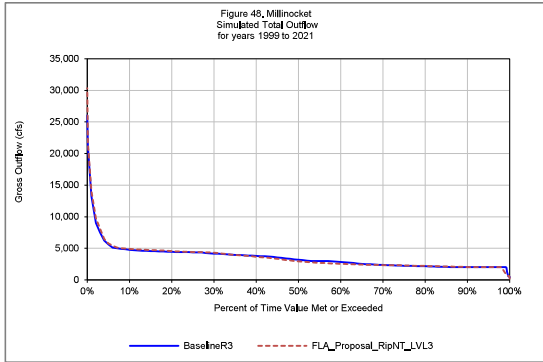
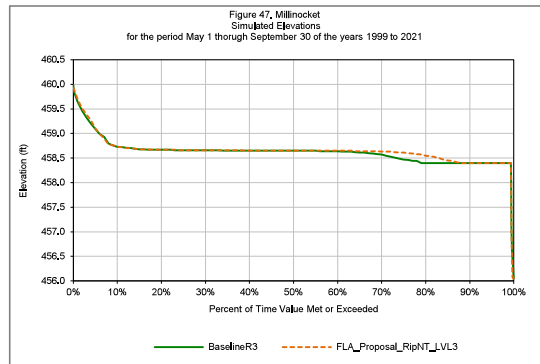
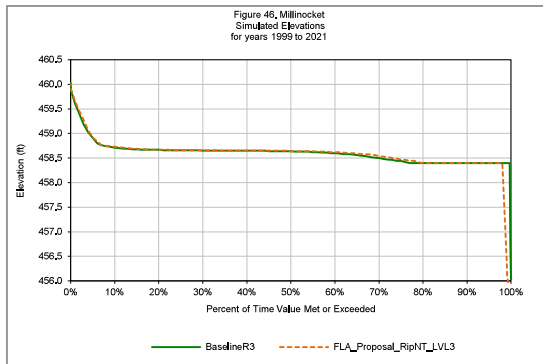


Table 5.

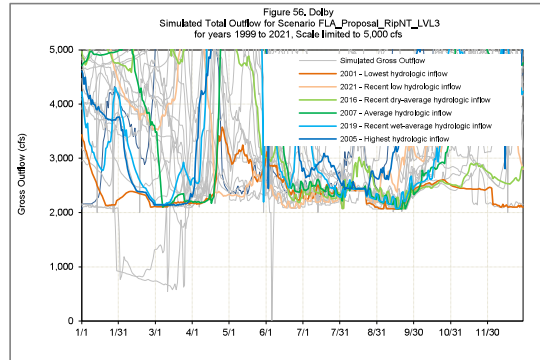
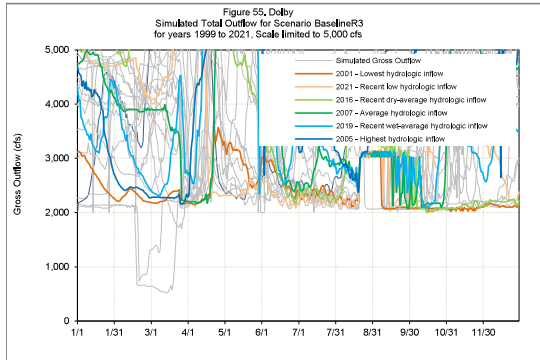
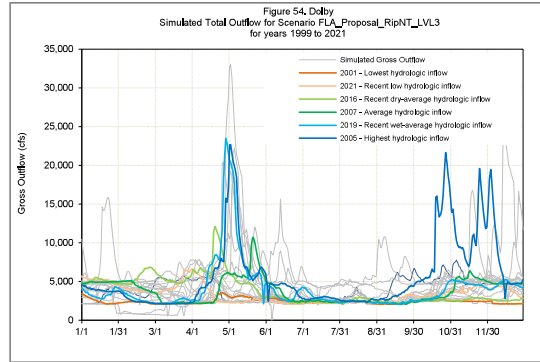
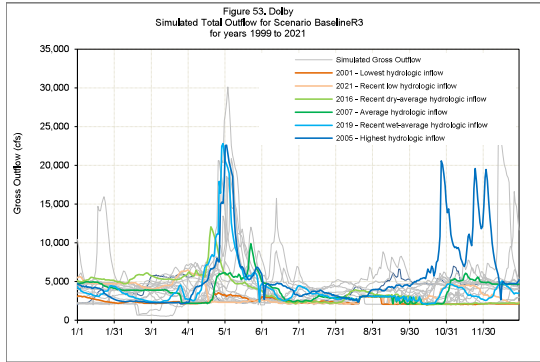
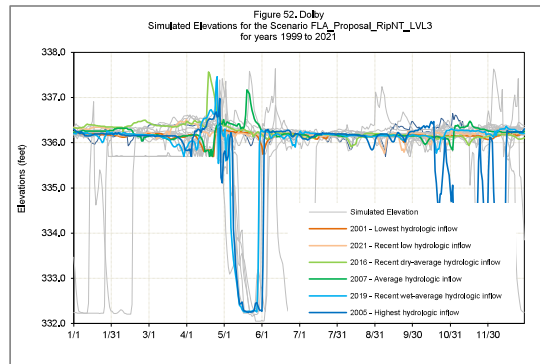
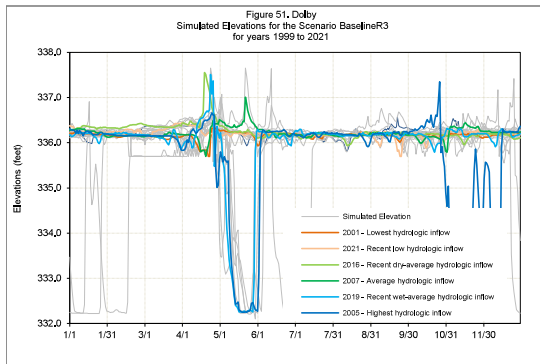
Millinocket Monthly Average Days of Spill (Days) Scenarios simulated for 1999 - 2021				
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3	Percent difference from BaselineR3
January	1.3	1.1	-0.2	-13%
February	0.3	0.8	0.5	157%
March	2.6	1.9	-0.7	-27%
April	5.5	4.0	-1.5	-28%
May	10.7	11.0	0.2	2%
June	1.9	1.9	0.0	-2%
July	0.2	0.2	0.0	-
August	0.1	0.0	-0.1	-67%
September	1.6	1.3	-0.2	-14%
October	1.0	1.5	0.6	59%
November	3.1	2.8	-0.3	-10%
December	3.0	3.2	0.2	7%
Annual	31.3	29.8	-1.6	-5%

Table 6.

Millinocket Monthly Average Elevation Scenarios simulated for 1999 - 2021			
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3
January	458.6	458.6	0.0
February	458.6	458.4	-0.2
March	458.6	458.2	-0.4
April	458.7	458.6	0.0
May	458.8	458.8	0.0
June	458.6	458.6	0.0
July	458.6	458.6	0.0
August	458.6	458.6	0.0
September	458.6	458.6	0.0
October	458.6	458.6	0.0
November	458.6	458.6	0.0
December	458.6	458.6	0.1
Annual	458.6	458.6	0.0

BaselineR3 simulated Millinocket total outflow of less than 1,000 cfs for 41 days in the period of record, 1999 - 2021.

FLA_Proposal_RipNT_LVL3 simulated Millinocket total outflow of less than 1,000 cfs for 82 days in the period of record.



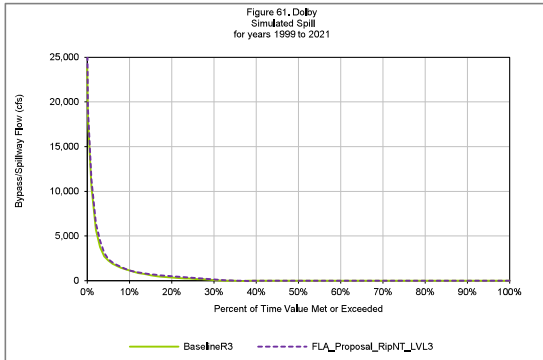
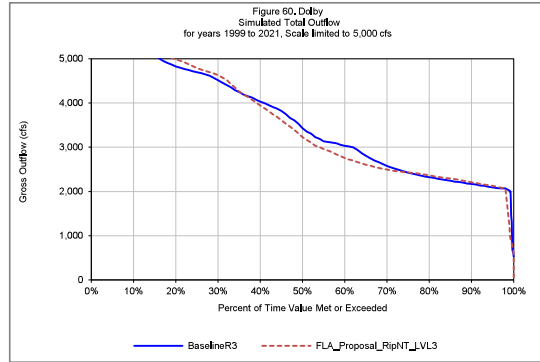
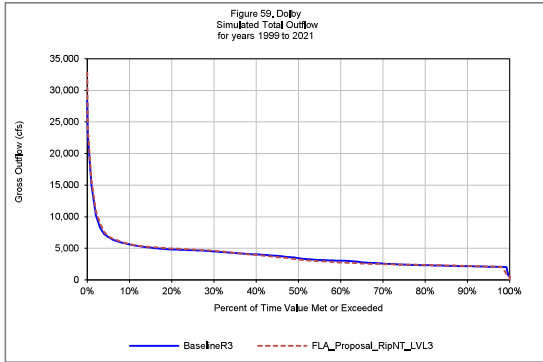
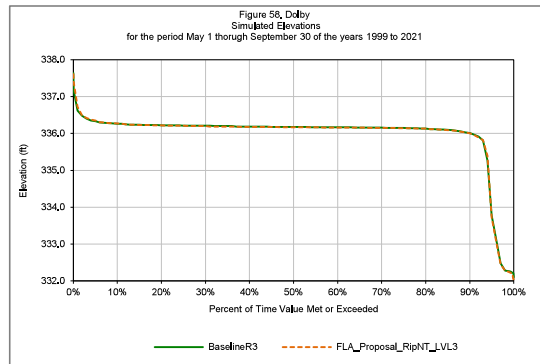
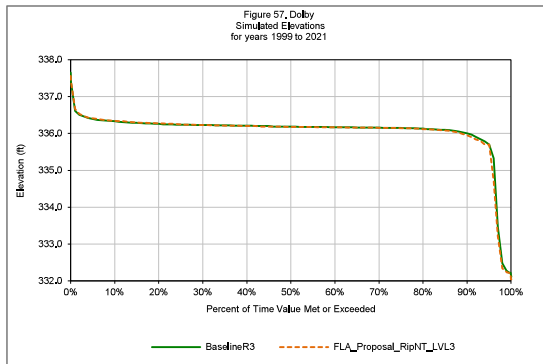


Table 7.

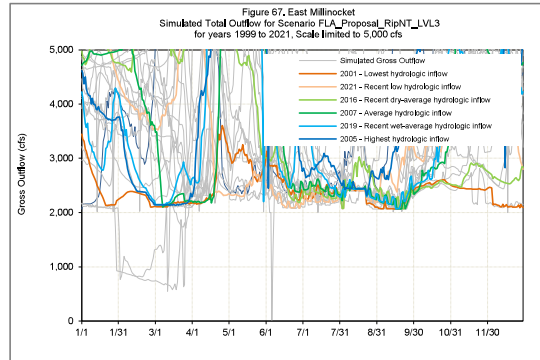
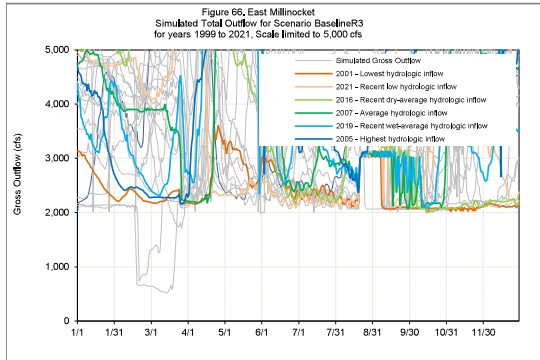
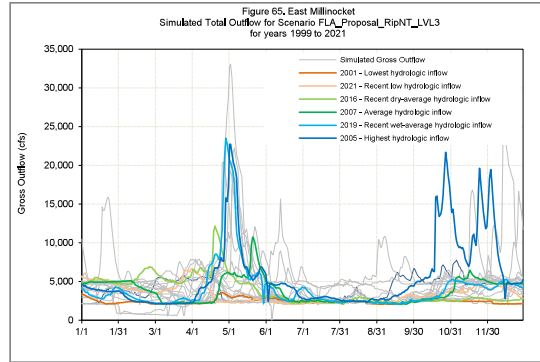
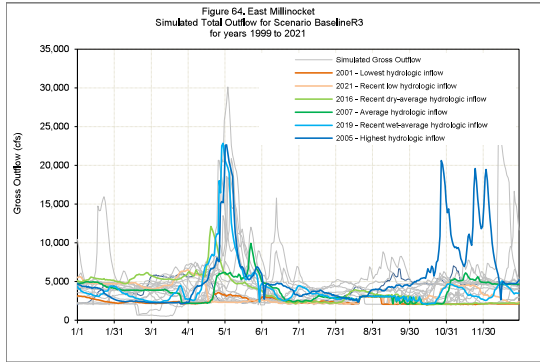
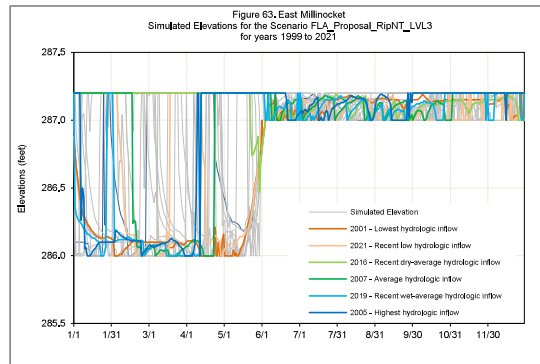
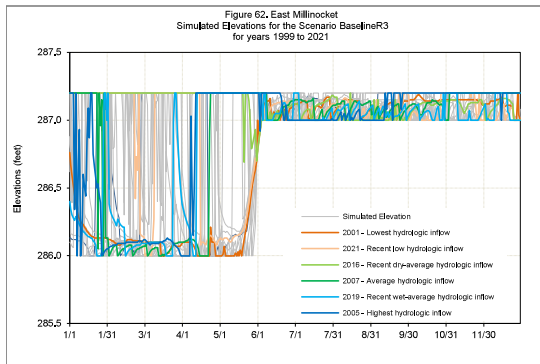
Dolby Monthly Average Days of Spill (Days) Scenarios simulated for 1999 - 2021				
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3	Percent difference from BaselineR3
January	16.5	16.5	0.0	0%
February	9.7	13.5	3.8	39%
March	13.6	10.7	-2.9	-21%
April	16.6	16.1	-0.5	-3%
May	17.0	16.8	-0.1	-1%
June	7.2	6.8	-0.3	-5%
July	2.9	2.9	0.0	-
August	3.5	4.2	0.7	20%
September	4.9	3.6	-1.3	-27%
October	9.1	8.7	-0.5	-5%
November	16.3	18.4	2.1	13%
December	18.5	22.7	4.3	23%
Annual	135.8	141.0	5.2	4%

Table 8.

Dolby Monthly Average Elevation Scenarios simulated for 1999 - 2021			
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3
January	336.0	336.0	0.0
February	336.1	336.1	0.0
March	336.2	336.2	0.0
April	336.2	336.2	0.0
May	335.5	335.5	0.0
June	336.0	336.0	0.0
July	336.1	336.1	0.0
August	336.2	336.2	0.0
September	336.2	336.2	0.0
October	336.2	336.2	0.0
November	336.1	336.1	0.0
December	336.1	336.1	-0.1
Annual	336.1	336.1	0.0

BaselineR3 simulated Dolby total outflow of less than 1,000 cfs for 40 days in the period of record, 1999 - 2021.

FLA_Proposal_RipNT_LVL3 simulated Dolby total outflow of less than 1,000 cfs for 76 day in the period of record.



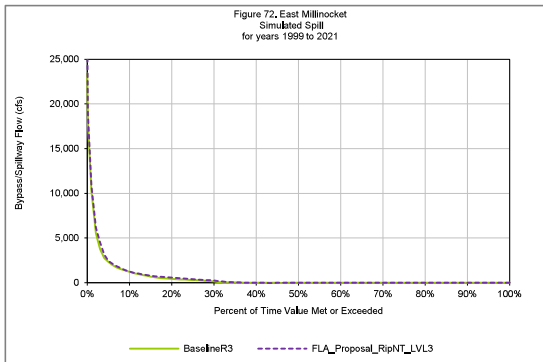
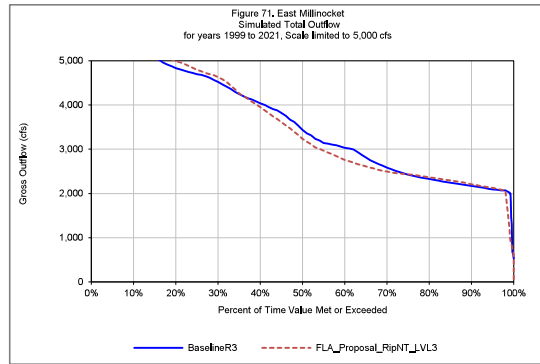
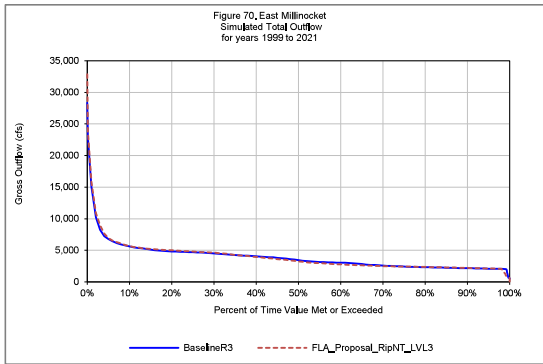
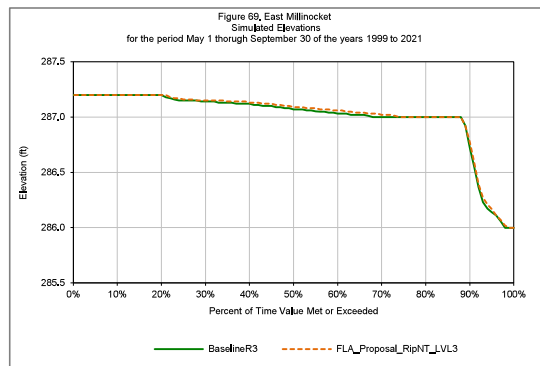
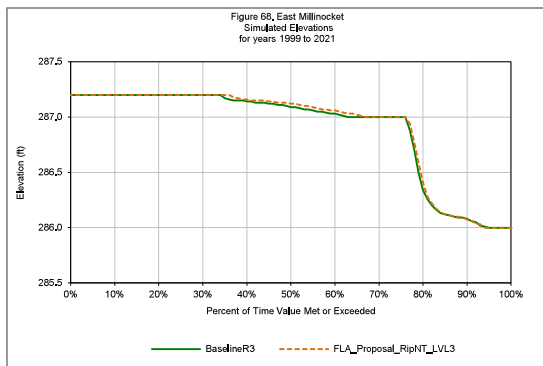


Table 9.

East Millinocket Monthly Average Days of Spill (Days) Scenarios simulated for 1999 - 2021				
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3	Percent difference from BaselineR3
January	15.9	15.7	-0.1	-1%
February	9.3	12.1	2.8	30%
March	12.4	10.3	-2.1	-17%
April	15.6	15.3	-0.3	-2%
May	16.5	16.1	-0.3	-2%
June	11.7	11.0	-0.7	-6%
July	10.7	5.3	-5.3	-50%
August	9.9	5.3	-4.6	-47%
September	11.6	6.1	-5.5	-47%
October	14.1	16.2	2.1	15%
November	21.0	23.3	2.3	11%
December	22.0	25.1	3.1	14%
Annual	170.7	162.0	-8.7	-5%

Table 10.

East Millinocket Monthly Average Elevation Scenarios simulated for 1999 - 2021			
Month	BaselineR3	FLA_Proposal_RipNT_LVL	Difference from BaselineR3
January	286.7	286.7	0.0
February	286.5	286.6	0.1
March	286.5	286.5	-0.1
April	286.6	286.7	0.0
May	286.7	286.7	0.0
June	287.1	287.1	0.0
July	287.1	287.1	0.0
August	287.1	287.1	0.0
September	287.1	287.1	0.0
October	287.1	287.1	0.0
November	287.1	287.2	0.0
December	287.1	287.2	0.0
Annual	286.9	286.9	0.0

BaselineR3 simulated East Millinocket total outflow of less than 1,000 cfs for 40 days in the period of record, 1999 - 2021.

FLA_Proposal_RipNT_LVL3 simulated East Millinocket total outflow of less than 1,000 cfs for 76 day in the period of record.

Generation Summary

Generation Summary									
	Scenario Code	Scenario (Simulated for 1999 - 2021)	Ripogenus Annual Average Gen (MWh)	North Twin Annual Average Gen (MWh)	Millinocket Annual Average Gen (MWh)	Dolby Annual Average Gen (MWh)	East Millinocket Annual Average Gen (MWh)	PMills* Project Total Annual Average Gen (MWh)	Rip and PMills* Projects Total Annual Average Gen (MWh)
	BaselineR3	Current Operations Baseline	254,390	48,840	192,073	99,535	37,500	377,948	632,338
24	FLA_Proposal	CLCA Proposed Scenario FLA_Proposal 1. Provide a minimum flow of 1,700 cfs into the West Branch downstream of McKay (not including the seasonal bypass flow). 2. Provide target boating flows downstream of McKay Station in accordance with the following schedule, subject to water availability. a. May 1 – September 15 (daily from 8:30 AM – 5:00 PM) Simulated as 8:00 AM – 5:00 PM as the model is hourly i. Normal and wet hydrologic periods – 2,000 cfs (weekdays) and 2,300 cfs (weekend days) ii. Dry hydrologic period – 1,800 cfs (daily) b. September 16 – October 1 (Sat & Sun from 8:30 AM – 5:00 PM) Simulated as 8:00 AM – 5:00 PM as the model is hourly i. Normal and wet hydrologic periods – 2,300 cfs ii. Dry hydrologic period – 1,800 cfs 3. Provide flow from North Twin to support the required minimum flow of 2,000 cfs year-round downstream of Shad Pond. 4. Eliminate requirement for seasonal minimum flow (Aug 22-Oct 15) of 3,000 cfs from North Twin. 5. Provide a minimum flow of 200 cfs year-round from Stone Dam. 6. Provide a target boating flow of 600 cfs from Millinocket Lake Storage Dam for 8 hours on one weekend day per month in June, July, August, and September.	257,675	48,881	183,158	99,578	37,533	369,150	626,825
		Difference from BaselineR3 (MWh)	3,285	41	-8,915	43	33	-8,798	-5,513
		Difference from BaselineR3 (%)	1.3%	0.1%	-4.6%	0.0%	0.1%	-2.3%	-0.9%
25	RipNTwinElevLev3MinInst	BaselineR3 with the Ripogenus and North Twin target elevations and North Twin minimum flow set to the elevations outlined in the 9/14/2024 Caribou and Chesuncook Lake Camp Owners Associations (CCLCA) scenario request, FERC AIR #5. Ripogenus target elevation schedule: 1/1 - 929.6, 2/1 - 927.1, 3/1 - 925.1, 4/1 - 925.1, 5/1 - 935.0, 5/10 - 940.1, 6/1 - 940.1, 7/1 - 939.1, 8/1 - 938.1, 9/1 - 937.1, 10/1 - 936.1, 10/15 - 935.6, 11/1 - 934.1, 12/1 - 932.6, interpolate to 1/1. North Twin target elevation schedule: 1/1 - 483.0, 2/1 - 483.0, 3/1 - 482.0, 4/1 - 482.0, 5/1 - 488.7, 5/10 - 490.4, 6/1 - 490.4, 7/1 - 490.4, 8/1 - 489.9, 9/1 - 489.0, 10/1 - 488.6, 11/1 - 486.0, 12/1 - 484.0, interpolate to 1/1. North Twin min flow from 8/22 – 10/15, provide 3,000 cfs as long as North Twin >488.42 and Ripogenus at or above target; otherwise, provide 1,500 cfs.	248,873	46,984	186,873	96,507	36,226	366,590	615,463
		Difference from BaselineR3 (MWh)	-5,517	-1,856	-5,200	-3,028	-1,274	-11,358	-16,875
		Difference from BaselineR3 (%)	-2.2%	-3.8%	-2.7%	-3.0%	-3.4%	-3.0%	-2.7%
26	FLA_Proposal_RipNT_LVL3	FLA_Proposal with the Ripogenus and North Twin target elevations and North Twin minimum flow set to the elevations outlined in the 9/14/2024 Caribou and Chesuncook Lake Camp Owners Associations (CCLCA) scenario request, FERC AIR #5. Ripogenus target elevation schedule: 1/1 - 929.6, 2/1 - 927.1, 3/1 - 925.1, 4/1 - 925.1, 5/1 - 935.0, 5/10 - 940.1, 6/1 - 940.1, 7/1 - 939.1, 8/1 - 938.1, 9/1 - 937.1, 10/1 - 936.1, 10/15 - 935.6, 11/1 - 934.1, 12/1 - 932.6, interpolate to 1/1. North Twin target elevation schedule: 1/1 - 483.0, 2/1 - 483.0, 3/1 - 482.0, 4/1 - 482.0, 5/1 - 488.7, 5/10 - 490.4, 6/1 - 490.4, 7/1 - 490.4, 8/1 - 489.9, 9/1 - 489.0, 10/1 - 488.6, 11/1 - 486.0, 12/1 - 484.0, interpolate to 1/1. North Twin min flow from 8/22 – 10/15, provide 3,000 cfs as long as North Twin >488.42 and Ripogenus at or above target; otherwise, provide 1,500 cfs.	254,588	45,757	179,990	97,881	36,843	360,471	615,059
		Difference from BaselineR3 (MWh)	198	-3,083	-12,083	-1,654	-657	-17,477	-17,279
		Difference from BaselineR3 (%)	0.1%	-6.3%	-6.3%	-1.7%	-1.8%	-4.6%	-2.7%

* PMills - Penobscot Mills Project (North Twin, Millinocket, Dolby, and East Millinocket)
Rip - Ripogenus Project (Ripogenus)

Appendix E

Maine DIFW Fish Assemblage Data

..

AREA/BOX NO.

[illegible]

(Continued)

WINTER CLERK SURVEYS

,DATA SUMMARY										AREA/BOX NO.		
				1998	2004	2006	2010	2014	2018	2020	2021	
,FISH DATA												
,LKT	,REL	,Sum		0.00,	1.00,	0.00,						
	,SUB	,Sum		0.00,	1.00,	0.00,						
	,SLOT	,Sum		0.00,	0.00,	0.00,						
,LLS	,SUCC	,Sum		36.00,	73.00,	98.00,	60.00,	106.00,	76.00,	52.00,	72.00,	
	,KEPT	,Sum		19.00,	63.00,	91.00,	53.00,	74.00,	77.00,	105.00,	103.00,	
	,REL	,Sum		32.00,	84.00,	33.00,	16.00,	97.00,	36.00,	9.00,	10.00,	
	,SUB	,Sum		104.00,	62.00,	109.00,	56.00,	147.00,	0.00,	0.00,	0.00,	
	,SLOT	,Sum		0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	
,LWF	,SUCC	,Sum		2.00,								
	,KEPT	,Sum		1.00,								
	,REL	,Sum		1.00,								
	,SUB	,Sum		0.00,								
	,SLOT	,Sum		0.00,								
,SLT	,SUCC	,Sum						21.00,				
	,KEPT	,Sum						390.00,				
	,REL	,Sum						0.00,				
	,SUB	,Sum						0.00,				
	,SLOT	,Sum						0.00,				
,SPK	,SUCC	,Sum			2.00,	6.00,	1.00,	6.00,	4.00,			
	,KEPT	,Sum			2.00,	4.00,	0.00,	6.00,	4.00,			
	,REL	,Sum			0.00,	2.00,	1.00,	0.00,	0.00,			

(Continued)

WINTER CLERK SURVEYS

,DATA SUMMARY										AREA/BOX NO.		
				1998	2004	2006	2010	2014	2018	2020	2021	


```

#####...#####~#####~#####~#####~#####~#####~#####~#####%
,FISH DATA      ,      ,      ,      ,      ,      ,      ,      ,
#####~#####~#####%
,SPK             ,SUB      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####%
,               ,SLOT      ,Sum      ,      ,      ,      ,      ,      ,      ,
#####~#####~#####~#####~#####~#####~#####~#####~#####%
,WHP             ,SUCC      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####%
,               ,KEPT      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####~#####%
,               ,REL      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####%
,               ,SUB      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####~#####%
,               ,SLOT      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
#####~#####~#####~#####~#####~#####~#####~#####~#####%
,YLP             ,SUCC      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####%
,               ,KEPT      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####~#####%
,               ,REL      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####%
,               ,SUB      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
,               #####~#####~#####~#####~#####~#####~#####~#####~#####%
,               ,SLOT      ,Sum      ,      ,      ,      ,      ,      ,      ,      ,
#####~#####~#####~#####~#####~#####~#####~#####~#####%
#####~#####~#####~#####~#####~#####~#####~#####~#####%

```

SUMMER CLERK SURVEYS

,DATA SUMMARY					
		AREA/BOX NO.			
		1996	2018	2020	2021
,TRIP INFO					
	,NO. PARTIES	125.00,	32.00,	44.00,	30.00,
	,TOTAL ANGLERS	301.00,	79.00,	104.00,	90.00,
	,TOTAL HRS	1683.50,	366.33,	534.75,	531.00,
	,MEAN PARTY SIZE	2.41,	2.47,	2.36,	3.00,
,FISH DATA					
,BKT					
	,SUCC	Sum	1.00,	1.00,	,,
	,KEPT	Sum	1.00,	0.00,	,,
	,REL	Sum	0.00,	1.00,	,,
	,SUB	Sum	0.00,	0.00,	,,
	,SLOT	Sum	0.00,	0.00,	,,
,FLF					
	,SUCC	Sum	9.00,	1.00,	,,
	,KEPT	Sum	1.00,	1.00,	,,
	,REL	Sum	8.00,	0.00,	,,
	,SUB	Sum	0.00,	0.00,	,,
	,SLOT	Sum	0.00,	0.00,	,,
,LKT					
	,SUCC	Sum	5.00,	,,	,,
	,KEPT	Sum	5.00,	,,	,,
	,REL	Sum	0.00,	,,	,,
	,SUB	Sum	2.00,	,,	,,
	,SLOT	Sum	0.00,	,,	,,
,LLS					
	,SUCC	Sum	91.00,	30.00,	58.00,
	,KEPT	Sum	50.00,	9.00,	69.00,
					145.00,

(Continued)

```
„fffffffffffffffffffffffffffffffff...fffffffffffffffffffffffffffffffff+
.DATA SUMMARY
```

DATA SUMMARY			AREA/BOX NO.			
			1996	2018	2020	2021
FISH DATA						
LLS	REL	Sum	68.00,	34.00,	67.00,	12.00,
	SUB	Sum	221.00,	32.00,	0.00,	0.00,
	SLOT	Sum	0.00,	0.00,	0.00,	0.00,
LWF	SUCC	Sum	5.00,	.,	.,	.,
	KEPT	Sum	0.00,	.,	.,	.,
	REL	Sum	5.00,	.,	.,	.,
	SUB	Sum	0.00,	.,	.,	.,
	SLOT	Sum	0.00,	.,	.,	.,
SPK	SUCC	Sum	.,	.,	.,	1.00,
	KEPT	Sum	.,	.,	.,	1.00,
	REL	Sum	.,	.,	.,	0.00,
	SUB	Sum	.,	.,	.,	0.00,
	SLOT	Sum	.,	.,	.,	0.00,
WHP	SUCC	Sum	31.00,	22.00,	3.00,	2.00,
	KEPT	Sum	23.00,	144.00,	2.00,	2.00,
	REL	Sum	42.00,	28.00,	1.00,	0.00,
	SUB	Sum	0.00,	0.00,	0.00,	0.00,
	SLOT	Sum	0.00,	0.00,	0.00,	0.00,
YLP	SUCC	Sum	2.00,	.,	1.00,	.,
	KEPT	Sum	2.00,	.,	0.00,	.,
	REL	Sum	0.00,	.,	1.00,	.,
Σ						

CHESUNCOOK CLERK SURVEYS SINCE 1996 SUMMARY BY SEASON AND YEAR

```
„fffffffffffffffffffffffffffffffff...fffffffffffffffffffffffffffffffff+
.DATA SUMMARY
```

DATA SUMMARY		AREA/BOX NO.	
	1996	1998	2001
1	1996	1998	2001
2	1996	1998	2001
3	1996	1998	2001
4	1996	1998	2001
5	1996	1998	2001
6	1996	1998	2001
7	1996	1998	2001
8	1996	1998	2001
9	1996	1998	2001
10	1996	1998	2001
11	1996	1998	2001
12	1996	1998	2001
13	1996	1998	2001
14	1996	1998	2001
15	1996	1998	2001
16	1996	1998	2001
17	1996	1998	2001
18	1996	1998	2001
19	1996	1998	2001
20	1996	1998	2001
21	1996	1998	2001
22	1996	1998	2001
23	1996	1998	2001
24	1996	1998	2001
25	1996	1998	2001
26	1996	1998	2001
27	1996	1998	2001
28	1996	1998	2001
29	1996	1998	2001
30	1996	1998	2001
31	1996	1998	2001
32	1996	1998	2001
33	1996	1998	2001
34	1996	1998	2001
35	1996	1998	2001
36	1996	1998	2001
37	1996	1998	2001
38	1996	1998	2001
39	1996	1998	2001
40	1996	1998	2001
41	1996	1998	2001
42	1996	1998	2001
43	1996	1998	2001
44	1996	1998	2001
45	1996	1998	2001
46	1996	1998	2001
47	1996	1998	2001
48	1996	1998	2001
49	1996	1998	2001
50	1996	1998	2001
51	1996	1998	2001
52	1996	1998	2001
53	1996	1998	2001
54	1996	1998	2001
55	1996	1998	2001
56	1996	1998	2001
57	1996	1998	2001
58	1996	1998	2001
59	1996	1998	2001
60	1996	1998	2001
61	1996	1998	2001
62	1996	1998	2001
63	1996	1998	2001
64	1996	1998	2001
65	1996	1998	2001
66	1996	1998	2001
67	1996	1998	2001
68	1996	1998	2001
69	1996	1998	2001
70	1996	1998	2001
71	1996	1998	2001
72	1996	1998	2001
73	1996	1998	2001
74	1996	1998	2001
75	1996	1998	2001
76	1996	1998	2001
77	1996	1998	2001
78	1996	1998	2001
79	1996	1998	2001
80	1996	1998	2001
81	1996	1998	2001
82	1996	1998	2001
83	1996	1998	2001
84	1996	1998	2001
85	1996	1998	2001
86	1996	1998	2001
87	1996	1998	2001
88	1996	1998	2001
89	1996	1998	2001
90			

```

#ffffffffffff...ffffffffffff...ffffffffffff ffffffff ffffffff ffffffff ffffffff%
.FISH DATA , , , , , , , ,
#ffffffffffff ffffffff%
,YLP ,SUB ,Sum , 0.00, -, 0.00, -,
, #ffffffffffff ffffffff ffffffff ffffffff ffffffff%
, ,SLOT ,Sum , 0.00, -, 0.00, -,
5ffffffffffff<ffffffffffff<ffffffffffff<ffffffffffff<ffffffffffff<ffffffffffffCE

```

(Continued)

11:12 Monday, April 25, 2022 8

(Continued)

CHESUNCOOK CLERK SURVEYS SINCE 1996
All YEARS AND SEASONS

11:12 Monday, April 25, 2022 9

```

,,ffffffffffffffffffffffffffffffffffffffff..ffffffffffff*
,DATA SUMMARY                                     ,    All    ,
+ffffffffffff...ffffffffffff...ffffffffffff* fffffffffffff%o
,FISH DATA
+ffffffffffff* fffffffffffff* fffffffffffff%o
,WHP          ,SUCC          ,Sum          ,    102.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,KEPT          ,Sum          ,    225.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,REL          ,Sum          ,    75.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,SUB          ,Sum          ,    0.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,SLOT          ,Sum          ,    0.00,
+ffffffffffff* fffffffffffff* fffffffffffff* fffffffffffff%o
,YLP          ,SUCC          ,Sum          ,    157.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,KEPT          ,Sum          ,    329.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,REL          ,Sum          ,    26.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,SUB          ,Sum          ,    0.00,
,          +ffffffffffff* fffffffffffff* fffffffffffff%o
,          ,SLOT          ,Sum          ,    0.00,
$ffffffffffff.ffffffffffff.ffffffffffff.ffffffffffffCE

```

----- SPECIES CODE=BKT -----

FISH LENGTH				FISH WEIGHT			K		
N	Mean	StdErr	N	Mean	StdErr	N	Mean	StdErr	
2	1.00	234.00	1.00	110.00		1.00	0.86		
3	1.00	293.00	1.00	200.00		1.00	0.80		
4	1.00	375.00	1.00	455.00		1.00	0.86		
6	1.00	505.00	1.00	1350.00		1.00	1.05		
All	4.00	351.75	58.70	4.00	528.75	283.33	4.00	0.89	0.05

----- SPECIES CODE=CSK -----

FISH LENGTH				FISH WEIGHT			K		
N	Mean	StdErr	N	Mean	StdErr	N	Mean	StdErr	
17	17.00	500.71	25.57	17	924.12	149.71	17.00	0.65	0.02
All	17.00	500.71	25.57	17	924.12	149.71	17.00	0.65	0.02

SPECIES CODE=LKT

FISH LENGTH				FISH WEIGHT				K			
N	Mean	StdErr		N	Mean	StdErr		N	Mean	StdErr	
3.00,	786.00,	59.57,		2.00,	5100.00,	600.00,		2.00,	0.86,	0.16,	
1.00,	655.00,	.,		0.00,	.,	.,		0.00,	.,	.,	
2.00,	624.50,	51.50,		2.00,	2287.50,	87.50,		2.00,	0.97,	0.20,	
1.00,	715.00,	.,		1.00,	3300.00,	.,		1.00,	0.90,	.,	
7.00,	711.00,	38.29,		5.00,	3615.00,	662.17,		5.00,	0.91,	0.08,	

----- SPECIES CODE=LLS -----

FISH LENGTH				FISH WEIGHT			K		
N	Mean	StdErr	N	Mean	StdErr	N	Mean	StdErr	
44.00,	384.25,	7.76,	40.00,	477.00,	31.26,	40.00,	0.77,	0.01,	
12.00,	311.17,	11.23,	11.00,	260.91,	35.17,	11.00,	0.81,	0.03,	
124.00,	376.41,	2.94,	101.00,	448.66,	13.27,	101.00,	0.82,	0.01,	
171.00,	412.92,	2.98,	144.00,	580.94,	16.31,	144.00,	0.79,	0.01,	
57.00,	444.09,	4.63,	47.00,	714.47,	29.05,	47.00,	0.79,	0.02,	
16.00,	499.75,	8.82,	14.00,	985.36,	60.78,	14.00,	0.78,	0.03,	
4.00,	509.25,	13.49,	3.00,	910.00,	45.83,	3.00,	0.65,	0.04,	
All	428.00,	404.84,	2.48,	360.00,	558.40,	11.81,	360.00,	0.80,	0.01,

SPECIES CODE=SPK

FISH LENGTH												FISH WEIGHT												K											
N												Mean												StdErr											
FISH AGE,												FISH AGE,												FISH AGE,											
9.00,												414.67,												25.59,											
5.00,												5.00,												699.00,											
202.29,												202.29,												202.29,											
5.00,												5.00,												5.00,											
0.97,												0.97,												0.97,											
0.01,												0.01,												0.01,											
6.00,												404.17,												8.35,											
3.00,												3.00,												3.00,											
568.33,												568.33,												568.33,											
79.60,												79.60,												79.60,											
3.00,												3.00,												3.00,											
0.92,												0.92,												0.92,											
0.09,												0.09,												0.09,											
2.00,												447.00,												17.00,											
1.00,												1.00,												1.00,											
555.00,												555.00,												555.00,											
1.00,												1.00,												1.00,											
760.00,												760.00,												760.00,											
1.00,												1.00,												1.00,											
1.06,												1.06,												1.06,											
1.00,												1.00,												1.00,											
0.00,												0.00,												0.00,											
0.04,												0.04,												0.04,											
19.00,												415.00,												12.40,											
10.00,												10.00,												10.00,											
651.50,												651.50,												651.50,											
100.53,												100.53,												100.53,											
10.00,												10.00,												10.00,											

----- SPECIES CODE=BKT -----

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
1	BKT	0662	03/13/04	2	2	234	110	0.859	.			CS	LP MISSING	.	.	.	.
2	BKT	0662	03/13/04	2	3	293	200	0.795	.			CS		.	.	.	.
3	BKT	0662	03/18/06	2	4	375	455	0.863	.			CS		.	.	.	.
4	BKT	0662	02/21/98	2	6	505	1350	1.048	.			CS		.	.	.	.

----- SPECIES CODE=CSK -----

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
5	CSK	0662	02/28/04	2	.	350	280	0.653	.			CS		.	.	.	.
6	CSK	0662	02/11/06	2	.	365	280	0.576	.			CS		.	.	.	.
7	CSK	0662	01/17/04	3	.	420	450	0.607	.			CS		.	.	.	.
8	CSK	0662	03/04/06	2	.	422	460	0.612	.			CS		.	.	.	.
9	CSK	0662	02/28/04	2	.	428	480	0.612	.			CS		.	.	.	.
10	CSK	0662	02/13/10	2	.	430	490	0.616	.			CS		.	.	.	.
11	CSK	0662	02/22/14	.	.	447	630	0.705	.			CS		.	.	.	.
12	CSK	0662	01/21/06	.	.	456	610	0.643	.			CS		.	.	.	.
13	CSK	0662	02/13/10	2	.	490	870	0.739	.			CS		.	.	.	.
14	CSK	0662	02/13/10	2	.	510	720	0.543	.			CS		.	.	.	.
15	CSK	0662	02/11/06	2	.	513	880	0.652	.			CS		.	.	.	.
16	CSK	0662	02/22/14	.	.	515	890	0.652	.			CS		.	.	.	.
17	CSK	0662	02/13/10	2	.	565	1240	0.688	.			CS		.	.	.	.
18	CSK	0662	02/13/10	2	.	585	1680	0.839	.			CS		.	.	.	.
19	CSK	0662	02/13/10	2	.	601	1310	0.603	.			CS		.	.	.	.
20	CSK	0662	02/22/14	.	.	680	2340	0.744	.			CS		.	.	.	.
21	CSK	0662	02/13/10	2	.	735	2100	0.529	.			CS		.	.	.	.

----- SPECIES CODE=LKT -----

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
22	LKT	0662	05/18/96	3	.	669	.	.	.			CS		.	.	.	.
23	LKT	0662	01/29/06	3	.	825	5700	1.015	5			CS	SPK?	.	.	.	.
24	LKT	0662	02/11/06	2	.	864	4500	0.698	5			CS		.	.	.	.
25	LKT	0662	05/18/96	3	8	655	.	.	23			CS		.	.	.	.
26	LKT	0662	02/21/98	2	10	573	2200	1.169	23			CS		.	.	.	.
27	LKT	0662	02/21/98	2	10	676	2375	0.769	23			CS		.	.	.	.
28	LKT	0662	03/04/06	3	17	715	3300	0.903	23			CS		.	.	.	.

-----SPECIES CODE=LLS-----

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
29	LLS	0662	05/30/21	1	.	290	180	0.738	.			CS		.	.	.	.
30	LLS	0662	05/30/21	1	.	295	180	0.701	.			CS		.	.	.	.
31	LLS	0662	02/22/20	.	.	305	210	0.740	.			CS	NO SCALE	.	.	.	.
32	LLS	0662	05/30/21	1	.	321	.	.	.			CS		.	.	.	.
33	LLS	0662	02/22/20	.	.	330	320	0.890	.			CS	NO SCALE	.	.	.	.
34	LLS	0662	02/22/20	.	.	331	330	0.910	.			CS	NO SCALE	.	.	.	.
35	LLS	0662	05/30/21	1	.	333	.	.	.			CS		.	.	.	.
36	LLS	0662	03/01/20	.	.	334	.	.	.			CS	NO SCALES	.	.	.	.
37	LLS	0662	05/30/21	1	.	340	280	0.712	.			CS		.	.	.	.
38	LLS	0662	05/30/21	1	.	352	360	0.825	.			CS		.	.	.	.
39	LLS	0662	02/22/20	.	.	355	360	0.805	.			CS	NO SCALE	.	.	.	.
40	LLS	0662	02/11/06	2	.	357	380	0.835	.			CS	NS	.	.	.	.
41	LLS	0662	02/22/20	.	.	357	320	0.703	.			CS	NO SCALE	.	.	.	.
42	LLS	0662	01/07/17	.	.	358	400	0.872	.			CS		.	.	.	.
43	LLS	0662	03/01/20	.	.	360	370	0.793	.			CS	NO SCALE	.	.	.	.
44	LLS	0662	02/22/20	.	.	365	400	0.823	.			CS		.	.	.	.
45	LLS	0662	05/30/21	1	.	365	.	.	.			CS		.	.	.	.
46	LLS	0662	02/22/14	.	.	369	340	0.677	.			CS	NO SCALE	.	.	.	.
47	LLS	0662	01/29/06	2	.	371	465	0.911	.			CS	NO SCALES	.	.	.	.
48	LLS	0662	01/07/17	.	.	374	470	0.898	.			CS		.	.	.	.
49	LLS	0662	05/30/21	1	.	374	360	0.688	.			CS		.	.	.	.

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
50	LLS	0662	02/22/14	.	.	375	340	0.645	.			CS	NO SCALE	.	.	.	.
51	LLS	0662	02/22/14	.	.	375	420	0.796	.			CS	NO SCALE	.	.	.	.
52	LLS	0662	02/11/06	2	.	379	405	0.744	.			CS	NS	.	.	.	.
53	LLS	0662	01/31/04	2	.	380	430	0.784	.			CS	NO SCALES	.	.	.	.
54	LLS	0662	02/22/20	.	.	382	400	0.718	.			CS	NO SCALE	.	.	.	.
55	LLS	0662	03/07/20	.	.	388	470	0.805	.			CS	BAD SCALES	.	.	.	.
56	LLS	0662	02/22/14	.	.	394	420	0.687	.			CS	NO SCALE	.	.	.	.
57	LLS	0662	03/04/06	3	.	395	390	0.633	.			CS	NS	.	.	.	.
58	LLS	0662	02/22/14	.	.	395	520	0.844	.			CS	NO SCALE	.	.	.	.
59	LLS	0662	05/30/21	1	.	397	520	0.831	.			CS		.	.	.	.
60	LLS	0662	03/22/14	.	.	400	470	0.734	.			CS		.	.	.	.
61	LLS	0662	02/22/20	.	.	400	450	0.703	.			CS	NO SCALE	.	.	.	.
62	LLS	0662	02/06/21	1	.	410	490	0.711	.			CS	no scales	.	.	.	.
63	LLS	0662	02/22/14	.	.	438	620	0.738	.			CS	NO SCALE	.	.	.	.
64	LLS	0662	02/06/21	1	.	440	560	0.657	.			CS	no scales	.	.	.	.
65	LLS	0662	01/17/04	3	.	442	800	0.926	.			CS	NO SCALES	.	.	.	.
66	LLS	0662	02/18/06	2	.	443	630	0.725	.			CS	NS	.	.	.	.
67	LLS	0662	02/22/20	.	.	445	650	0.738	.			CS	NO SCALE	.	.	.	.
68	LLS	0662	05/30/21	1	.	445	900	1.021	.			CS		.	.	.	.
69	LLS	0662	02/18/06	1	.	447	710	0.795	.			CS	NS	.	.	.	.
70	LLS	0662	01/29/06	2	.	472	840	0.799	.			CS	NO SCALES	.	.	.	.
71	LLS	0662	05/30/21	1	.	505	900	0.699	.			CS		.	.	.	.
72	LLS	0662	02/04/06	3	.	524	1020	0.709	.			CS	NS	.	.	.	.
73	LLS	0662	05/30/21	1	3	262	160	0.890	.			CS		2	.	.	.
74	LLS	0662	02/22/20	.	3	277	150	0.706	.			CS		2	.	.	.
75	LLS	0662	03/01/20	.	3	277	170	0.800	.			CS		2	.	.	.
76	LLS	0662	02/22/20	.	3	278	200	0.931	.			CS		2	.	.	.
77	LLS	0662	03/07/20	.	3	280	170	0.774	.			CS		2	.	.	.
78	LLS	0662	02/16/20	.	3	300	.	.	.			CS		2	.	.	.
79	LLS	0662	03/01/20	.	3	306	240	0.838	.			CS		1	.	.	.
80	LLS	0662	05/30/21	1	3	317	230	0.722	.			CS		1	.	.	.
81	LLS	0662	05/30/21	1	3	343	260	0.644	.			CS		2	.	.	.
82	LLS	0662	01/03/04	3	3	360	380	0.814	.			CS		1	.	.	.
83	LLS	0662	01/17/04	1	3	364	420	0.871	.			CS		1	.	.	.
84	LLS	0662	02/07/98	2	3	370	490	0.967	.			CS		2	.	.	.
85	LLS	0662	02/13/21	1	4	311	.	.	.			CS		2	.	.	.
86	LLS	0662	02/22/20	.	4	316	.	.	.			CS		2	.	.	.
87	LLS	0662	02/22/20	.	4	321	.	.	.			CS		2	.	.	.
88	LLS	0662	02/22/20	.	4	321	280	0.847	.			CS		2	.	.	.
89	LLS	0662	02/13/21	1	4	322	220	0.659	.			CS		2	.	.	.
90	LLS	0662	02/13/21	1	4	323	.	.	.			CS		2	.	.	.
91	LLS	0662	02/22/20	.	4	325	300	0.874	.			CS		2	.	.	.
92	LLS	0662	02/22/20	.	4	330	330	0.918	.			CS		2	.	.	.
93	LLS	0662	03/01/20	.	4	330	300	0.835	.			CS		2	.	.	.
94	LLS	0662	05/30/21	1	4	335	280	0.745	.			CS		2	.	.	.
95	LLS	0662	02/22/20	.	4	337	280	0.732	.			CS		1	.	.	.
96	LLS	0662	02/22/20	.	4	338	.	.	.			CS		2	.	.	.
97	LLS	0662	03/13/21	1	4	340	260	0.662	.			CS		2	.	.	.
98	LLS	0662	02/28/04	2	4	342	380	0.950	.			CS		2	.	.	.

99 LLS	0662	02/13/21	1	4	342	.	.	.	CS	2	.	.	.
100 LLS	0662	02/13/21	1	4	342	.	.	.	CS	2	.	.	.
101 LLS	0662	01/18/14	.	4	345	.	.	.	CS	2	.	.	.
102 LLS	0662	02/22/20	.	4	345	.	.	.	CS	2	.	.	.
103 LLS	0662	02/13/21	1	4	347	.	.	.	CS	2	.	.	.
104 LLS	0662	05/30/21	1	4	350	320	0.746	.	CS	2	.	.	.
105 LLS	0662	03/01/20	.	4	351	350	0.809	.	CS	2	.	.	.
106 LLS	0662	02/28/04	3	4	355	360	0.805	.	CS	2	.	.	.
107 LLS	0662	02/25/06	4	4	355	330	0.738	.	CS	2	.	.	.
108 LLS	0662	02/22/20	.	4	355	.	.	.	CS	2	.	.	.
109 LLS	0662	03/22/14	.	4	356	390	0.864	.	CS	2	.	.	.
110 LLS	0662	03/29/14	.	4	356	350	0.776	.	CS	2	.	.	.
111 LLS	0662	02/06/21	1	4	356	330	0.731	.	CS	2	.	.	.
112 LLS	0662	03/01/20	.	4	357	350	0.769	.	CS	2	.	.	.
113 LLS	0662	02/25/06	4	4	358	360	0.785	.	CS	2	.	.	.
114 LLS	0662	02/13/10	4	4	358	360	0.785	.	CS	2	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 247

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
115 LLS	0662	02/28/04	2	4	360	440	0.943	.			CS			2	.	.	.
116 LLS	0662	03/21/04	4	4	360	380	0.814	.			CS			2	.	.	.
117 LLS	0662	02/25/06	4	4	360	400	0.857	.			CS			2	.	.	.
118 LLS	0662	02/22/20	.	4	360	390	0.836	.			CS			1	.	.	.
119 LLS	0662	03/07/20	.	4	360	330	0.707	.			CS			1	.	.	.
120 LLS	0662	02/11/06	2	4	361	355	0.755	.			CS			2	.	.	.
121 LLS	0662	02/13/10	4	4	361	410	0.871	.			CS			2	.	.	.
122 LLS	0662	01/23/10	3	4	362	380	0.801	.			CS			2	.	.	.
123 LLS	0662	02/13/10	4	4	362	380	0.801	.			CS			1	.	.	.
124 LLS	0662	03/13/10	2	4	362	350	0.738	.		MAT	CS			2	.	.	.
125 LLS	0662	02/22/20	.	4	362	.	.	.			CS			2	.	.	.
126 LLS	0662	02/06/21	1	4	362	360	0.759	.			CS			2	.	.	.
127 LLS	0662	02/28/04	2	4	363	400	0.836	.			CS			2	.	.	.
128 LLS	0662	02/20/10	2	4	363	450	0.941	.			CS			2	.	.	.
129 LLS	0662	03/13/21	1	4	364	300	0.622	.			CS			2	.	.	.
130 LLS	0662	02/18/06	3	4	365	400	0.823	.			CS			2	.	.	.
131 LLS	0662	02/25/06	4	4	365	350	0.720	.			CS			2	.	.	.
132 LLS	0662	02/25/06	4	4	365	270	0.555	.			CS			2	.	.	.
133 LLS	0662	02/13/10	4	4	365	390	0.802	.			CS			2	.	.	.
134 LLS	0662	02/22/20	.	4	365	.	.	.			CS			1	.	.	.
135 LLS	0662	02/13/21	1	4	365	350	0.720	.			CS			2	.	.	.
136 LLS	0662	01/29/06	2	4	366	340	0.693	.			CS			2	.	.	.
137 LLS	0662	03/18/06	2	4	366	410	0.836	.			CS			2	.	.	.
138 LLS	0662	03/13/10	2	4	366	400	0.816	.		MAT	CS			2	.	.	.
139 LLS	0662	02/25/06	4	4	367	310	0.627	.			CS			2	.	.	.
140 LLS	0662	01/16/10	2	4	368	370	0.742	.			CS			2	.	.	.
141 LLS	0662	03/13/10	2	4	368	410	0.823	.		MAT	CS			2	.	.	.
142 LLS	0662	03/04/06	2	4	369	430	0.856	.			CS			2	.	.	.
143 LLS	0662	02/01/14	.	4	369	400	0.796	.			CS			1	.	.	.
144 LLS	0662	02/14/04	1	4	370	440	0.869	.			CS			2	.	.	.
145 LLS	0662	02/28/04	2	4	370	520	1.027	.			CS			2	.	.	.
146 LLS	0662	02/06/10	3	4	370	385	0.760	.			CS			1	.	.	.

147 LLS	0662	01/18/14	.	4	370	300	0.592	.	CS	1	.	.	.
148 LLS	0662	02/28/04	3	4	373	400	0.771	.	CS	2	.	.	.
149 LLS	0662	03/13/04	2	4	373	500	0.963	.	CS	2	.	.	.
150 LLS	0662	02/25/06	2	4	374	430	0.822	.	CS	2	.	.	.
151 LLS	0662	01/31/04	2	4	375	580	1.100	.	CS	2	.	.	.
152 LLS	0662	01/21/10	3	4	375	380	0.721	.	CS	1	.	.	.
153 LLS	0662	02/13/10	4	4	375	405	0.768	.	CS	2	.	.	.
154 LLS	0662	02/22/14	.	4	375	.	.	.	CS	1	.	.	.
155 LLS	0662	03/13/04	3	4	376	520	0.978	5	CS	2	.	.	.
156 LLS	0662	02/04/06	2	4	377	420	0.784	.	CS	1	.	.	.
157 LLS	0662	02/13/10	4	4	377	455	0.849	.	CS	1	.	.	.
158 LLS	0662	03/06/10	4	4	378	465	0.861	.	CS	1	.	.	.
159 LLS	0662	02/04/06	3	4	380	535	0.975	.	CS	2	.	.	.
160 LLS	0662	02/11/06	2	4	380	470	0.857	.	CS	2	.	.	.
161 LLS	0662	02/25/06	4	4	380	395	0.720	.	CS	2	.	.	.
162 LLS	0662	02/25/06	4	4	380	440	0.802	.	CS	1	.	.	.
163 LLS	0662	02/25/06	4	4	382	420	0.753	.	CS	1	.	.	.
164 LLS	0662	02/25/06	4	4	383	400	0.712	.	CS	1	.	.	.
165 LLS	0662	02/13/21	1	4	383	.	.	.	CS	1	.	.	.
166 LLS	0662	02/11/06	2	4	384	540	0.954	.	CS	2	.	.	.
167 LLS	0662	03/13/04	2	4	385	535	0.938	.	CS	2	.	.	.
168 LLS	0662	02/04/06	2	4	385	450	0.789	.	CS	1	.	.	.
169 LLS	0662	02/25/06	4	4	385	395	0.692	.	CS	1	.	.	.
170 LLS	0662	02/25/06	4	4	385	485	0.850	.	CS	2	.	.	.
171 LLS	0662	02/04/06	2	4	386	480	0.835	.	CS	2	.	.	.
172 LLS	0662	02/04/06	2	4	386	530	0.922	.	CS	1	.	.	.
173 LLS	0662	02/04/06	2	4	386	465	0.809	.	CS	1	.	.	.
174 LLS	0662	02/04/06	2	4	386	450	0.782	.	CS	1	.	.	.
175 LLS	0662	02/13/10	1	4	386	.	.	.	MAT CS	1	.	.	.
176 LLS	0662	02/25/06	4	4	388	420	0.719	.	CS	1	3	.	.
177 LLS	0662	01/31/04	2	4	390	710	1.197	.	CS	2	.	.	.
178 LLS	0662	02/14/04	2	4	391	560	0.937	.	CS	2	.	.	.
179 LLS	0662	02/04/06	2	4	392	.	.	.	CS	2	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 248

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
180 LLS	0662	03/13/10	3	4	392	600	0.996	.		MAT	CS			2	.	.	.
181 LLS	0662	03/13/10	4	4	393	450	0.741	.		MAT	CS			2	.	.	.
182 LLS	0662	02/06/10	2	4	394	520	0.850	.			CS			1	.	.	.
183 LLS	0662	02/14/04	2	4	395	550	0.892	.			CS			2	.	.	.
184 LLS	0662	02/28/04	3	4	395	600	0.974	.			CS			2	.	.	.
185 LLS	0662	02/25/06	4	4	395	500	0.811	.			CS			1	.	.	.
186 LLS	0662	02/13/10	2	4	395	485	0.787	.			CS			1	.	.	.
187 LLS	0662	03/04/06	2	4	396	525	0.845	.			CS			2	.	.	.
188 LLS	0662	02/25/06	4	4	399	420	0.661	.			CS			2	.	.	.
189 LLS	0662	02/28/04	3	4	400	560	0.875	.			CS			2	.	.	.
190 LLS	0662	03/21/04	2	4	400	540	0.844	.			CS			1	.	.	.
191 LLS	0662	03/06/10	4	4	400	580	0.906	.			CS			1	.	.	.
192 LLS	0662	03/21/04	2	4	401	610	0.946	.			CS			2	.	.	.
193 LLS	0662	06/24/17	2	4	410	.	.	.			CS			2	.	.	.
194 LLS	0662	02/04/06	2	4	417	550	0.758	.			CS			2	.	.	.

195 LLS	0662	02/25/06	4	4	418	520	0.712	.	CS	2	.	.	.
196 LLS	0662	01/31/04	2	4	420	800	1.080	.	CS	1	.	.	.
197 LLS	0662	06/17/17	2	4	420	570	0.769	.	CS	2	.	.	.
198 LLS	0662	06/15/96	2	4	429	.	.	.	CS	2	.	.	.
199 LLS	0662	01/31/04	2	4	430	720	0.906	.	CS	2	.	.	.
200 LLS	0662	02/25/06	4	4	434	810	0.991	.	CS	2	.	.	.
201 LLS	0662	02/25/06	2	4	438	640	0.762	.	CS	1	.	.	.
202 LLS	0662	06/22/96	2	4	442	.	.	.	CS	2	.	.	.
203 LLS	0662	06/15/96	2	4	444	890	1.017	.	CS	2	.	.	.
204 LLS	0662	06/15/96	2	4	454	790	0.844	.	CS	1	.	.	.
205 LLS	0662	06/15/96	2	4	465	.	.	.	CS	2	.	.	.
206 LLS	0662	06/22/96	2	4	472	920	0.875	.	CS	1	.	.	.
207 LLS	0662	05/19/96	3	4	479	.	.	.	CS	1	.	.	.
208 LLS	0662	05/27/96	2	4	487	.	.	.	CS	2	.	.	.
209 LLS	0662	05/30/21	1	5	326	.	.	.	CS	3	.	.	.
210 LLS	0662	03/13/21	1	5	340	300	0.763	.	CS	3	.	.	.
211 LLS	0662	03/01/20	.	5	351	350	0.809	.	CS	2	.	.	.
212 LLS	0662	02/16/20	.	5	354	330	0.744	.	CS	2	.	.	.
213 LLS	0662	03/13/21	1	5	354	300	0.676	.	CS	2	.	.	.
214 LLS	0662	02/20/10	3	5	356	310	0.687	.	CS	1	.	.	.
215 LLS	0662	02/13/21	1	5	360	370	0.793	.	CS	3	.	.	.
216 LLS	0662	02/13/10	4	5	362	330	0.696	.	CS	2	.	.	.
217 LLS	0662	01/18/14	.	5	362	.	.	.	CS	2	.	.	.
218 LLS	0662	03/29/14	.	5	362	340	0.717	.	CS	2	.	.	.
219 LLS	0662	02/22/20	.	5	362	340	0.717	.	CS	2	.	.	.
220 LLS	0662	01/18/14	.	5	363	.	.	.	CS	2	.	.	.
221 LLS	0662	01/18/14	.	5	364	.	.	.	CS	1	.	.	.
222 LLS	0662	02/25/06	4	5	365	300	0.617	.	CS	2	.	.	.
223 LLS	0662	02/16/20	.	5	365	400	0.823	.	CS	2	.	.	.
224 LLS	0662	03/06/10	3	5	366	370	0.755	.	CS	1	.	.	.
225 LLS	0662	03/15/14	.	5	368	.	.	.	CS	2	.	.	.
226 LLS	0662	02/22/20	.	5	368	440	0.883	.	CS	2	.	.	.
227 LLS	0662	02/14/04	2	5	370	500	0.987	.	CS	1	.	.	.
228 LLS	0662	03/15/14	.	5	370	.	.	.	CS	2	.	.	.
229 LLS	0662	02/13/21	1	5	370	.	.	.	CS	2	.	.	.
230 LLS	0662	02/06/21	1	5	370	.	.	.	CS	2	.	.	.
231 LLS	0662	01/18/14	.	5	371	340	0.666	.	CS	2	.	.	.
232 LLS	0662	02/01/14	.	5	371	350	0.685	.	CS	2	.	.	.
233 LLS	0662	02/22/20	.	5	371	.	.	.	CS	2	.	.	.
234 LLS	0662	02/13/10	4	5	372	405	0.787	.	CS	2	.	.	.
235 LLS	0662	02/16/20	.	5	372	450	0.874	.	CS	2	.	.	.
236 LLS	0662	03/01/20	.	5	372	350	0.680	.	CS	2	.	.	.
237 LLS	0662	03/01/20	.	5	372	490	0.952	.	CS	3	.	.	.
238 LLS	0662	03/15/14	.	5	373	.	.	.	CS	2	.	.	.
239 LLS	0662	02/22/20	.	5	373	420	0.809	.	CS	2	.	.	.
240 LLS	0662	02/04/06	2	5	375	360	0.683	.	CS	2	4	.	.
241 LLS	0662	01/23/10	2	5	375	345	0.654	.	CS	1	.	.	.
242 LLS	0662	02/13/21	1	5	375	360	0.683	.	CS	2	.	.	.
243 LLS	0662	02/20/10	2	5	376	430	0.809	.	CS	2	.	.	.
244 LLS	0662	02/13/21	1	5	376	.	.	.	CS	3	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 249

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
245	LLS	0662	02/13/10	4	5	377	345	0.644	.			CS		2	.	.	.
246	LLS	0662	02/13/10	4	5	378	490	0.907	.			CS		2	.	.	.
247	LLS	0662	02/13/10	2	5	378	480	0.889	.			CS		2	.	.	.
248	LLS	0662	03/15/14	.	5	378	.	.	.			CS		2	.	.	.
249	LLS	0662	02/13/10	4	5	380	435	0.793	.			CS		2	.	.	.
250	LLS	0662	02/20/10	2	5	381	380	0.687	.			CS		2	.	.	.
251	LLS	0662	01/18/14	.	5	381	.	.	.			CS		2	.	.	.
252	LLS	0662	02/08/14	.	5	381	400	0.723	.			CS		2	.	.	.
253	LLS	0662	03/22/14	.	5	381	370	0.669	.			CS		2	.	.	.
254	LLS	0662	02/22/20	.	5	382	380	0.682	.			CS		2	.	.	.
255	LLS	0662	03/13/10	2	5	383	365	0.650	.		MAT	CS		2	.	.	.
256	LLS	0662	02/01/14	.	5	384	490	0.865	.			CS		1	.	.	.
257	LLS	0662	02/28/04	2	5	385	600	1.051	.			CS		2	.	.	.
258	LLS	0662	03/15/14	.	5	385	365	0.640	.	F	MAT	CS	SPENT	2	.	.	.
259	LLS	0662	01/16/10	2	5	386	380	0.661	.			CS		2	.	.	.
260	LLS	0662	02/20/10	2	5	386	410	0.713	.			CS		1	.	.	.
261	LLS	0662	01/16/10	2	5	387	420	0.725	.			CS		2	.	.	.
262	LLS	0662	02/01/14	.	5	388	490	0.839	.			CS		2	.	.	.
263	LLS	0662	03/15/14	.	5	388	.	.	.			CS		2	.	.	.
264	LLS	0662	02/13/21	1	5	388	390	0.668	.			CS		2	.	.	.
265	LLS	0662	02/11/06	2	5	389	.	.	.			CS		2	4	.	.
266	LLS	0662	02/01/14	.	5	390	380	0.641	.			CS		2	.	.	.
267	LLS	0662	02/13/21	1	5	390	.	.	.			CS		2	.	.	.
268	LLS	0662	02/01/14	.	5	391	395	0.661	.			CS		2	.	.	.
269	LLS	0662	03/15/14	.	5	391	510	0.853	.			CS		2	.	.	.
270	LLS	0662	03/15/14	.	5	391	400	0.669	.			CS		2	.	.	.
271	LLS	0662	02/22/20	.	5	392	450	0.747	.			CS		2	.	.	.
272	LLS	0662	02/01/14	.	5	393	360	0.593	.			CS		2	.	.	.
273	LLS	0662	02/28/04	3	5	395	415	0.673	.			CS		2	.	.	.
274	LLS	0662	01/21/06	2	5	395	395	0.641	.			CS		1	4	.	.
275	LLS	0662	02/04/06	2	5	395	440	0.714	.			CS		2	4	.	.
276	LLS	0662	02/13/10	4	5	395	.	.	.			CS		2	.	.	.
277	LLS	0662	03/29/14	.	5	398	550	0.872	.			CS		2	.	.	.
278	LLS	0662	02/20/10	2	5	400	560	0.875	.			CS		2	.	.	.
279	LLS	0662	02/08/14	.	5	400	510	0.797	.			CS		2	.	.	.
280	LLS	0662	02/25/06	2	5	401	570	0.884	.			CS		2	4	.	.
281	LLS	0662	02/01/14	.	5	401	510	0.791	.			CS		2	.	.	.
282	LLS	0662	02/22/14	.	5	401	550	0.853	.			CS		2	.	.	.
283	LLS	0662	03/13/10	2	5	403	535	0.817	.		MAT	CS		2	.	.	.
284	LLS	0662	02/13/21	1	5	403	.	.	.			CS		1	.	.	.
285	LLS	0662	03/06/10	4	5	405	590	0.888	.			CS		2	.	.	.
286	LLS	0662	02/21/98	2	5	406	490	0.732	.			CS		2	.	.	.
287	LLS	0662	01/31/04	2	5	406	570	0.852	.			CS		2	.	.	.
288	LLS	0662	02/08/14	.	5	406	490	0.732	.			CS		2	.	.	.
289	LLS	0662	02/11/06	2	5	407	440	0.653	.			CS		2	4	.	.
290	LLS	0662	02/25/06	4	5	407	430	0.638	.			CS		2	.	.	.
291	LLS	0662	02/25/06	2	5	407	610	0.905	.			CS		2	.	.	.
292	LLS	0662	01/21/10	3	5	407	535	0.794	.			CS		1	.	.	.
293	LLS	0662	01/22/10	3	5	408	550	0.810	.			CS		1	.	.	.
294	LLS	0662	02/14/04	1	5	410	560	0.813	.			CS		2	.	.	.
295	LLS	0662	02/08/14	.	5	410	500	0.725	.			CS		2	.	.	.
296	LLS	0662	01/17/04	3	5	411	600	0.864	.			CS		2	.	.	.
297	LLS	0662	02/11/06	2	5	412	520	0.744	.			CS		2	.	.	.
298	LLS	0662	01/23/10	3	5	412	545	0.779	.			CS		1	.	.	.
299	LLS	0662	01/31/04	2	5	413	660	0.937	.			CS		2	.	.	.
300	LLS	0662	03/21/04	2	5	413	600	0.852	.			CS		2	.	.	.

301 LLS	0662	01/16/10	2	5	413	460	0.653	.	CS	1	.	.	.
302 LLS	0662	02/07/98	3	5	415	600	0.839	2	CS	2	.	.	.
303 LLS	0662	01/31/04	2	5	415	690	0.965	.	CS	1	.	.	.
304 LLS	0662	03/21/04	4	5	415	620	0.867	.	CS	2	.	.	.
305 LLS	0662	02/25/06	4	5	415	600	0.839	.	CS	2	3	.	.
306 LLS	0662	01/16/10	2	5	416	620	0.861	.	CS	2	.	.	.
307 LLS	0662	03/13/10	2	5	416	700	0.972	.	MAT CS	2	.	.	.
308 LLS	0662	05/28/17	.	5	416	.	.	.	CS	2	.	.	.
309 LLS	0662	02/21/98	2	5	419	500	0.680	.	CS	2	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 250

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
310 LLS	0662	03/13/10	3	5	419	560	0.761	.	MAT	CS	2	.	.	.	.	.	.
311 LLS	0662	02/04/06	3	5	420	745	1.006	.		CS	2	.	.	.	.	.	.
312 LLS	0662	02/11/06	2	5	420	560	0.756	.		CS	2	.	.	.	.	.	.
313 LLS	0662	02/25/06	2	5	420	600	0.810	.		CS	2	.	.	.	.	.	.
314 LLS	0662	02/06/10	2	5	420	570	0.769	.		CS	2	.	.	.	.	.	.
315 LLS	0662	02/13/10	4	5	420	.	.	.		CS	2	.	.	.	.	.	.
316 LLS	0662	02/28/04	3	5	422	700	0.931	.		CS	2	.	.	.	.	.	.
317 LLS	0662	02/21/98	2	5	425	510	0.664	.		CS	2	.	.	.	.	.	.
318 LLS	0662	02/28/04	2	5	425	600	0.782	.		CS	2	.	.	.	.	.	.
319 LLS	0662	02/06/10	2	5	425	575	0.749	.		CS	2	.	.	.	.	.	.
320 LLS	0662	02/20/10	3	5	426	600	0.776	.		CS	1	.	.	.	.	.	.
321 LLS	0662	03/21/04	2	5	429	640	0.811	.		CS	2	.	.	.	.	.	.
322 LLS	0662	01/29/06	2	5	430	625	0.786	.		CS	1	.	.	.	.	.	.
323 LLS	0662	02/25/06	4	5	430	660	0.830	.		CS	2	3	.	.	.	.	.
324 LLS	0662	02/25/06	2	5	430	575	0.723	.		CS	2	.	.	.	.	.	.
325 LLS	0662	03/04/06	2	5	431	610	0.762	.		CS	1	.	.	.	.	.	.
326 LLS	0662	01/29/06	3	5	432	.	.	.		CS	CLEANED	1	.	.	.	.	.
327 LLS	0662	02/04/06	2	5	434	625	0.765	.		CS	2	.	.	.	.	.	.
328 LLS	0662	01/23/10	3	5	434	540	0.661	.		CS	2	.	.	.	.	.	.
329 LLS	0662	05/18/96	3	5	435	780	0.948	.		CS	2	.	.	.	.	.	.
330 LLS	0662	02/07/98	2	5	435	540	0.656	.		CS	2	.	.	.	.	.	.
331 LLS	0662	01/31/04	3	5	435	650	0.790	.		CS	2	.	.	.	.	.	.
332 LLS	0662	01/29/06	3	5	435	510	0.620	.		CS	2	4	.	.	.	.	.
333 LLS	0662	02/25/06	4	5	435	550	0.668	.		CS	2	.	.	.	.	.	.
334 LLS	0662	02/18/06	2	5	436	650	0.784	.		CS	1	.	.	.	.	.	.
335 LLS	0662	02/21/98	2	5	437	.	.	.		CS	2	.	.	.	.	.	.
336 LLS	0662	02/25/06	2	5	437	540	0.647	.		CS	1	4	.	.	.	.	.
337 LLS	0662	05/28/17	.	5	439	830	0.981	.		CS	2	.	.	.	.	.	.
338 LLS	0662	01/31/04	2	5	440	680	0.798	.		CS	1	.	.	.	.	.	.
339 LLS	0662	02/25/06	4	5	440	650	0.763	.		CS	2	.	.	.	.	.	.
340 LLS	0662	02/04/06	2	5	443	720	0.828	.		CS	2	.	.	.	.	.	.
341 LLS	0662	01/17/04	3	5	445	625	0.709	.		CS	2	.	.	.	.	.	.
342 LLS	0662	01/31/04	2	5	445	890	1.010	.		CS	2	.	.	.	.	.	.
343 LLS	0662	01/21/06	2	5	445	665	0.755	.		CS	2	4	.	.	.	.	.
344 LLS	0662	02/25/06	2	5	445	730	0.828	.		CS	1	4	.	.	.	.	.
345 LLS	0662	03/04/06	2	5	445	690	0.783	.		CS	2	.	.	.	.	.	.
346 LLS	0662	02/28/04	4	5	446	780	0.879	.		CS	2	.	.	.	.	.	.
347 LLS	0662	02/04/06	2	5	447	680	0.761	.		CS	1	4	.	.	.	.	.
348 LLS	0662	02/04/06	2	5	449	860	0.950	.		CS	2	.	.	.	.	.	.

349	LLS	0662	01/31/04	2	5	450	780	0.856	.		CS	2	.	.	.
350	LLS	0662	01/31/04	2	5	451	760	0.828	.		CS	2	.	.	.
351	LLS	0662	02/04/06	2	5	451	640	0.698	.		CS	2	4	.	.
352	LLS	0662	02/07/98	3	5	455	750	0.796	.		CS	2	.	.	.
353	LLS	0662	01/17/04	3	5	456	770	0.812	.		CS	2	.	.	.
354	LLS	0662	05/19/96	3	5	457	.	.	.		CS	3	.	.	.
355	LLS	0662	01/21/06	2	5	459	850	0.879	.	F	MAT	CS	1	.	.
356	LLS	0662	02/07/98	3	5	460	850	0.873	.		CS	2	.	.	.
357	LLS	0662	06/14/96	2	5	461	.	.	.		CS	2	.	.	.
358	LLS	0662	02/04/06	2	5	462	640	0.649	.		CS	1	.	.	.
359	LLS	0662	02/11/06	2	5	462	835	0.847	.		CS	1	.	.	.
360	LLS	0662	06/15/96	2	5	463	800	0.806	.		CS	2	.	.	.
361	LLS	0662	02/04/06	2	5	463	695	0.700	.		CS	1	.	.	.
362	LLS	0662	02/21/98	2	5	467	760	0.746	.		CS	2	.	.	.
363	LLS	0662	02/25/06	2	5	467	800	0.785	.		CS	2	4	.	.
364	LLS	0662	02/28/04	2	5	468	1120	1.093	.		CS	2	.	.	.
365	LLS	0662	02/21/98	2	5	469	1120	1.086	.		CS	2	.	.	.
366	LLS	0662	02/07/98	2	5	470	820	0.790	.		CS	2	.	.	.
367	LLS	0662	02/21/98	2	5	470	900	0.867	.		CS	2	.	.	.
368	LLS	0662	06/09/96	2	5	472	1130	1.075	.		CS	3	.	.	.
369	LLS	0662	01/23/10	3	5	475	855	0.798	.		CS	2	.	.	.
370	LLS	0662	06/15/96	2	5	484	.	.	.		CS	2	.	.	.
371	LLS	0662	05/13/17	.	5	486	.	.	.		CS	2	.	.	.
372	LLS	0662	02/04/06	2	5	489	825	0.706	.		CS	2	.	.	.
373	LLS	0662	06/24/17	2	5	489	.	.	.		CS	2	.	.	.
374	LLS	0662	06/15/96	2	5	491	1040	0.879	.		CS	2	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 251

-----SPECIES CODE=LLS-----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
375	LLS	0662	02/25/06	2	5	496	1000	0.820	.			CS		1	3	.	.
376	LLS	0662	02/25/06	2	5	505	870	0.676	.			CS		1	.	.	.
377	LLS	0662	06/09/96	2	5	507	1160	0.890	.			CS		2	.	.	.
378	LLS	0662	02/11/06	2	5	515	980	0.717	.			CS		2	4	.	.
379	LLS	0662	02/04/06	2	5	531	1110	0.741	.			CS		2	.	.	.
380	LLS	0662	02/13/21	1	6	365	.	.	.			CS		2	.	.	.
381	LLS	0662	03/22/14	.	6	388	.	.	.			CS		2	.	.	.
382	LLS	0662	01/18/14	.	6	392	320	0.531	.			CS		3	.	.	.
383	LLS	0662	02/13/10	1	6	395	.	.	.			CS		2	.	.	.
384	LLS	0662	02/08/14	.	6	396	400	0.644	.			CS		1	.	.	.
385	LLS	0662	03/22/14	.	6	396	490	0.789	.			CS		2	.	.	.
386	LLS	0662	03/15/14	.	6	403	490	0.749	.			CS		2	.	.	.
387	LLS	0662	02/01/14	.	6	405	600	0.903	.			CS		2	.	.	.
388	LLS	0662	03/15/14	.	6	408	485	0.714	.			CS		2	.	.	.
389	LLS	0662	02/06/21	1	6	408	.	.	.			CS		2	.	.	.
390	LLS	0662	01/18/14	.	6	409	440	0.643	.			CS		2	.	.	.
391	LLS	0662	03/15/14	.	6	409	545	0.797	.			CS		2	.	.	.
392	LLS	0662	03/15/14	.	6	411	620	0.893	.			CS		2	.	.	.
393	LLS	0662	02/01/14	.	6	414	590	0.831	.			CS		2	.	.	.
394	LLS	0662	03/22/14	.	6	415	470	0.658	.			CS		2	.	.	.
395	LLS	0662	01/31/04	2	6	417	660	0.910	.			CS		2	.	.	.
396	LLS	0662	02/04/06	2	6	425	540	0.703	.			CS		2	5	.	.

397 LLS	0662	02/14/04	2	6	427	710	0.912	.	CS	2	.	.	.
398 LLS	0662	02/01/14	.	6	427	720	0.925	.	CS	1	.	.	.
399 LLS	0662	03/29/14	.	6	427	665	0.854	.	CS	2	.	.	.
400 LLS	0662	02/13/21	1	6	431	420	0.525	.	CS	2	.	.	.
401 LLS	0662	02/04/06	2	6	432	610	0.757	.	CS	2	5	.	.
402 LLS	0662	02/25/06	4	6	435	700	0.850	.	CS	2	4	.	.
403 LLS	0662	02/14/04	2	6	437	750	0.899	.	CS	2	.	.	.
404 LLS	0662	02/13/10	4	6	438	.	.	.	CS	2	.	.	.
405 LLS	0662	02/28/21	1	6	439	680	0.804	.	CS	2	.	.	.
406 LLS	0662	02/06/10	2	6	440	700	0.822	.	CS	2	.	.	.
407 LLS	0662	01/31/04	2	6	442	840	0.973	.	CS	2	.	.	.
408 LLS	0662	03/13/04	2	6	442	695	0.805	.	CS	2	.	.	.
409 LLS	0662	05/30/21	1	6	444	820	0.937	.	CS	1	.	.	.
410 LLS	0662	02/16/20	.	6	445	770	0.874	.	CS	2	.	.	.
411 LLS	0662	02/14/04	2	6	447	880	0.985	.	CS	2	.	.	.
412 LLS	0662	03/21/04	4	6	448	600	0.667	.	CS	2	.	.	.
413 LLS	0662	01/03/04	3	6	450	630	0.691	.	CS	2	.	.	.
414 LLS	0662	02/22/14	.	6	450	615	0.675	.	CS	2	.	.	.
415 LLS	0662	05/30/21	1	6	450	730	0.801	.	CS	2	.	.	.
416 LLS	0662	03/06/10	2	6	451	720	0.785	.	CS	2	.	.	.
417 LLS	0662	01/21/06	2	6	453	660	0.710	.	CS	2	5	.	.
418 LLS	0662	02/14/04	2	6	457	700	0.733	.	CS	2	.	.	.
419 LLS	0662	02/01/14	.	6	461	915	0.934	.	CS	1	.	.	.
420 LLS	0662	02/20/10	2	6	468	850	0.829	.	CS	2	.	.	.
421 LLS	0662	02/13/10	1	6	470	.	.	.	CS	2	.	.	.
422 LLS	0662	02/13/10	4	6	470	.	.	.	CS	2	.	.	.
423 LLS	0662	01/18/14	.	6	472	.	.	.	CS	2	.	.	.
424 LLS	0662	02/28/04	2	6	475	1020	0.952	.	CS	2	.	.	.
425 LLS	0662	02/28/04	2	6	476	860	0.797	.	CS	2	.	.	.
426 LLS	0662	03/04/06	2	6	485	960	0.841	.	CS	2	5	.	.
427 LLS	0662	02/06/10	3	6	488	840	0.723	.	CS	2	.	.	.
428 LLS	0662	02/20/10	3	6	490	1030	0.875	.	CS	2	.	.	.
429 LLS	0662	05/13/17	.	6	490	.	.	.	CS	2	.	.	.
430 LLS	0662	02/21/98	2	6	491	.	.	.	CS	2	.	.	.
431 LLS	0662	05/30/21	1	6	492	940	0.789	.	CS	2	.	.	.
432 LLS	0662	01/29/06	3	6	493	650	0.542	.	CS	2	.	.	.
433 LLS	0662	01/21/06	2	6	494	940	0.780	.	CS	2	5	.	.
434 LLS	0662	02/18/06	2	6	505	1060	0.823	.	CS	2	.	.	.
435 LLS	0662	03/13/04	3	6	512	930	0.693	.	CS	2	.	.	.
436 LLS	0662	02/14/04	2	6	513	1320	0.978	.	CS	2	.	.	.
437 LLS	0662	02/22/14	.	7	425	590	0.769	.	CS	2	.	.	.
438 LLS	0662	02/08/14	.	7	450	650	0.713	.	CS	2	.	.	.
439 LLS	0662	01/31/04	2	7	477	1060	0.977	.	CS	1	.	.	.

CHESUNCOOK CLERK CENSUS SINCE 1996
AGE/GROWTH SHEET

08:53 Friday, April 22, 2022 252

----- SPECIES CODE=LLS -----

(continued)

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
440 LLS	0662	02/20/10	3	7	483	765	0.679	.		CS	2	.	.	.	.	.	.
441 LLS	0662	03/22/14	.	7	483	.	.	.		CS	2	.	.	.	.	.	.
442 LLS	0662	02/22/20	.	7	485	880	0.771	.		CS	1	.	.	.	.	.	.
443 LLS	0662	01/31/04	2	7	495	1300	1.072	.		CS	2	.	.	.	.	.	.
444 LLS	0662	03/01/20	.	7	498	1060	0.858	.		CS	2	.	.	.	.	.	.

445 LLS	0662	02/22/14	.	7	500	940	0.752	.			CS	2	.	.	.	
446 LLS	0662	03/13/21	1	7	500	850	0.680	.			CS	2	.	.	.	
447 LLS	0662	05/30/21	1	7	510	900	0.678	.			CS	2	.	.	.	
448 LLS	0662	02/13/10	4	7	512	.	.	.			CS	2	.	.	.	
449 LLS	0662	02/20/10	4	7	520	1150	0.818	.			CS	2	.	.	.	
450 LLS	0662	01/31/04	2	7	541	1200	0.758	.			CS	3	.	.	.	
451 LLS	0662	05/19/96	3	7	557	1320	0.764	.			CS	2	.	.	.	
452 LLS	0662	02/06/21	1	7	560	1130	0.643	.			CS	2	.	.	.	
453 LLS	0662	01/18/14	.	8	475	.	.	.			CS	2	.	.	.	
454 LLS	0662	01/18/14	.	8	502	850	0.672	.	F	AD	CS	SPENT	2	.	.	.
455 LLS	0662	02/22/14	.	8	523	1000	0.699	.			CS	2	.	.	.	
456 LLS	0662	01/18/14	.	8	537	880	0.568	.	F	AD	CS	SPENT	2	.	.	.

-----SPECIES CODE=SPK-----

Obs	SPP	WATCODE	DATE	SUBAREA	AGE	LENGTH	WEIGHT	K	MARKON_P	SEX	MATURITY	GEAR	COMMENTS	STRLF	SPAWN1	SPAWN2	SPAWN3
457 SPK	0662	01/17/04	3	.	315	310	0.992	5				CS		.	.	.	.
458 SPK	0662	01/31/04	2	.	330	350	0.974	23				CS		.	.	.	.
459 SPK	0662	02/04/06	2	.	376	.	.	23				CS		.	.	.	.
460 SPK	0662	01/18/14	.	.	380	.	.	.				CS	NO SCALES	.	.	.	.
461 SPK	0662	02/18/06	2	.	399	595	0.937	4				CS		.	.	.	.
462 SPK	0662	03/22/14	.	.	431	.	.	.				CS	NO SCALES	.	.	.	.
463 SPK	0662	02/04/06	2	.	444	820	0.937	4				CS		.	.	.	.
464 SPK	0662	01/17/04	3	.	523	1420	0.993	5				CS		.	.	.	.
465 SPK	0662	02/11/06	2	.	534	.	.	2				CS		.	.	.	.
466 SPK	0662	02/22/14	.	3	379	580	1.065	.				CS		.	.	.	.
467 SPK	0662	02/22/14	.	3	383	425	0.756	.				CS		.	.	.	.
468 SPK	0662	03/29/14	.	3	402	.	.	.				CS		.	.	.	.
469 SPK	0662	02/28/04	3	3	410	.	.	5				CS	CLEANED	.	.	.	.
470 SPK	0662	02/22/14	.	3	420	700	0.945	.				CS		.	.	.	.
471 SPK	0662	01/18/14	.	3	431	.	.	.				CS		.	.	.	.
472 SPK	0662	02/22/14	.	4	430	555	0.698	.				CS		.	.	.	.
473 SPK	0662	02/28/04	3	4	464	.	.	2				CS	CLEANED	.	.	.	.
474 SPK	0662	02/28/04	3	5	415	760	1.063	4				CS		.	.	.	.
475 SPK	0662	02/13/10	4	6	419	.	.	4				CS		.	.	.	.

----- SPECIES=BKT -----

```
„ffffffffffffffffffff...ffffffffffffffffffff...ffffffffffffffffffff+
,                                     ,      NUMBER      ,      VOLUME      ,
,                                     +ffffffffffff...ffffffffffff...ffffffffffff%
,                                     ,      TOTAL      ,      % TOTAL      ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,ITEM                                     ,      ,      ,      ,      ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,EMP                                     ,      ,      ,      ,      ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,SLT                                     ,      3.00,      100.00,      3.50,      77.78,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,REM                                     ,      ,      ,      ,      1.00,      22.22,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,All                                     ,      3.00,      100.00,      4.50,      100.00,
$ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffffCE
```

----- SPECIES=LKT -----

```
„ffffffffffffffffffff...ffffffffffffffffffff...ffffffffffffffffffff+
,                                     ,      NUMBER      ,      VOLUME      ,
,                                     +ffffffffffff...ffffffffffff...ffffffffffff%
,                                     ,      TOTAL      ,      % TOTAL      ,      TOTAL      ,      % TOTAL      ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,ITEM                                     ,      ,      ,      ,      ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,SLT                                     ,      84.00,      98.82,      185.50,      75.25,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,REM                                     ,      ,      ,      ,      13.00,      5.27,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,WHP                                     ,      1.00,      1.18,      48.00,      19.47,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,All                                     ,      85.00,      100.00,      246.50,      100.00,
$ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffffCE
```

----- SPECIES=LLS -----

```

,,ffffffffffffffffffff...ffffffffffffffffffff...ffffffffffffffffffff+
,                                     ,          NUMBER          ,          VOLUME          ,
,                                     +ffffffffffff...ffffffffffff...ffffffffffff%
,                                     , TOTAL , % TOTAL , TOTAL , % TOTAL ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,ITEM , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,SLT , 507.00, 98.64, 1697.50, 84.10,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,REM , 1.00, 0.19, 281.50, 13.95,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,EMP , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,HKS , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,INS , , , 28.00, 1.39,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,WHF , 4.00, 0.78, 6.00, 0.30,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,FRG , , , 0.50, 0.02,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,MIN , 1.00, 0.19, 1.00, 0.05,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,RKS , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
, , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,VEG , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,WHF , 1.00, 0.19, 4.00, 0.20,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,All , 514.00, 100.00, 2018.50, 100.00,
$ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffffCE

```

CHESUNCOOK LAKE FOOD HABITS WINTER CLERK SURVEYS 1996-2021

08:53 Friday, April 22, 2022 256

----- SPECIES=SPK -----

```

,,ffffffffffffffffffff...ffffffffffffffffffff...ffffffffffffffffffff+
,                                     ,          NUMBER          ,          VOLUME          ,
,                                     +ffffffffffff...ffffffffffff...ffffffffffff%
,                                     , TOTAL , % TOTAL , TOTAL , % TOTAL ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,ITEM , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,REM , , , 7.00, 11.11,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,SLT , 8.00, 88.89, 53.00, 84.13,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,EMP , , , , ,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,WHF , 1.00, 11.11, 3.00, 4.76,
+ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffff%
,All , 9.00, 100.00, 63.00, 100.00,
$ffffffffffffffffffff...ffffffffffff...ffffffffffff...ffffffffffffCE

```


-----SPECIES=BKT-----

Obs	ITEM	Frequency Count	% OCC.	STOMACHS W/FOOD	STOMACHS EXAMINED
1	SLT	2	100	2	4
2	REM	1	50	2	4
3	EMP	2	100	2	4

-----SPECIES=LKT-----

Obs	ITEM	Frequency Count	% OCC.	STOMACHS W/FOOD	STOMACHS EXAMINED
4	SLT	15	93.75	16	16
5	REM	2	12.50	16	16
6	WHP	1	6.25	16	16

-----SPECIES=LLS-----

Obs	ITEM	Frequency Count	% OCC.	STOMACHS W/FOOD	STOMACHS EXAMINED
7	SLT	205	68.1063	301	376
8	REM	143	47.5083	301	376
9	EMP	75	24.9169	301	376
10	HKS	22	7.3090	301	376
11	WHP	3	0.9967	301	376
12	INS	3	0.9967	301	376
13	WHS	1	0.3322	301	376
14	FRG	1	0.3322	301	376
15	MIN	1	0.3322	301	376
16	RKS	1	0.3322	301	376
17	VEG	1	0.3322	301	376

-----SPECIES=SPK-----

Obs	ITEM	Frequency Count	% OCC.	STOMACHS W/FOOD	STOMACHS EXAMINED
19	SLT	3	50.0000	6	7
20	REM	4	66.6667	6	7
21	EMP	1	16.6667	6	7
22	WHS	1	16.6667	6	7

Obs	TOTAL NUMBER STOMACHS EXAMINED	TOTAL NUMBER STOMACHS WITH FOOD	MEAN VOLUME/ SMELT	MEAN NUMBER SMELTS/STOMACH WITH SMELTS	MEAN NUMBER SMELTS/STOMACHS WITH FOOD
1	4	2	1.16667	1.5	1.5
CHESUNCOOK LAKE FOOD HABITS WINTER CLERK SURVEYS 1996-2021 LAKE TROUT - SMELT ANALYSIS					08:53 Friday, April 22, 2022 259
Obs	TOTAL NUMBER STOMACHS EXAMINED	TOTAL NUMBER STOMACHS WITH FOOD	MEAN VOLUME/ SMELT	MEAN NUMBER SMELTS/STOMACH WITH SMELTS	MEAN NUMBER SMELTS/STOMACHS WITH FOOD
1	16	16	2.20833	5.6	5.25
CHESUNCOOK LAKE FOOD HABITS WINTER CLERK SURVEYS 1996-2021 SALMON - SMELT ANALYSIS					08:53 Friday, April 22, 2022 260
Obs	TOTAL NUMBER STOMACHS EXAMINED	TOTAL NUMBER STOMACHS WITH FOOD	MEAN VOLUME/ SMELT	MEAN NUMBER SMELTS/STOMACH WITH SMELTS	MEAN NUMBER SMELTS/STOMACHS WITH FOOD
1	376	301	3.34813	2.47317	1.68439
CHESUNCOOK LAKE FOOD HABITS WINTER CLERK SURVEYS 1996-2021 SPLAKE - SMELT ANALYSIS					08:53 Friday, April 22, 2022 261
Obs	TOTAL NUMBER STOMACHS EXAMINED	TOTAL NUMBER STOMACHS WITH FOOD	MEAN VOLUME/ SMELT	MEAN NUMBER SMELTS/STOMACH WITH SMELTS	MEAN NUMBER SMELTS/STOMACHS WITH FOOD
1	7	6	6.625	2.66667	1.33333

Food item codes:

SLT smelt
REM unid fish remains
EMP empty
HKS old hooks
WHP white perch
INS insects
WHS white sucker
FRG frog
MIN unid minnow
RKS rocks
VEG vegetation

[illegible]

AREA/BOX NO.

(Continued)

SEASON - WINTER

,DATA SUMMARY		AREA/BOX NO.									
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
,FISH DATA											
,LKT											
	,REL	1.00,	,,	1.00,	,,	0.00,	0.00,	,,	0.00,	,,	,,
	,SUB	2.00,	,,	1.00,	,,	0.00,	1.00,	,,	0.00,	,,	,,
	,SLOT	0.00,	,,	0.00,	,,	0.00,	0.00,	,,	0.00,	,,	,,
,LLS											
	,SUCC	21.00,	17.00,	42.00,	26.00,	19.00,	28.00,	6.00,	17.00,	11.00,	45.00,
	,KEPT	11.00,	8.00,	15.00,	18.00,	28.00,	21.00,	9.00,	25.00,	12.00,	54.00,
	,REL	34.00,	20.00,	36.00,	45.00,	26.00,	38.00,	0.00,	5.00,	0.00,	0.00,
	,SUB	116.00,	29.00,	100.00,	15.00,	24.00,	14.00,	8.00,	6.00,	8.00,	45.00,
	,SLOT	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
,SLT											
	,SUCC	,,	,,	,,	,,	,,	,,	,,	4.00,	1.00,	,,
	,KEPT	,,	,,	,,	,,	,,	,,	,,	5.00,	1.00,	,,
	,REL	,,	,,	,,	,,	,,	,,	,,	0.00,	0.00,	,,
	,SUB	,,	,,	,,	,,	,,	,,	,,	0.00,	0.00,	,,
	,SLOT	,,	,,	,,	,,	,,	,,	,,	0.00,	0.00,	,,
,SPK											
	,SUCC	,,	,,	,,	,,	,,	,,	,,	,,	4.00,	1.00,
	,KEPT	,,	,,	,,	,,	,,	,,	,,	,,	4.00,	1.00,
	,REL	,,	,,	,,	,,	,,	,,	,,	,,	0.00,	0.00,
	,SUB	,,	,,	,,	,,	,,	,,	,,	,,	1.00,	0.00,
	,SLOT	,,	,,	,,	,,	,,	,,	,,	,,	0.00,	0.00,
,WHP											
	,SUCC	,,	,,	10.00,	,,	,,	,,	,,	6.00,	6.00,	7.00,
	,KEPT	,,	,,	10.00,	,,	,,	,,	,,	18.00,	15.00,	9.00,
	,REL	,,	,,	0.00,	,,	,,	,,	,,	2.00,	0.00,	0.00,

(Continued)

SEASON - WINTER

AREA/BOX NO.											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
FISH DATA											
WHP											
SUB											
Sum											
SLOT											
Sum											
YLP											
SUCC											
Sum											
KEPT											
Sum											
REL											
Sum											
SUB											
Sum											
SLOT											
Sum											

(Continued)

SEASON - WINTER

AREA/BOX NO.											
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
,DATA SUMMARY											
,TRIP INFO	,NO. PARTIES	23.00,	8.00,	2.00,	2.00,	10.00,	1.00,	5.00,	6.00,	4.00,	3.00,
	,TOTAL ANGLERS	92.00,	25.00,	6.00,	7.00,	68.00,	4.00,	20.00,	19.00,	10.00,	8.00,
	,TOTAL HRS	622.50,	181.50,	46.50,	53.00,	420.00,	28.00,	116.00,	106.00,	47.00,	37.00,
	,MEAN PARTY SIZE	4.00,	3.13,	3.00,	3.50,	6.80,	4.00,	4.00,	3.17,	2.50,	2.67,
,FISH DATA											
,BKT	,SUCC	,Sum					1.00,				
	,KEPT	,Sum					1.00,				
	,REL	,Sum					0.00,				
	,SUB	,Sum					0.00,				
	,SLOT	,Sum					0.00,				
,CSK	,SUCC	,Sum	17.00,	3.00,		2.00,	9.00,				
	,KEPT	,Sum	21.00,	2.00,		2.00,	9.00,				
	,REL	,Sum	1.00,	2.00,		3.00,	0.00,				
	,SUB	,Sum	0.00,	0.00,		0.00,	0.00,				
	,SLOT	,Sum	0.00,	0.00,		0.00,	0.00,				
,FLF	,SUCC	,Sum	4.00,								
	,KEPT	,Sum	4.00,								
	,REL	,Sum	0.00,								
	,SUB	,Sum	0.00,								
	,SLOT	,Sum	0.00,								
,LKT	,SUCC	,Sum	1.00,								
	,KEPT	,Sum	1.00,								

(Continued)

SEASON - WINTER

,DATA SUMMARY		AREA/BOX NO.									
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
,FISH DATA											
,LKT		0.00,									
,SUB		0.00,									
,SLOT		0.00,									
,LLS		36.00,	19.00,	5.00,	3.00,	32.00,	1.00,	13.00,	16.00,	10.00,	6.00,
,KEPT		32.00,	22.00,	6.00,	3.00,	32.00,	1.00,	14.00,	22.00,	13.00,	7.00,
,REL		14.00,	13.00,	0.00,	0.00,	1.00,	0.00,	0.00,	11.00,	0.00,	1.00,
,SUB		32.00,	12.00,	0.00,	8.00,	16.00,	6.00,	32.00,	29.00,	15.00,	5.00,
,SLOT		0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
,SLT		1.00,									
,KEPT		1.00,									
,REL		0.00,									
,SUB		0.00,									
,SLOT		0.00,									
,SPK		2.00,									
,KEPT		2.00,									
,REL		0.00,									
,SUB		0.00,									
,SLOT		0.00,									
,WHP		16.00,									
,KEPT		25.00,									
,REL		0.00,									

(Continued)

SEASON - WINTER

AREA/BOX NO.											
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
FISH DATA											
WHP											
SUB											
Sum	0.00										
SLOT											
Sum	0.00										
YLP											
SUCC											
Sum	24.00	2.00				2.00		3.00		1.00	
KEPT											
Sum	67.00	0.00				2.00		8.00		1.00	
REL											
Sum	0.00	4.00				0.00		0.00		0.00	
SUB											
Sum	0.00	0.00				0.00		0.00		0.00	
SLOT											
Sum	0.00	0.00				0.00		0.00		0.00	

(Continued)

SEASON - WINTER

,DATA SUMMARY		AREA/BOX NO.			
		2016	2017	2020	2021
,TRIP INFO					
	,NO. PARTIES	8.00,	9.00,	4.00,	4.00,
	,TOTAL ANGLERS	30.00,	32.00,	12.00,	13.00,
	,TOTAL HRS	177.50,	210.00,	59.50,	72.00,
	,MEAN PARTY SIZE	3.75,	3.56,	3.00,	3.25,
,FISH DATA					
,BKT	,SUCC	Sum	3.00,		
	,KEPT	Sum	0.00,		
	,REL	Sum	3.00,		
	,SUB	Sum	0.00,		
	,SLOT	Sum	0.00,		
,CSK	,SUCC	Sum	10.00,	2.00,	1.00,
	,KEPT	Sum	13.00,	1.00,	0.00,
	,REL	Sum	0.00,	1.00,	1.00,
	,SUB	Sum	0.00,	0.00,	0.00,
	,SLOT	Sum	0.00,	0.00,	0.00,
,FLF	,SUCC	Sum	1.00,		
	,KEPT	Sum	0.00,		
	,REL	Sum	1.00,		
	,SUB	Sum	0.00,		
	,SLOT	Sum	0.00,		
,LKT	,SUCC	Sum			
	,KEPT	Sum			

(Continued)

SEASON - WINTER					
,DATA SUMMARY					
		AREA/BOX NO.			
		2016	2017	2020	2021
,FISH DATA					
,LKT					
,SUB					
,SLOT					
,LLS					
,SUCC					
,KEPT					
,REL					
,SUB					
,SLOT					
,SLT					
,SUCC					
,KEPT					
,REL					
,SUB					
,SLOT					
,SPK					
,SUCC					
,KEPT					
,REL					
,SUB					
,SLOT					
,WHP					
,SUCC					
,KEPT					
,REL					

(Continued)

SEASON WINTER

Month	Days
January	31
February	28
March	31
April	30
May	31
June	30
July	31
August	31
September	30
October	31
November	30
December	31

AREA/BOX NO.

	2016	2017	2020	2021
FISH DATA				
WHP	SUB	Sum		
	SLOT	Sum		
YLP	SUCC	Sum	3,00	3,00
	KEPT	Sum	3,00	3,00
	REL	Sum	0,00	0,00
	SUB	Sum	0,00	0,00
	SLOT	Sum	0,00	0,00

SEASON - SUMMER

,DATA SUMMARY

		AREA/BOX NO.									
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
*.....%											
,TRIP INFO	,NO. PARTIES	39.00,	39.00,	63.00,	29.00,	45.00,	31.00,	52.00,	58.00,	72.00,	51.00,
	*.....%										
	,TOTAL ANGLERS	103.00,	92.00,	147.00,	97.00,	115.00,	77.00,	120.00,	148.00,	159.00,	119.00,
	*.....%										
	,TOTAL HRS	586.25,	531.25,	773.75,	483.50,	610.50,	440.25,	699.00,	701.00,	825.00,	572.25,
	*.....%										
	,MEAN PARTY SIZE	2.64,	2.36,	2.33,	3.34,	2.56,	2.48,	2.31,	2.55,	2.21,	2.33,
*.....%											
,FISH DATA											
*.....%											
,BKT	,SUCC ,Sum					1.00,	1.00,	2.00,	3.00,	1.00,	1.00,
	*.....%										
	,KEPT ,Sum					0.00,	1.00,	2.00,	1.00,	1.00,	1.00,
	*.....%										
	,REL ,Sum					1.00,	0.00,	0.00,	3.00,	0.00,	0.00,
	*.....%										
	,SUB ,Sum					0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
	*.....%										
	,SLOT ,Sum					0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
*.....%											
,FLF	,SUCC ,Sum	1.00,		4.00,	1.00,	4.00,	6.00,	10.00,	10.00,		
	*.....%										
	,KEPT ,Sum	1.00,		3.00,	1.00,	1.00,	0.00,	7.00,	7.00,		
	*.....%										
	,REL ,Sum	0.00,		1.00,	0.00,	3.00,	6.00,	3.00,	3.00,		
	*.....%										
	,SUB ,Sum	0.00,		0.00,	0.00,	0.00,	0.00,	0.00,	0.00,		
	*.....%										
	,SLOT ,Sum	0.00,		0.00,	0.00,	0.00,	0.00,	0.00,	0.00,		
*.....%											
,LKT	,SUCC ,Sum	2.00,	1.00,	3.00,				1.00,	1.00,		
	*.....%										
	,KEPT ,Sum	1.00,	0.00,	5.00,				0.00,	0.00,		
	*.....%										
	,REL ,Sum	1.00,	1.00,	0.00,				1.00,	1.00,		
	*.....%										
	,SUB ,Sum	0.00,	0.00,	0.00,				0.00,	1.00,		
	*.....%										
	,SLOT ,Sum	0.00,	0.00,	0.00,				0.00,	0.00,		
*.....%											
,LLS	,SUCC ,Sum	43.00,	35.00,	42.00,	44.00,	61.00,	53.00,	65.00,	94.00,	122.00,	57.00,
	*.....%										
	,KEPT ,Sum	11.00,	6.00,	7.00,	8.00,	25.00,	22.00,	33.00,	28.00,	89.00,	22.00,

*****CE

(Continued)

SEASON - SUMMER

		AREA/BOX NO.											
,DATA SUMMARY		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005		
,FISH DATA													
,LLS		,REL	,Sum	47.00,	39.00,	51.00,	46.00,	70.00,	66.00,	67.00,	139.00,	170.00,	81.00,
		,SUB	,Sum	142.00,	194.00,	296.00,	97.00,	85.00,	68.00,	146.00,	336.00,	322.00,	207.00,
		,SLOT	,Sum	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
,SPK		,SUCC	,Sum	,	1.00,	,	,	,	,	1.00,	1.00,	5.00,	
		,KEPT	,Sum	,	1.00,	,	,	,	,	1.00,	1.00,	4.00,	
		,REL	,Sum	,	0.00,	,	,	,	,	0.00,	0.00,	1.00,	
		,SUB	,Sum	,	0.00,	,	,	,	,	0.00,	2.00,	0.00,	
		,SLOT	,Sum	,	0.00,	,	,	,	,	0.00,	0.00,	0.00,	
,WHP		,SUCC	,Sum	6.00,	20.00,	13.00,	26.00,	21.00,	33.00,	22.00,	31.00,	10.00,	6.00,
		,KEPT	,Sum	13.00,	0.00,	20.00,	75.00,	10.00,	60.00,	33.00,	17.00,	15.00,	10.00,
		,REL	,Sum	0.00,	58.00,	13.00,	0.00,	23.00,	16.00,	5.00,	27.00,	11.00,	0.00,
		,SUB	,Sum	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
		,SLOT	,Sum	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,
,YLP		,SUCC	,Sum	,	1.00,	,	3.00,	8.00,	3.00,	1.00,	,	1.00,	
		,KEPT	,Sum	,	0.00,	,	3.00,	0.00,	3.00,	0.00,	,	0.00,	
		,REL	,Sum	,	1.00,	,	1.00,	9.00,	0.00,	1.00,	,	2.00,	
		,SUB	,Sum	,	0.00,	,	0.00,	0.00,	0.00,	0.00,	,	0.00,	
		,SLOT	,Sum	,	0.00,	,	0.00,	0.00,	0.00,	0.00,	,	0.00,	

(Continued)

SEASON - SUMMER

AREA/BOX NO.											
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
,DATA SUMMARY											
,TRIP INFO											
	,NO. PARTIES	42.00,	56.00,	53.00,	55.00,	44.00,	30.00,	29.00,	2.00,	20.00,	20.00,
	,TOTAL ANGLERS	98.00,	124.00,	109.00,	124.00,	109.00,	69.00,	67.00,	3.00,	43.00,	42.00,
	,TOTAL HRS	504.50,	525.75,	519.50,	698.25,	611.75,	433.50,	404.25,	19.00,	303.25,	240.50,
	,MEAN PARTY SIZE	2.33,	2.21,	2.06,	2.25,	2.48,	2.30,	2.31,	1.50,	2.15,	2.10,
,FISH DATA											
,BKT											
	,SUCC	Sum	2.00,	0.00,	1.00,	3.00,	2.00,	2.00,	,,	,,	,,
	,KEPT	Sum	2.00,	0.00,	1.00,	1.00,	0.00,	0.00,	,,	,,	,,
	,REL	Sum	0.00,	0.00,	0.00,	2.00,	2.00,	2.00,	,,	,,	,,
	,SUB	Sum	0.00,	1.00,	0.00,	0.00,	0.00,	0.00,	,,	,,	,,
	,SLOT	Sum	0.00,	0.00,	0.00,	0.00,	0.00,	0.00,	,,	,,	,,
,FLF											
	,SUCC	Sum	3.00,	2.00,	1.00,	,,	1.00,	1.00,	,,	,,	,,
	,KEPT	Sum	3.00,	0.00,	0.00,	,,	1.00,	1.00,	,,	,,	,,
	,REL	Sum	0.00,	2.00,	2.00,	,,	0.00,	0.00,	,,	,,	,,
	,SUB	Sum	0.00,	0.00,	0.00,	,,	0.00,	0.00,	,,	,,	,,
	,SLOT	Sum	0.00,	0.00,	0.00,	,,	0.00,	0.00,	,,	,,	,,
,LKT											
	,SUCC	Sum	0.00,	,,	,,	,,	,,	,,	,,	,,	,,
	,KEPT	Sum	0.00,	,,	,,	,,	,,	,,	,,	,,	,,
	,REL	Sum	0.00,	,,	,,	,,	,,	,,	,,	,,	,,
	,SUB	Sum	1.00,	,,	,,	,,	,,	,,	,,	,,	,,
	,SLOT	Sum	0.00,	,,	,,	,,	,,	,,	,,	,,	,,
,LLS											
	,SUCC	Sum	44.00,	78.00,	39.00,	62.00,	58.00,	35.00,	28.00,	2.00,	22.00,
	,KEPT	Sum	21.00,	40.00,	12.00,	28.00,	22.00,	8.00,	10.00,	1.00,	7.00,

(Continued)

SEASON - SUMMER

AREA/BOX NO.												
DATA SUMMARY			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015

(Continued)

SEASON - SUMMER

DATA SUMMARY				AREA/BOX NO.		
		2016	2017	2020		
TRIP INFO						
	,NO. PARTIES	6.00,	26.00,	15.00,		
	,TOTAL ANGLERS	10.00,	40.00,	34.00,		
	,TOTAL HRS	41.75,	137.00,	254.50,		
	,MEAN PARTY SIZE	1.67,	1.54,	2.27,		
FISH DATA						
,BKT	,SUCC	Sum	1.00,			
	,KEPT	Sum	0.00,			
	,REL	Sum	1.00,			
	,SUB	Sum	0.00,			
	,SLOT	Sum	0.00,			
,FLF	,SUCC	Sum				
	,KEPT	Sum				
	,REL	Sum				
	,SUB	Sum				
	,SLOT	Sum				
,LKT	,SUCC	Sum				
	,KEPT	Sum				
	,REL	Sum				
	,SUB	Sum				
	,SLOT	Sum				
,LLS	,SUCC	Sum	6.00,	21.00,	31.00,	
	,KEPT	Sum	0.00,	5.00,	40.00,	

(Continued)

SEASON - SUMMER

DATA SUMMARY		AREA/BOX NO.		
		2016	2017	2020
FISH DATA				
LLS	REL	Sum	9.00,	29.00,
	SUB	Sum	62.00,	25.00,
	SLOT	Sum	0.00,	0.00,
SPK	SUCC	Sum	1.00,	1.00,
	KEPT	Sum	0.00,	0.00,
	REL	Sum	1.00,	1.00,
	SUB	Sum	0.00,	0.00,
	SLOT	Sum	0.00,	0.00,
WHP	SUCC	Sum	1.00,	1.00,
	KEPT	Sum	0.00,	0.00,
	REL	Sum	1.00,	1.00,
	SUB	Sum	0.00,	0.00,
	SLOT	Sum	0.00,	0.00,
VLP	SUCC	Sum	1.00,	1.00,
	KEPT	Sum	0.00,	0.00,
	REL	Sum	1.00,	1.00,
	SUB	Sum	0.00,	0.00,
	SLOT	Sum	0.00,	0.00,

(Continued)

```

„#####...#####
,DATA SUMMARY , All ,
#####...#####
,FISH DATA , ,
#####
,LKT ,SUB ,Sum , 6.00,
, #####
, ,SLOT ,Sum , 0.00,
#####
,LLS ,SUCC ,Sum , 1500.00,
, #####
, ,KEPT ,Sum , 893.00,
, #####
, ,REL ,Sum , 1645.00,
, #####
, ,SUB ,Sum , 3780.00,
, #####
, ,SLOT ,Sum , 0.00,
#####
,SLT ,SUCC ,Sum , 6.00,
, #####
, ,KEPT ,Sum , 7.00,
, #####
, ,REL ,Sum , 0.00,
, #####
, ,SUB ,Sum , 0.00,
, #####
, ,SLOT ,Sum , 0.00,
#####
,SPK ,SUCC ,Sum , 29.00,
, #####
, ,KEPT ,Sum , 22.00,
, #####
, ,REL ,Sum , 7.00,
, #####
, ,SUB ,Sum , 3.00,
, #####
, ,SLOT ,Sum , 0.00,
#####
,WHP ,SUCC ,Sum , 356.00,
, #####
, ,KEPT ,Sum , 3306.00,
, #####
, ,REL ,Sum , 168.00,
, #####
, ,SUB ,Sum , 0.00,
, #####
, ,SLOT ,Sum , 0.00,
#####
#####

```

(Continued)

```
„ffffffffffffffffffffffffffffffff.....ffffffffff†
,DATA SUMMARY                                , All ,
‡ffffffffffff...ffffffffff-..ffffffffff" ffffffffb%
,FISH DATA , , ,
‡ffffffffffff" ffffffffb%
,YLP ,SUCC ,Sum , 100.00,
, ‡ffffffffffff" ffffffffb%
, ,KEPT ,Sum , 152.00,
, ‡ffffffffffff" ffffffffb%
, ,REL ,Sum , 19.00,
, ‡ffffffffffff" ffffffffb%
, ,SUB ,Sum , 0.00,
, ‡ffffffffffff" ffffffffb%
, ,SLOT ,Sum , 0.00,
$ffffffffffff·ffffffffff·ffffffffff·ffffffffffCE
```

Summary of IFW Species data from Chesuncook Lake
1996 to 2021

IFW Clerk Surveys (completed by our staff)

Winter: We conducted winter clerks surveys in 8 years during the period 1996 – 2021

Summer: We conducted summer clerk surveys in 4 years during the period 1996- 2021

Data summary all years/all seasons:

Total Angler days: 1,821

Total Angler Hours: 10,444

<u>Species</u>	<u># Reported (all sizes)</u>
Brook Trout	25
Cusk	222
Fallfish	70
Lake Trout	13
Landlocked Salmon	2087
Lake Whitefish	7
Smelt	390
Splake	20
White Perch	300
Yellow Perch	355

Voluntary record book data

Winter: We have data from 24 years during the period 1996 – 2021

Summer: We have data from 23 years during the period 1996- 2020

Data summary all years/all seasons:

Total Angler days: 2,777

Total Angler Hours: 15,523

<u>Species</u>	<u># Reported (all sizes)</u>
Brook Trout	28
Cusk	87
Fallfish	64
Lake Trout	22
Landlocked Salmon	6,318
Smelt	7
Splake	32
White Perch	3,474
Yellow Perch	171

IFW Age and growth data – These are fish that our staff have handled during creel surveys. They are typically measured, weighed, scale samples and a subsample of stomachs taken.

<u>Species</u>	<u># Examined</u>	<u>Mean Length (mm)</u>	<u>Ages represented</u>
Brook Trout	4	352	2-4, 6
Cusk	17	501	
Lake Trout	7	711	8,10,17
Landlocked Salmon	428	405	3-8
Splake	19	415	3-6

Food Habits data – Stomach samples are taken during winter clerk surveys. Food items are identified, enumerated, and volumes measured by displacement.

<u>Species with Stomachs Examined</u>	<u># examined</u>
Brook Trout	4
Lake Trout	16
Landlocked Salmon	376
Splake	7

Food items identified in stomachs

Smelt

Unid. Fish Remains

White Perch

Old Hooks

Insects

White Suckers

Frogs

Unid. Minnow spp

Rocks

Vegetation

Notes:

Brook Trout – Population is limited by competition by warm waters species such as white perch, yellow perch, fallfish, and suckers. Brook trout are present in the lake but not abundant. Likely abundant in the tribs.

Cusk: Abundant

Fallfish: Abundant

Lake Trout: Fishery was maintained through a stocking program. Stocking was terminated in 1994.

Landlocked Salmon: Abundant

Lake Whitefish: We are not clear on the status. They do not show up in the winter clerk surveys. If they were abundant, we would expect to see them. Anglers have reported them, but they may be misidentified round whitefish or, most likely, fallfish. The last lake whitefish IFW sampled were in 1970 during a gillnetting operation. Seventeen were taken that ranged in size from 415-520 mm.

Smelt: Present. Although not as abundant as in past years, the population is still considered stable. Anglers that target smelt are successful and smelt are commonly found in salmonid stomachs.

Splake: Splake occasionally drop downstream from Ragged Lake and Deer Pd into the Chesuncook System. Considered incidental.

White Perch: Abundant

Yellow Perch: Abundant

White Sucker: Abundant

West Branch of the Penobscot River - SLT drift

New sites: Just above Telos Rd (bridge)

Month	Est mean Flow	SLT Catch - South side	South side - Total weight	SLT catch - North side	North side - Total weight
05/22/21		1	6.0	0	0.0
06/11/21		1	5.0	0	0.0
06/26/21		143	20.0	130	18.0
07/17/21	1700/2199	33	5.6	49	4.0
07/24/21	1100/2200	9	0.9	1	0.2
08/06/21	1800	14	13.0	50	4.6
08/18/21	1800	13	6.6	2	1.0
08/24/21	1800	0	0.0	0	
09/04/21	1800/2200	4	1.0	0	
09/14/21	1100/1800	3	1.7	3	1.6
09/30/21	1100	4	17.7	0	0.0
11/02/21	1100	7	6.2	3	1.3

232

CPUE =

19.3

West Branch Smelt Drift Work - 2001
Flow Measurements - Holbrook Pool Site

Date	Total River Flow (cfs)	No. Smelts all Nets	Average Weight/SLT (g)
1/2	2015	2	2.73
1/8	1994	4	1.43
1/15	2600	4	5.5
1/22	2258	3	5.15
1/29	2400	3	5.28
2/8	1930	3	1.4
2/15	1922	4	1.75
2/21	1918	7	2.8
2/26	1914	9	3.84
3/5	1960	1	1.39
3/14	1928	6	1.73
3/19	1916	7	1.79
3/26	1906	1	0.49
4/2	1778	0	
4/3	1778	1	2.16
4/10	1650	0	
4/16	1889	0	
4/24	1430	0	
5/1	2009	0	
5/7	2010	6	1.66
5/14	2025	9	1.89
5/15	2025	0	0
5/22	2038	2	5.74
5/23	2038		0
5/31	1908	24	7.29
6/4	2024	7	3.05
6/11	2032	21	0.45
6/18	2006	146	0.85
6/25	2022	101	0.03
7/2	2038	159	0.03
7/9	1836	86	0.05
7/17	1881	28	0.06
7/23	2040	10	0.08
7/30	2035	25	0.1
8/6	1818	9	0.1
8/13	2047	8	0.11
8/20	2049	9	0.16
8/27	1400	0	
9/4	1250	7	0.16
9/10	1100	16	1.13
9/17	900	0	

9/18	900	0	
9/24	922	2	0.32
10/1	1011	0	
10/8	800	0	
10/16	800	2	0.25
10/22	800	0	
10/29	800	0	
11/8	800	2	6.58
11/13	800	3	2.13
11/19	830	2	0.44
11/26	825	3	0.39
12/3	840	0	
12/10	832	1	0.35
12/17	832	0	
12/26	832	3	0.55

745.5

CPUE = 13.3125

* No flow measurements taken at the sites or could not find any flow data.

Estimated flow based on samples from similar river flows.

No flow data from McKay on this date. Averaged the flows on dates sampled prior to and/or after this s

This week not sampled. Numbers are averages generated from samples the week before and the week

Consecutive day samples. Combined both days into one for calculating weekly catch.

West Branch Smelt Drift Work - 2000
Flow Measurements - Holbrook Pool Site

Date	Total River Flow (cfs)	No. Smelts all Nets	Average Weight/SLT (g)
1/5	2950	1	2.68
1/13	2938	19	2.87
1/20	2430	6	3.75
1/25	2789	2	13.78
2/1	2272	11	2.91
2/8	2427	19	4.49
2/15	2581	27	6.07
2/22	2498	14	4.7
2/29	2703	23	3.93
3/9	2326	9	3.78
3/13	3028	19	4.02
3/20	3431	14	4.63
3/28	3087	0	0
4/4	3546	14	4.63
4/11	4000	3	5.24
4/18	4119	3	5.24
4/25	4743	3	5.24
5/2	5367	1	0.63
5/9	4779	3	0.63
5/16	4498	3	0.63
5/21	4228	3	1.24
5/23	3348	5	0.88
5/27	3414	30	1.89
average	3663	13	1.34
5/31	3228	1	2
6/1	2694	1	1.91
average	2961	1	1.96
6/6	2940	1	1.83
6/12	2246	0	
6/19	2588	2	3.21
6/26	2625	1	11.24
7/5	2594	264	0.06
7/9	2569	18	0.12
7/17	2866	90	0.18
7/24	3318	94	0.18
8/2	3339	123	0.22
8/7	3337	58	0.24
8/14	3287	17	0.25
8/20	2453	10	0.29
8/28	2449	8	0.51
9/5	2534	2	0.6

9/11	2383	3	0.52
9/18	1400	1	0.53
9/25	1400	4	0.53
10/2	1300	1	0.2
10/10	1085	0	
10/16	1968	1	1.98
10/23	1956	1	3.16
10/31	1967	4	1.56
11/8	1977	3	9.79
11/13	2222	0	
11/20	2307	9	3.96
11/27	2306	19	5.45
12/5	2600	3	4.85
12/12	2600	0	
12/19	2600	6	4.89
12/27	2308	5	4.93

995.666667

** Drift net damaged CPUE 17.46783626

Estimated net flows, are based on samples from similar river flows.

No flow data from McKay on this date. Averaged the flows on dates sampled prior to and/or after this sample. Tr

These two nets appear to be located downstream near Chewonki Campground

No smelt weights. Averaged weights of smelts collected the week before and week after this sample

This week not sampled. Numbers are averages generated from samples the week before and the week after this

Average of samples from 5/21, 5/23, and 5/27 (all same week). Average of samples from 5/31 and 6/2 (both san

West Branch Smelt Drift Work - 1999
Flow Measurements - Holbrook Pool Site

Date	Total River Flow (cfs)	No. Smelts all Nets	Average Weight/SLT (g)
9/16	1882	11	0.71
9/21	1300	5	0.83
9/27	1118	0	0.00
10/6	1389	2	0.67
10/13	1188	1	1.50
10/19	2141	7	1.24
10/25	1859	1	2.49
11/1	2136	9	1.38
11/9	2169	5	7.40
11/23	2015	9	3.56
11/29	3008	19	4.00
12/6	3143	53	3.06
12/13	3552	14	2.61
12/20	3961	5	2.16
12/28	3465	14	3.68

155
cpue 10.33

* No flow measurements taken at the sites or could not find any flow data. Estimated flows based on sampled flow data. This week not sampled. Numbers are averages generated from samples the week before and the week after this date. Try to obtain flow data from Brookfield.

* Just a 1-run spot check

MAINE DEPARTMENT OF INLAND FISHERIES AND GAME
DIVISION OF FISHERY RESEARCH AND MANAGEMENT

Page 1 of 3
Standing Crop Studies
July, 1969

Stream West Branch Penobscot - Spawning channel Town _____ County _____
Location Halbrook Dy-Pass Length 146 Width 24.3 Temp. _____ Flow _____
Previous weather Hot showers Stream stage Stable Resistivity _____
Description of section Rocky riffle Freq. _____ Duty cycle _____
Load volts 500-800 Amps. _____

First run (A) Collection by TO, JB, NF Date 8/4/21 Mark _____

Species	50-74mm	75-99mm	100-124mm	125-149mm	150-174mm	175-199mm	200-224mm	225-249mm	250 & over
BKT	68, 71, 65 55, 72, 72 69, 76, 70, 67 57, 49, 54, 46 63, 62, 52, 44	82 60		131, 141		185			

LLS 62, 58, 65, 68, 73, 64 6" Approx. 10" Approx.
Second run; Collection by _____ Date _____

Species	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M

$P = \frac{A(U+M)}{M}$ Total Population = _____

Pop. Estimate for each size class

50-74	75-99	100-124	125-149	150-174	175-199	200-224	225-249	250 & over

BND CRT
Missed several BKT including large Ind., + LLS smolt
wetter widths
17' 28' 28'
24.3'

MAINE DEPARTMENT OF INLAND FISHERIES AND GAME
DIVISION OF FISHERY RESEARCH AND MANAGEMENT

Page 1 of 3
Standing Crop Studies
July, 1969

Stream Rip Stream Town TH RII County _____
Location Below Frost Rd Length 92' Width 35' Temp. _____ Flow _____
Previous weather Clear Stream stage _____ Resistivity _____
Description of section _____ Freq. _____ Duty cycle _____
Load volts _____ Amps. _____

First run (A) Collection by TD/JSB/NF Date 8/4/21 Mark _____

Species	50-74mm	75-99mm	100-124mm	125-149mm	150-174mm	175-199mm	200-224mm	225-249mm	250 & over
LLS	65-65.61 66-55.60 58-58.59 60-60.55 63-66.55								

48.63.

6" Approx.

10" Approx.

Second run; Collection by _____ Date _____

Species	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M

$$P = \frac{A(U+M)}{M}$$

Total Population = _____

Pop. Estimate for each size class

50-74	75-99	100-124	125-149	150-174	175-199	200-224	225-249	250 & over

Bul CSK
LCB CMS
BND

No pan. In 2019, no 40g!

MAINE DEPARTMENT OF INLAND FISHERIES AND GAME
DIVISION OF FISHERY RESEARCH AND MANAGEMENT

Page 1 of 3
Standing Crop Studies
July, 1969

Stream Rio Stream Town T4 R11 County _____
Location ① Frost Rd crossing; ② Telos Rd Length _____ Width _____ Temp. _____ Flow _____
Previous weather _____ Stream stage _____ Resistivity _____
Description of section Boulder run riffle Freq. _____ Duty cycle _____
Load volts 500 Amps. 0.5

First run (A) Collection by JD/JB/MK Date 9/19/19 Mark _____

Species	50-74mm	75-99mm	100-124mm	125-149mm	150-174mm	175-199mm	200-224mm	225-249mm	250 & over
Site #1	No yoy LLS			144 ① CSK-BP	173 ①	198 ①			
Site #2	No yoy LLS			147 ①	164 160 161 158 157 ⑦ 171 169	178 ①			

1 Run - No Blocky seines Flow too high
6" Approx.

10" Approx.

Second run; Collection by _____ Date _____

Species	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M	U	M

$$P = \frac{A(U+M)}{M}$$

Total Population = _____

Also took: CSK, FLF, BND, CCB

Pop. Estimate for each size class

50-74	75-99	100-124	125-149	150-174	175-199	200-224	225-249	250 & over

Site #1 92' x 35' - Below Bridge to 1st pool = 36 units
Site #2 132 x 30 - Below Telos Rd = 44 units

From: [Obrey, Tim](#)
To: [Matthew Brewer](#)
Cc: [Wendy Bley](#)
Subject: RE: Ripogenus Project FERC Additional Information Request
Date: Monday, May 19, 2025 9:41:24 AM
Attachments: [image003.png](#)

Matt,

You are correct in your interpretation of the metrics. “Succ” is the number of anglers successfully landing a legal fish. In the past, we would ask how many anglers in a party actually caught a legal fish because some anglers are more successful than others. But we don’t collect that metric anymore. So, the computer simply distributes the legal catch over all anglers in that party for each record.

I was mistaken we did collect a small amount of winter clerk data in 2025.

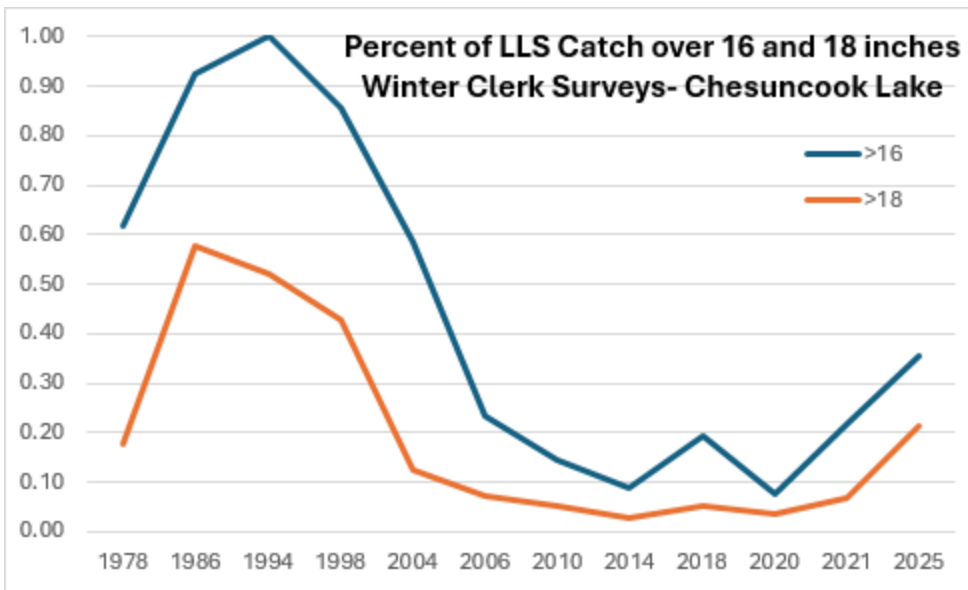
	2025
Parties	23
Anglers	73
Hours	565
BKT-k	3
BKT-r	0
BKT-s	0
BKT-All	3
x Len Kept	
LLS-k	72
LLS-r	8
LLS-s	0
LLS-All	80

Here are some other charts you might include:

Regulations		Years	All LLS/Hr
2 FISH/14"		1978-1991	0.166
1 FISH/16"		1992-1998	0.227
2 FISH/14"		1999-2005	0.354
3 FISH 14" min only 1 OVER 18"		2006-2014	0.232
no size bag under 16"/1 over 16"		2018- present	0.172

This shows the increased number of salmon in the lake after the more restrictive

regulations were implemented in 1992. Catch rates increase because there were too many salmon and growth crashed. Catch rates are now (2018 - present) dropping back after new liberal regulations were adopted in 2018. We are thinning the population, and the number of larger fish is increasing.



Tim

From: Matthew Brewer <Matthew.Brewer@KleinschmidtGroup.com>

Sent: Tuesday, May 13, 2025 10:48 AM

To: Obrey, Tim <Tim.Obrey@maine.gov>

Cc: Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>

Subject: RE: Ripogenus Project FERC Additional Information Request

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Tim,

Thanks for your response, and we completely understand you have a large region to cover with few staff to do it. Thank you for providing the data that you had available.

I have attached my summaries of the data you had previously provided (attached to my original email). Most are simple plots or tables of the data as you provided it, summarized by year and species as specifically requested by FERC. I included a couple of plots showing LLS Catch per Angler Hour from Clerk Survey Data and Volunteer Logbook data.

I do have one questions on those plots (Figure 1 and Figure 2) – I am assuming the metrics are “kept” meaning the fish was harvested, “rel” meaning the fish was of legal size but released, “sub” meaning the fish was not of legal size and was released, and “succ” which I assume is success. Could you explain the “succ” metric to me as I am confused on what that is recording? If my interpretations of the other metrics are incorrect, please correct those for me as well.

If you have any other comments or concerns with these summaries and how they are presenting your data, please let me know and I will resolve those.

Thanks in advance,
Matt Brewer

From: Obrey, Tim <Tim.Obrey@maine.gov>
Sent: Monday, March 31, 2025 11:03 AM
To: Matthew Brewer <Matthew.Brewer@KleinschmidtGroup.com>
Cc: Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>
Subject: RE: Ripogenus Project FERC Additional Information Request

Hi Matt,

Sorry, but I’m not going to be much help. We have just 3 staff to manage our region of ¼ million acres of standing water, so we don’t work on the Chesuncook system every year. Typically, we get to our larger waters every 4-5 years, except Moosehead Lake which requires most of our staff time each year. Below are my comments:

1. Smelt drift data from the West Branch downstream of McKay Station from 2022 if available. – **Planned but cancelled due to lack of staffing.**
2. Updated Chesuncook clerk survey data from 1996 to 2021 to include any data from 2022 – Present. – **No new data since 2021.**
3. Any additional backpack electrofishing data from Ripogenus Project like was provided for Holbrook Side Channel and Ripogenus Stream in 2019 and 2021. – **No new data since 2021.**
4. Any additional angler census box data from West Branch downstream of McKay Station for 2023 or 2024. – **No new data in 2023 or 2024.**

Tim

=====

Tim Obrey, Fisheries Supervisor, Moosehead Lake Region
19 Village St
PO Box 551
Greenville, ME 04441

(207)695-4139

From: Matthew Brewer <Matthew.Brewer@KleinschmidtGroup.com>

Sent: Wednesday, March 26, 2025 1:03 PM

To: Obrey, Tim <Tim.Obrey@maine.gov>

Cc: Wendy Bley <Wendy.Bley@Kleinschmidtgroup.com>

Subject: Ripogenus Project FERC Additional Information Request

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello Tim,

Hope you are well and had a good winter season and looking forward to spring.

In place of Jesse Wechsler (who recently departed from Kleinschmidt) I am reaching out regarding some Additional Information Requests from FERC for the Ripogenus Project Final License Application. We received two requests for updated fish assemblage information.

The first was a request for 2022 smelt drift data from the West Branch downstream of McKay Station. It is our understanding MDIFW collected this data, but it was not available when writing our Fish Assemblage Study Report. If that data is available, could you provide that to me? I will attach the data that we already have from 99-01 and 2021.

The second request had a few components. The first was for any additional Chesuncook data from clerk surveys since you last provided the data through 2021 (which I will attach here for your reference). The second was for any additional electrofishing or angler census box data from the Ripogenus Project area – I will attach what we have already and the summary that was provided in the FLA. If there is any additional information for any of these requests that you can provide I would appreciate it.

To summarize the total request, FERC has requested:

1. Smelt drift data from the West Branch downstream of McKay Station from 2022 if available.
2. Updated Chesuncook clerk survey data from 1996 to 2021 to include any data from 2022 – Present.
3. Any additional backpack electrofishing data from Ripogenus Project like was provided for Holbrook Side Channel and Ripogenus Stream in 2019 and 2021.
4. Any additional angler census box data from West Branch downstream of McKay Station for 2023 or 2024.

If you could let me know if this information is available and provide that to me if available, I would greatly appreciate it.

Thank you in advance,
Matt Brewer

Matthew Brewer

Staff Scientist

Kleinschmidt

Office: 207.416.1238

Follow us on [LinkedIn](#)