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MULTI-PROJECT

ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSE

Upper Red Lake Dam Hydroelectric Project
FERC Project No. 2484-018

Weed Dam Hydroelectric Project
FERC Project No. 2464-015

Wisconsin

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

July 2016

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
BEHI	Bank Erosion Hazard Index
BEPI	Bank Erosion Potential Index
BMPs	best management practice
ºC	degrees Celsius
cfs	cubic feet per second
CFR	Code of Federal Regulations
Commission or FERC	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CY	cubic yard
DO	dissolved oxygen
EA	environmental assessment
EIA	Energy Information Administration
ESA	Endangered Species Act
ºF	degrees Fahrenheit
FERC or Commission	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
GLEC	Great Lakes Environmental Center, Inc.
FWS	U.S. Fish and Wildlife Service
Gresham or applicant	Gresham Municipal Utilities
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kV	kilovolt
kW	kilowatt
Lower Red Lake	Weed Project reservoir
MISO	Midcontinent Independent System Operator
mg/L	milligrams per liter
MRO	Midwest Reliability Organization
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmosphere Administration
O&M	Operation and Maintenance
PA	Programmatic Agreement

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Park Service	U.S. National Park Service
PEM	Palustrine Emergent, persistent wetlands
PFO	Palustrine Forested, broad-leafed deciduous and evergreen wetlands
projects	Upper Red Lake and Weed Hydroelectric Projects
PSS	Palustrine Scrub-Shrub, broad-leafed deciduous wetlands
RM	river mile
SCADA	Supervisory Control and Data Acquisition
Shawano Project	Shawano Hydroelectric Project
Upper Red Lake	Upper Red Lake Project reservoir
Upper Red Lake Project or project	Upper Red Lake Dam Hydroelectric Project
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
Weed Project or project	Weed Dam Hydroelectric Project
Wisconsin CMP	Wisconsin Coastal Management Program
Wisconsin DNR	Wisconsin Department of Natural Resources
Wisconsin SHPO	Wisconsin State Historic Preservation Office
WQC	water quality certification

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EXECUTIVE SUMMARY

Proposed Action

On June 10, 2013, Gresham Municipal Utilities (Gresham or applicant) filed an application for a subsequent license with the Federal Energy Regulatory Commission (Commission or FERC) for the continued operation of the existing Upper Red Lake Dam Hydroelectric Project No. 2484 (Upper Red Lake Project). The Upper Red Lake Project is located on the Red River in Shawano County, Wisconsin. The Upper Red Lake Project has an installed capacity of 275 kilowatts (kW) and an annual generation of 1,918 megawatt-hours (MWh).

On June 10, 2013, Gresham filed an application for a subsequent license with the Commission for the continued operation of the existing Weed Dam Hydroelectric Project No. 2464 (Weed Project). The Weed Project is located on the Red River in Shawano County, Wisconsin. The Weed Project has an installed capacity of 620 kW and an annual generation of 1,487 MWh.

Neither project occupies federal land.

Project Facilities

Upper Red Lake Project

The Upper Red Lake Project consists of a reservoir known as Upper Red Lake, an earth and concrete dam, a steel penstock, a brick and concrete powerhouse, a transmission line, and a substation. The reservoir has a surface area of 1,300 acre feet at a normal maximum elevation of 933.0 feet National Geodetic Vertical Datum (NGVD). The earth and concrete dam is 315.75 feet long and consists of an earthen embankment from the north river bank, a concrete gated spillway, a concrete and masonry overflow section, a concrete and masonry non-overflow section incorporating the penstock intake, and an earthen embankment from the south river bank. Water flows through the 680-foot-long, 6-foot-diameter steel penstock, which bifurcates near a 16.5-foot-diameter surge tank for the last 90 feet then enters the powerhouse.

The brick and concrete powerhouse is a 61.50-foot-long by 53-foot-wide brick structure that contains two turbine-generators; one 175 kW and one 100 kW, for a total installed capacity of 275 kW. A 300-foot-long, 2.4-kilovolt (kV) transmission line conveys the generated power to the project substation which steps up the power from 2.4 kV to 7.2 kV and feeds the power into Gresham's grid. The project generates an average of 1,918 MWh annually.

Project recreation facilities include the South Shore access area, which provides a fishing/launching pier and a boat ramp, located on the southwest shoreline of Upper Red Lake, just upstream of the Upper Red Lake Project dam.

Weed Project

The Weed Project is located approximately 1.5 miles downstream of the Upper Red Lake Project and consists of a reservoir known as Lower Red Lake, an earth and concrete dam, an emergency spillway, two steel penstocks, a concrete powerhouse, a short transmission line, and a substation. The reservoir has a surface area of 1,200 acre feet at a normal maximum elevation of 897.2 feet NGVD. The 1,506-foot-long earth and concrete dam consists of an earthen embankment from the north river bank, a concrete dam section, a concrete intake structure, a gated concrete spillway section, and an earthen embankment from the south river bank. A grass-lined emergency spillway is located about 500 feet west of the end of the south earthen embankment. From the concrete intake structure, water flows into two penstocks that are 56.50 feet long, 6.5 feet in diameter and 60.50 feet long, 4 feet in diameter, respectively, connecting the intake structure and the powerhouse.

The reinforced concrete powerhouse is 35 feet long, 21.50 feet wide, containing one 500-kW turbine-generator and one 120-kW turbine-generator for a total installed capacity of 620 kW. A 100-foot-long, 2.4-kV transmission line conveys the generated power to the project substation which steps up the power from 2.4 kV to 7.2 kV and feeds the power into Gresham's grid. The project generates about 1,487 MWh annually.

Project recreation facilities include: (1) Riverside Park, located on the northwest shoreline of Lower Red Lake; (2) the Geider Road access area, located on the west shoreline of the northernmost inlet of the reservoir; and (3) the Red River walk-in site, located downstream of the Weed Project dam on the south shoreline of Red River.

Project Operation

Both projects are required by the current licenses to operate in a run-of-river mode. The Upper Red Lake Project is required to maintain its headwater elevation at or within 6 inches of the normal pool elevation of 933.0 feet National Geodetic Vertical Datum (NGVD).[1] The Weed Project is required to maintain its headwater elevation at or within 3 inches of the normal pool elevation of 897.2 feet NGVD.[2]

At both projects, headwater elevations and generating unit output are monitored and digitally recorded by electronic equipment that includes an automated dialer system that notifies operators if headwater levels exceed pre-determined levels. In addition, operating personnel maintain daily logs of headwater elevations and generating unit output at both projects. Tailwater elevations at the Weed Project are monitored using a pressure transducer and logged on an hourly basis. The current Weed Project license

[1] Run-of-river operation is required by Article 401. *See* 46 FERC ¶61,067 (1989).

[2] Run-of-river operation is required by ordering paragraph A. *See* 131 FERC ¶62,245 (2010).

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requires a minimum flow of 7 cubic feet per second (cfs) into the bypassed channel to protect downstream water quality.[3]

When flow conditions exceed the combined hydraulic capacity of the Weed Project's generating units (greater than approximately 330 cfs), one or more of the spillway's four Tainter gates are manually opened. When flow conditions exceed the combined hydraulic capacity of the Upper Red Lake Project's generating units (greater than approximately 250 cfs), one or more of the three vertical slide gates are manually opened.

Project Boundary

Gresham proposes to modify the current project boundary at the Upper Red Lake Project to include a parking area at the South Shore access area, which provides access to the existing project boat launch and fishing/launching pier. Gresham also proposes to modify the project boundary to exclude privately-owned residences surrounding the Lions Club boat launch.[4]

Gresham proposes to modify the project boundary at the Weed Project to include the Geider Road access area, which provides a winter "drive-on" access point for ice fishing and other winter lake activities. At the Riverside Park, Gresham proposes to remove from the project boundary athletic fields and other buildings unrelated to project operation.

Proposed Environmental Measures

Gresham proposes the following measures to protect or enhance environmental resources:

Upper Red Lake Project

- operate the project in a run-of-river mode, maintaining the Upper Red Lake Project reservoir water surface elevation at 933.0 feet NGVD ±3 inches;
- prepare an operation compliance monitoring plan to verify run-of-river operation, by monitoring: (1) headwater elevations in the Upper Red Lake Project reservoir with an existing headwater ultrasonic water surface elevation sensor; and (2) turbine output;
- prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation;

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[3] *See* 131 FERC ¶62,245 (2010).

[4] The Gresham Lions Club boat launch is not a project recreation facility; however, it does provide access to the reservoir.

- prepare a recreation plan within 1 year of license issuance to enhance recreation resources;[5]
- continue to operate and maintain the boat landing, accessible fishing/launching pier, boat ramp, and parking area at the South Shore access area;
- install picnic tables and benches at the South Shore access area; and
- implement an Historic Properties Management Plan (HPMP), filed on November 29, 2011.[6]

Weed Project

- prepare an erosion management plan for the Weed Project tailrace channel to describe the contributing factors for the erosion observed in the Weed Project tailrace channel and develop mitigation measures;
- continue to operate the project in a run-of-river mode, maintaining the Weed Project reservoir water surface elevation at 897.2 feet NGVD ±3 inches;
- continue to provide a minimum flow of 7 cfs to the spillway channel;
- prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation;
- prepare a recreation plan within 1 year of license issuance to enhance recreation resources;[7]
- continue to operate and maintain: (1) Riverside Park; (2) the Geider Road access area; and (3) the swimming area, canoe/kayak put-in site, and parking area at the Red River walk-in site;
- continue to maintain a tree berm[8] at the Red River walk-in site;

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[5] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include any specific proposed measures or purpose. We assume that the purpose of the applicant's proposal to develop a recreation plan would be to manage the existing recreation facilities, as well as any proposed recreation enhancements.

[6] The Wisconsin State Historic Preservation Office (Wisconsin SHPO) approved the HPMP, entitled *Historic Resources Management Plan for the Upper Red Lake Dam Hydroelectric Project, FERC No. 2484*, in a letter filed on November 29, 2011.

[7] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures. We assume that the purpose of the applicant's proposal to develop a recreation plan would be to manage the existing recreation facilities, as well as any proposed recreation enhancements.

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- install a fishing dock and benches at the Riverside Park boat landing;
- develop a picnic area at the Red River walk-in site;
- install an ornamental fence and signage at an informal beach access site to eliminate use of the site and direct recreationists to the Red River walk-in site, located across the river; and
- implement an HPMP filed on November 29, 2011.[9]

Public Involvement and Areas of Concern

Before filing its license applications for the Upper Red and Weed Projects, Gresham conducted pre-filing consultation under the Commission's traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, Tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission.

Before preparing this environmental assessment (EA), Commission staff conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested parties on February 7, 2014, which solicited comments, recommendations, and information on the projects. On April 9, 2014, staff issued notices, requesting comments, recommendations, terms and conditions, and prescriptions for the projects.

Alternatives Considered

This EA analyzes the effects of continued project operation and recommends conditions for any subsequent license that may be issued for each project. This EA considers the following alternatives for the Upper Red Lake and Weed Projects: (1) Gresham's proposal; (2) Gresham's proposal with staff modifications (staff alternative); and (3) no action, meaning the projects would continue to be operated as they are presently with no changes.

Staff Alternative

Under the staff alternative, the projects would include the measures proposed by Gresham and the additional staff-recommended measures or modifications to Gresham's proposal noted below. Unless otherwise noted, the measures apply to both projects.

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[8] The tree berm at the Red River walk-in site is located along the southeastern shoreline of the peninsula, and is also referred to in the application as a "tree buffer."

[9] The Wisconsin SHPO approved the HPMP, entitled *Historic Resources Management Plan for the Weed Dam Hydroelectric Project, FERC No. 2464*, in a letter filed on November 29, 2011.

- Prepare an erosion and sediment control plan for the Weed Project for the ground-disturbing activities associated with construction of the proposed recreation facility improvements.
- Modify the proposed operation compliance monitoring plan for the Upper Red Lake Project to include provisions to: (1) install staff gages both upstream and downstream of the project; (2) install an automatic water level recording device downstream of the project; and (3) maintain hourly records of project operation on a daily basis to document compliance with the operational requirements of any license issued for the project.
- Prepare an operation compliance monitoring plan for the Weed Project to include provisions to: (1) install staff gages both upstream and downstream of the project; and (2) maintain hourly records of project operation on a daily basis to document compliance with the operational requirements of any license issued for the project.
- Modify the proposed invasive species management plan to include: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance; (3) educational signage; (4) staff training; and (5) monitoring.
- For the Weed Project, to protect northern long-eared habitat, avoid cutting northern long-eared bat forage or roosting trees between April 1 and October 31, and where trees need to be removed, only remove trees equal or greater than 3 inches in diameter at breast height between November 1 and March 31.
- Modify the proposed recreation plan for the Upper Red Lake Project to include: (1) all proposed recreation measures; (2) installing picnic tables and benches at the South Shore access area; and (3) conceptual drawings.
- Modify the proposed recreation plan for the Weed Project to include: (1) all proposed recreation measures; (2) upgrade the existing informal parking area by paving or with gravel; (3) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (4) signage for the existing facilities; (5) conceptual drawings; and (6) posting information on water levels downstream of the Weed Project on a public website.
- Implement the statewide Wisconsin programmatic agreement (PA) for the projects.

Environmental Effects of the Staff Alternative

The primary issues associated with relicensing the Upper Red Lake and Weed Projects are: (1) stream bank erosion in the Weed Project tailrace channel; (2) monitoring compliance with run-of-river operation; and (3) the effects of project operation on recreational facilities at the Weed Project.

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Geological and Soil Resources

Gresham identified six areas of stream bank erosion in the Weed Project tailrace channel resulting from three separate processes including foot traffic at the recreational access points to the river, flow exiting the powerhouse, and seepage. Gresham's proposed erosion management plan would describe the areas of active erosion within the Weed Project tailrace channel, describe the contributing factors for the areas of active erosion, develop and evaluate mitigation measures, justify the selection of the mitigation measures, and develop a cost and schedule to implement the selected alternative. Implementation of the erosion management plan would help ensure that project operation does not cause stream bank erosion that adversely affects water quality, resident aquatic species, and their respective instream habitats in the project area.

Ground disturbing activities associated with constructing the proposed recreation facility enhancements at the Weed Project could cause localized soil erosion, which could adversely affect water quality. The staff-recommended erosion and sediment control plan would include measures that, when implemented, would limit the amount of soil eroded from these proposed ground disturbing activities at the Weed Project.

Aquatic Resources

Continuing to operate both projects in a run-of-river mode would help maintain stable flows and water surface levels in the reservoirs and downstream of each project. Maintaining these relatively stable conditions would protect fish and other aquatic organisms that rely on nearshore habitat for feeding, spawning, and cover.

Gresham has had difficulties maintaining the Weed Project's run-of-river mode of operation due to the hydraulic capacity differences between project's two turbines, which has resulted in downstream water surface level fluctuations of up to one foot. However, in 2010, the Commission approved a Run-of-River Plan[10] for the Weed Project to ensure that the project operated as run-of-river. Recent data shows a marked reduction in the frequency of downstream fluctuations, which Gresham has attributed to a refurbishment of the larger generating unit that now allow it to pass lower flows. However, preparing an operation compliance monitoring plan, not only for the Weed Project, but also for the Upper Red Lake Project, that includes a description of project operation and the equipment and procedures to monitor project operation, would provide a means to verify compliance with the operational requirements of any licenses issued for the projects.

In addition, including in an operation compliance monitoring plan for each project a provision to install upstream staff gages that show reservoir water elevation limits would be a useful tool to ensure that the operational requirements of each project are met. Installing publically visible staff gages both upstream and downstream of each project,

[10] *See* 131 FERC ¶62,245 (2010).

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would provide a numerical benchmark of the water surface elevation of each project reservoir and tailrace. These staff gages would enable Gresham to calibrate the water level sensors needed to monitor and demonstrate compliance with the operational requirements of any licenses issued for the projects.

Terrestrial Resources

Gresham proposes to manage the tree berm at the Weed Project's Red River walk-in site in order to improve views to and from the river and the site. Management of the tree berm would include selective removal of low vegetation growth and dead or dying trees. Vegetation removal at the tree berm would disturb shoreline and deciduous forest habitats and could result in invasive species growth. In addition, both reservoirs contain invasive plants, including curly-leaf pondweed and Eurasian watermilfoil. The staff-recommended invasive species management plan, which would include measures for the management of invasive species during project operation and maintenance, staff training, public education, and monitoring, would help to minimize the introduction and spread of invasive plant species.

Threatened and Endangered Species

The types of forest favored as roosting habitat by the northern long-eared bat is found around the projects, and Gresham's proposal to remove trees at the Red River walk-in site at the Weed Project could affect this habitat. The staff-recommended measure would ensure that tree removal at the Weed Project is avoided between April 1 and October 31, the time where trees serve as maternity roosting or summer habitat for this species. Only trees equal to or greater than 3 inches in diameter at breast height would be removed between November 1 and March 31, which would protect northern long-eared bat habitat. Therefore, we conclude that operation and maintenance of the project as proposed with staff-recommended measures, is not likely to adversely affect the northern long-eared bat for the Weed Project.

Gresham does not propose tree removal for the Upper Red Lake Project. Also project operation and maintenance would not require tree removal. Therefore, because the northern long-ear bat's habitat would not be disturbed, continued operation of the Upper Red Lake Project would have no effect on the northern long-eared bat.

No federally listed mussel species, including the snuffbox mussel, were encountered in the vicinity of the projects during a 2011 mussel survey. Additionally, there are no historical records of snuffbox mussels existing in the Red River near the projects. Therefore, continued operation of the projects would have no effect on the federally listed snuffbox mussel.

The projects would likewise have no effect on the Karner blue butterfly and the gray wolf because no existing or extant populations of the species are known to occur in the vicinity of the project.

Recreation and Land Use Resources

Recreation plans can provide a framework for implementing recreation facility enhancements. However, the recreation plans proposed by Gresham do not include a purpose or any specific proposed measures. Therefore, modifying the proposed recreation plans to include Gresham's proposed recreation measures for each project would ensure that facilities and amenities are suitably constructed and maintained.

At the Weed Project, recreationists currently use an informal beach access site,[11] causing shoreline erosion at the site. Implementing the applicant's proposal to prohibit access by installing ornamental fencing around the site would permanently eliminate recreation use of the informal beach access site. However, prohibiting access would enable the eroded area to stabilize naturally over time, reducing the potential for erosion into the river. Also Gresham's proposal to provide directional signage to the Red River walk-in site, which provides similar beach access, would redirect recreationists to the site.

The Red River walk-in site provides swimming opportunities and a canoe/kayak put-in. Occasionally there are conflicts between the boaters and swimmers because the put-in and swimming areas are undefined. We anticipate the conflicts to increase once the recreationists that use the informal beach access site are redirected to the Red River walk-in site. Modifying the Weed Project recreation plan to include: (1) formalizing the existing parking area, canoe/kayak put-in, and adjacent swimming area; (2) installing signage directing recreationists to the kayak/canoe put-in and the swimming area; and (3) constructing paths to each area would enhance access to the Red River walk-in site and help reduce conflict between user groups.

Additionally, modifying the Weed Project recreation plan to include a website that posts downstream water levels would inform boaters of on-site river conditions at the Weed Project.

Cultural Resources

Phase I archaeological resource surveys were conducted along the shorelines of both reservoirs in 2011. No historic properties were identified; however, the Phase I surveys did not include all the lands within the projects' area of potential effects (APE).

Gresham also conducted a historical and cultural resources assessment within the APE for each project.[12] For the Weed Project, the Lower Lake Road Bridge, located

[11] The site is located on the north shore directly across from the Red River walk-in site.

[12] The projects themselves were determined not to be eligible for the National Register of Historic Places (National Register).

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adjacent to the Weed Project dam, is eligible for listing on the National Register. Although proposed project operation would not affect the bridge, it could be adversely affected by future project maintenance of the dam,[13] or if an emergency situation occurs at the Weed Project dam.

Any unanticipated discoveries, and any effects on the National Register-eligible bridge, would be taken into account through the implementation of the state-wide Wisconsin PA and the HPMPs. For the unsurveyed areas within the APEs, the HPMP for each project contains protocols that would be implemented if there are any unanticipated discoveries. The HPMPs also contain provisions to lessen, avoid, or mitigate for unavoidable adverse effects if a discovered resource is eligible for the National Register. In addition, the HPMP for the Weed Project contains procedures to implement if future project maintenance would result in the Lower Lake Road Bridge being altered or if there would be an emergency situation.

No-Action Alternative

Under the no-action alternative, no licenses would be issued and the proposed projects would not be constructed. Environmental conditions would remain the same.

Conclusions

Based on our analysis, we recommend re-licensing the projects as proposed by the applicant, with some staff modifications and additional measures.

In section 4.2 *Comparison of Alternatives*, we estimate the likely cost of alternative power for each of the three alternatives identified above.

For the Upper Red Lake Project, our analysis shows that, during the first year of operation under the proposed action alternative, project power would cost $20,336, or $10.60/MWh, less than the likely alternative cost of power. Under the staff alternative, project power would cost $14,543, or $7.58/MWh, less than the likely alternative cost of power.

For the Weed Project, our analysis shows that, during the first year of operation under the proposed action alternative, project power would cost $19,100, or $12.85/MWh, more than the likely alternative cost of power. Under the staff alternative, project power would cost $26,969, or $18.14/MWh, more than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative for each project because: (1) the projects would provide a dependable source of electrical energy for the region

[13] Future maintenance to the dam that causes vibrations could adversely affect the bridge.

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(3,405 MWh annually); (2) the combined 895 kW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by the applicants, as modified by staff, would adequately protect and enhance environmental resources affected by the projects. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

We conclude that issuing subsequent licenses for the projects, with the environmental measures we recommend, would not be a major federal action significantly affecting the quality of the human environment.

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ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Upper Red Lake Dam Hydroelectric Project, P-2484-018
Weed Dam Hydroelectric Project, P-2464-015
Wisconsin

1.0 INTRODUCTION

1.1 APPLICATION

Upper Red Lake Project

On June 10, 2013, Gresham Municipal Utilities (Gresham or applicant) filed an application for a subsequent license with the Federal Energy Regulatory Commission (Commission or FERC) for the continued operation of the existing Upper Red Lake Dam Hydroelectric Project No. 2484 (Upper Red Lake Project). The Upper Red Lake Project is located on the Red River in Shawano County, Wisconsin (figure 1 and figure 2). The Upper Red Lake Project has an installed capacity of 275 kilowatts (kW) and an annual generation of 1,918 megawatt-hours (MWh).

Weed Project

On June 10, 2013, Gresham filed an application for a subsequent license with the Commission for the continued operation of the existing Weed Dam Hydroelectric Project No. 2464 (Weed Project). The Weed Project is located on the Red River in Shawano County, Wisconsin (figure 1 and figure 3). The Weed Project has an installed capacity of 620 kW and an annual generation of 1,487 MWh.

Neither project occupies federal land.

Figure 1. Location for the Upper Red Lake and Weed Projects, Shawano County, Wisconsin (Source: staff).

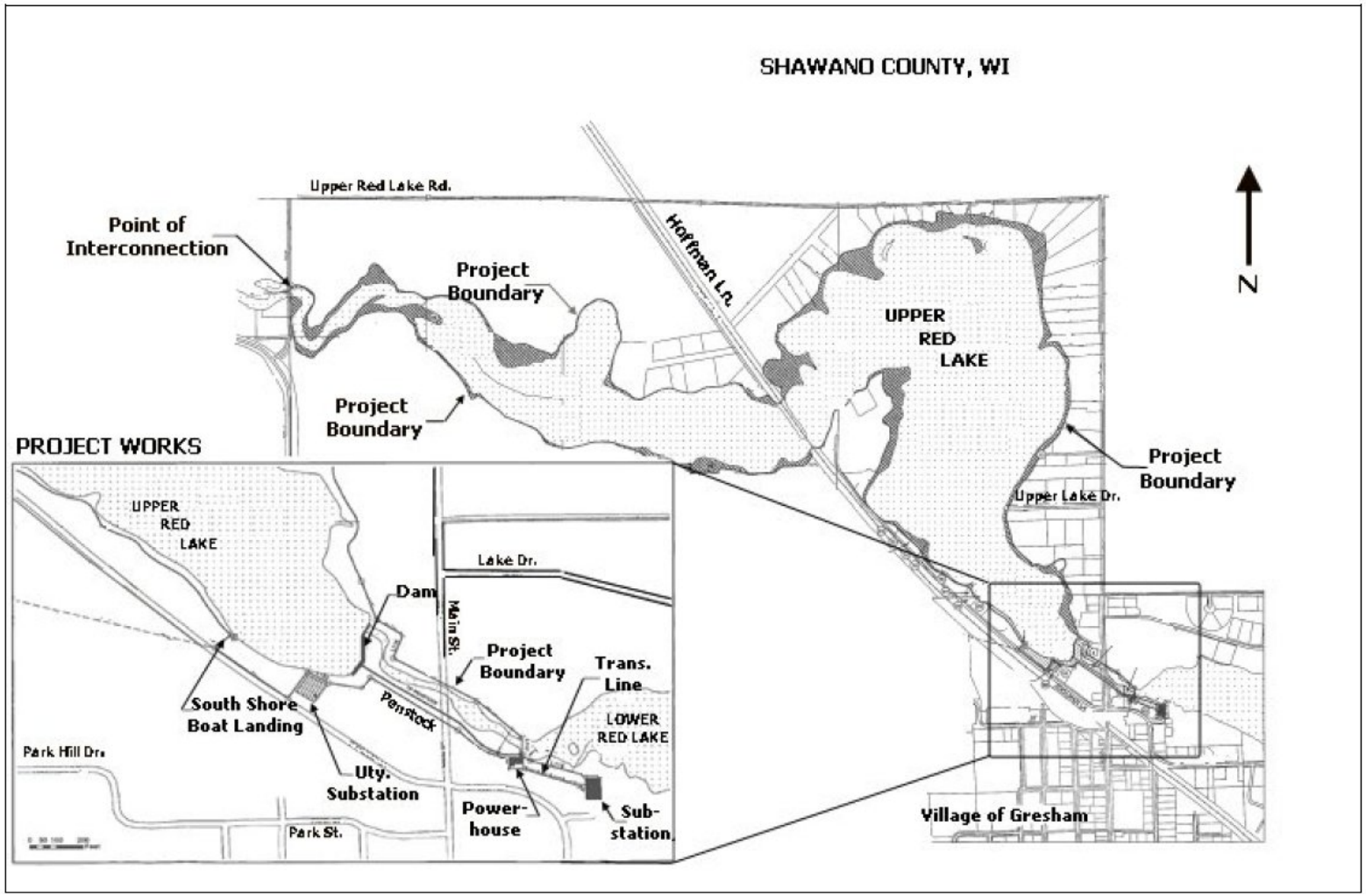

Figure 2. Project location and project works for the Upper Red Lake Project (Source: Gresham, 2013, as modified by staff).

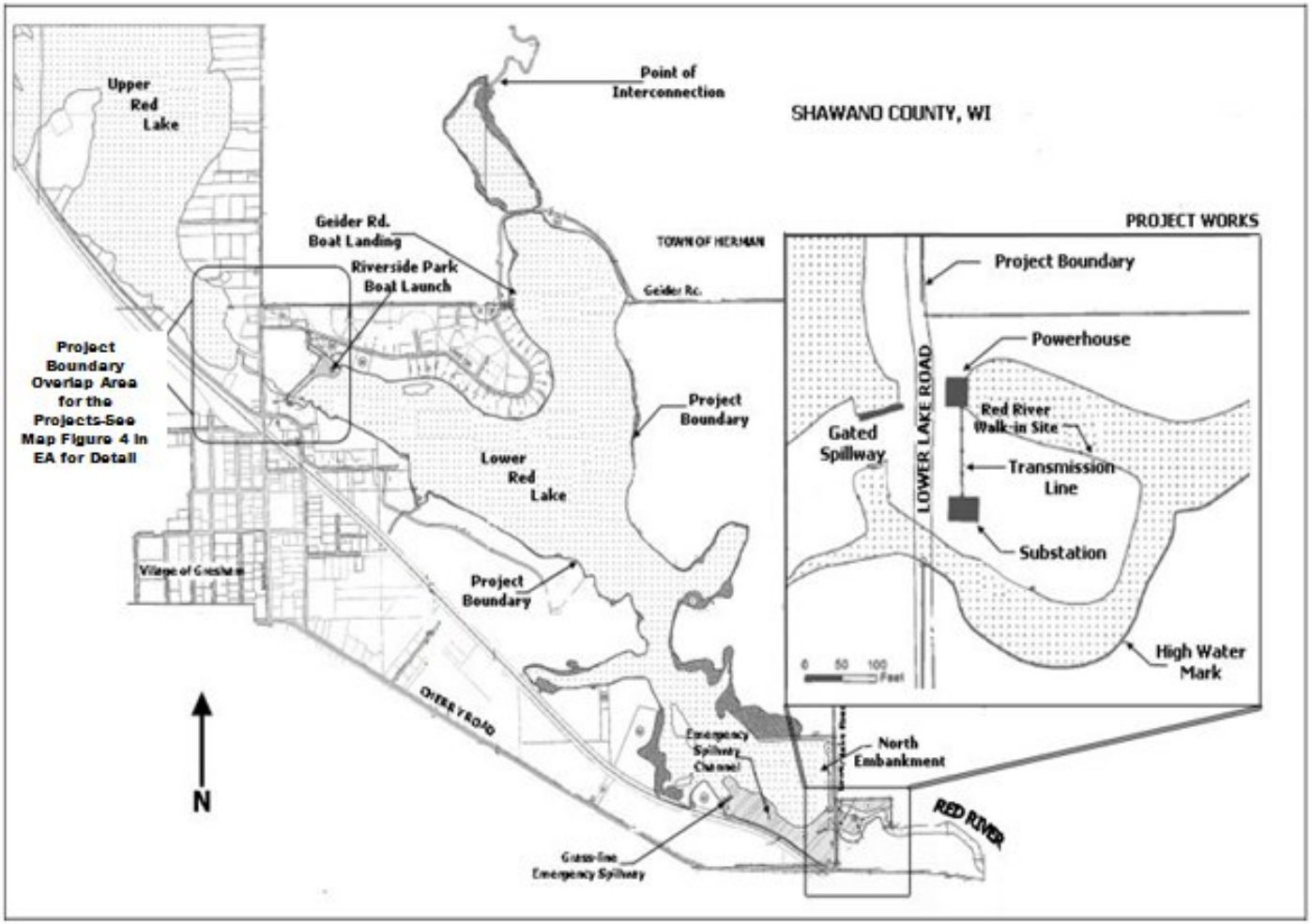

Figure 3. Project location and project works for the Weed Project (Source: Gresham, 2013, as modified by staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Upper Red Lake Project and the Weed Project (projects) is to continue to provide a source of hydroelectric power to meet the region's power needs. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue licenses to Gresham for the projects and what conditions should be placed on any licenses issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Power generated at the projects is sold to Gresham customers. Issuing subsequent licenses for the projects would allow Gresham to generate electricity at the projects for the term of any subsequent licenses, and consequently off-sets the cost of power for the applicant.

This multi-project environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act of 1969 to assess the environmental and economic effects associated with operation of the projects, alternatives to the proposed projects, and makes recommendations to the Commission on whether to issue a subsequent license for each project, and if so, recommends terms and conditions to become a part of any license issued for each project.

In this EA, we assess the effects of continued operation of the projects: (1) as proposed by Gresham (proposed action); and (2) with our recommended measures (staff alternative). For the purposes of conducting our environmental analysis, we also consider the effects of no-action. In this case, the project would continue to operate and no new environmental protection, mitigation, or enhancement measures would be implemented under the no-action alternative.

1.2.2 Need for Power

The proposed projects would provide hydroelectric generation to meet part of Wisconsin's power requirements, resource diversity, and capacity needs. The Upper Red Lake Project has an installed capacity of 275 kW and generates approximately 1.90 gigawatt hours per year. The Weed Project has an installed capacity of 620 kW and generates approximately 1.49 gigawatt-hours per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The projects

are located in the Midcontinent Independent System Operator (MISO) which falls in the Midwest Reliability Organization (MRO) of the NERC. NERC's 2015 Long-Term Reliability Assessment designates summer as the peak season for the planning reserve margin[14] in the MISO area. The anticipated planning reserve margin is forecasted to range from 16.28 percent in 2016 to 11.08 percent in 2025. The MISO area is thus forecast to meet its target reserve margin of 14.3 percent through the year 2020, but fall below the target reserve margin for the reminder of the forecast period (2016-2025).

We conclude that power from the projects would help meet a need for power in the MRO region in both the short- and long-term. The projects would provide low-cost power that displaces generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating environmental benefits.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Licenses for the proposed projects are subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce. By letter filed June 4, 2014, the Department of the Interior (Interior) requests that a reservation of authority to prescribe fishways under section 18, as delegated to the U.S. Fish and Wildlife Service (FWS), be included in any licenses issued for the projects.

1.3.1.2 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an

[14] Planning reserve margin is approximately equivalent to the following: [(capacity minus demand) divided by demand]. Planning reserve margin replaced capacity margin for NERC assessments in 2009.

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agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

The Interior filed comments and terms and conditions as recommendations pursuant to FPA section 10(j) on June 4, 2014. In section 5.3, *Fish and Wildlife Agency Recommendations* we discuss how we address the agency recommendations and comply with the requirements of section 10(j).

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On May 9, 2014, Gresham applied to the Wisconsin Department of Natural Resources (Wisconsin DNR) for 401 water quality certification (WQC) for both the Upper Red Lake and Weed Projects. Wisconsin DNR did not act on the request within 1 year from the receipt of the request; therefore, the WQC is considered waived. On June 9, 2014, the Wisconsin DNR filed comments and recommendations on the notice for ready for environmental analysis, which we have analyzed pursuant to section 10(a) of the FPA.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

Four federally listed endangered species are known to occur in the vicinity of the projects: the snuffbox mussel, the Karner blue butterfly, the northern long-eared bat, and the gray wolf. A non-essential experimental population of whooping crane is considered a proposed species in Shawano County. Our analyses of project effects on threatened and endangered species are presented in section 3.3.5, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

We find that the operation of the projects, as proposed with staff-recommended measures, would have no effect on the Karner blue butterfly, the snuffbox mussel, or the gray wolf. We also find that the operation of the Upper Red Lake Project would have no effect on the northern long-eared bat. Tree clearing within the Red River walk-in site at the Weed Project has the potential to affect habitat that may be used for summer roosting by the northern long-eared bat. However, operating the Weed Project with the staff-recommended northern long-eared bat avoidance and protection measures would not likely adversely affect the northern long-eared bat.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

In a letter filed on December 2, 2013,[15] the Wisconsin Coastal Management Program (Wisconsin CMP) stated that the projects are located outside of the state-designated coastal zone. The Wisconsin CMP further stated that: "Because the projects are located outside of the coastal zone and unlikely to affect coastal resources, Wisconsin CMP would not conduct a federal consistency review." Accordingly, certification with the Wisconsin CMP is not required.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

Pursuant to section 106 of the NHPA, Gresham consulted with the Wisconsin State Historic Preservation Office (Wisconsin SHPO) and Indian tribes to identify historic properties, determine the National Register-eligibility of the project, and assess potential adverse effects on historic properties within each project's area of potential effects (APE). These consultations and other investigations concluded that there is one historical site eligible for listing in the National Register within the APE for the Weed Project.

To meet the requirements of section 106 of the NHPA, on December 16, 1993, Commission staff executed a programmatic agreement (PA) with the Wisconsin SHPO and Michigan State Historic Preservation Office. The PA contains principals and procedures for the protection of historic properties from the effects of the operation of hydroelectric projects in the state of Wisconsin and adjacent portions of the Upper Peninsula of Michigan. The terms of the PA ensure that Gresham addresses and treats all historic properties identified within the projects' areas of potential effects (APE) through

[15] The letter was filed as Attachment 6 of the applicant's response to the Commission's letter listing deficiencies and a request for additional information.

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implementation of an HPMP for each project. Gresham prepared two HPMPs, one for each project, and filed the HPMPs on November 29, 2011. The Wisconsin SHPO concurred with both HPMPs on November 9, 2011.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. section 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping for both projects to determine what issues and alternatives should be addressed. A multi-project scoping document was distributed to interested agencies and others on February 7, 2014. We did not hold public or agency scoping meetings. Instead, we conducted paper scoping for the projects. The following entity provided written comments:

Commenting Entity	Date Filed
American Whitewater	March 10, 2014

1.4.2 Interventions

On April 9, 2014, the Commission issued a notice that Gresham had filed an application for subsequent licenses for the Upper Red Lake and Weed Projects. In an errata notice issued on April 21, 2014, the Commission set June 9, 2014, as the deadline for filing protests and motions to intervene. In response to the notice, the Wisconsin DNR filed a timely motion to intervene on May 19, 2014, and the FWS filed a timely motion to intervene on May 22, 2014.

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1.4.3 Comments on the License Applications

The April 9, 2014 notice also stated that the applications were ready for environmental analysis, and requested that comments, recommendations, terms, and conditions be filed. The following entities commented for both projects.

Commenting Agencies	Date Filed
Interior	June 4, 2014
Wisconsin DNR	June 9, 2014

Gresham filed reply comments on July 21, 2014.

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2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the projects would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.1.1 Project Description

The projects are located on the Red River downstream of the village of Gresham. The applicant proposes no new construction or development.

2.1.1.1 Upper Red Lake Project

The Upper Red Lake Project consists of the following existing facilities (see figure 2): (1) a reservoir with a surface area of 239 acres and gross storage capacity of 1,300 acre feet at normal pool elevation 933.0 feet National Geodetic Vertical Datum (NGVD); (2) a 315.75-foot-long dam, consisting of (a) a 50-foot-long north earth embankment; (b) a 42-foot-long concrete gated spillway, including one 6.83-foot-wide by 11.25-foot-high left slide gate and two 10-foot-wide by 6-foot-high slide gates; (c) a 106.75-foot-long concrete and masonry overflow section incorporating an 11-foot-wide by 2.50-foot-high trash gate; (d) an 82-foot-long concrete and masonry non-overflow section incorporating the penstock intake; and (e) a 55-foot-long south earth embankment; (3) a 680-foot-long, 6-foot-diameter steel penstock bifurcating into one 90-foot-long, 5-foot-diameter and one 90-foot-long, 4-foot-diameter steel penstocks; (4) a 25-foot-tall, 16.50-foot-diameter surge tank located approximately 70 feet upstream of the powerhouse; (5) a 61.50-foot-long, 53-foot-wide brick and concrete powerhouse containing one 175-kW generator and one 100-kW generator for a total installed capacity of 275 kW; (6) a 300-foot-long, 2.4-kilovolt (kV) transmission line; (7) a substation stepping-up the generated power from 2.4 kV to 7.2 kV; (8) the South Shore access area; and (9) appurtenant facilities. The project generates an average of 1,918 MWh annually.

2.1.1.2 Weed Project

The Weed Project consists of the following existing facilities (see figure 3): (1) a reservoir with a surface area of 244 acres and gross storage capacity of 1,200 acre feet at normal pool elevation 897.2 feet NGVD; (2) a 1,506-foot-long dam consisting of (a) a 700-foot-long north earth embankment; (b) a 20-foot-long concrete north dam; (c) a 20-foot-long reinforced concrete intake structure; (d) a 64-foot-long gated concrete spillway structure, containing four 14-foot-wide; 5-foot-high Tainter gates; and (e) a700-foot-long south earth embankment; (3) a 150-foot-long grass-lined emergency spillway located

approximately 500 feet from the end of the south earth embankment; (4) one 56.50-foot-long, 78-inch-diameter steel penstock and one 60.50-foot-long, 48-inch-diameter steel penstock connecting to the intake structure and the powerhouse; (5) a 35-foot-long, 21.50-foot-wide reinforced concrete powerhouse containing one 500-kW generator and one 120-kW generator for a total installed capacity of 620 kW; (6) a 100-foot-long, 2.4-kV transmission line; (7) a substation stepping up the generated power from 2.4 kV to 7.2 kV; (8) three recreation sites, including (a) Riverside Park, (b) Geider Road access area, and (c) Red River walk-in site; and (9) appurtenant facilities. The project generates about 1,487 MWh annually.

2.1.2 Project Safety

The projects have been operating for more than 50 years under the existing licenses and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operation, compliance with the terms of the license, and proper maintenance. As part of the relicensing process, Commission staff would evaluate the continued adequacy of the proposed project facilities under subsequent licenses. Special articles would be included in any licenses issued, as appropriate. Commission staff would continue to inspect the projects during the subsequent license terms to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures. In addition, in the case of the Weed Project, any license issued would require an inspection and evaluation every 5 years by an independent consultant and submittal of the consultant's safety report for the Commission review.

2.1.3 Existing Project Operation

Upper Red Lake Project

The Upper Red Lake and the Weed Projects are operated as run-of-river, that is, the sum of the inflows to each project impoundment approximate the discharge from each project in a nearly instantaneous way without any significant storage. Project personnel monitor flows at the upstream U.S. Geological Survey (USGS) river gage to forecast changes in project inflows.

Under normal-flow conditions, the Upper Red Lake Project's headwater elevation is maintained at or within 6 inches of the normal pool elevation of 933.0 feet NGVD. There is no minimum flow requirement for the bypassed reach. The project is operated

remotely by means of a Supervisory Control and Data Acquisition (SCADA)[16] system with programmable logic control. During low-flow conditions (about 100 cubic feet per second [cfs] or less), river flows exceeding 10 cfs are passed through the smaller generating unit by adjusting the wicket gates. When inflows exceed the small unit's maximum hydraulic capacity of approximately 90 cfs, the headwater level rises. When a pre-programmed reservoir level is achieved, the larger unit comes online and the smaller unit goes offline. If inflows continue to rise, the smaller unit comes back online alongside the larger unit. In the event flows begin to fall, the two turbines wicket gates are adjusted to match inflow.

Under high-flow conditions exceeding the combined hydraulic capacity of 250 cfs, one or more of the three vertical slide gates are opened to release inflow exceeding 250 cfs. The slide gates and the spillway also serve to pass all inflows in the event the generating units are taken offline for maintenance or other reasons.

Weed Project

Under normal-flow conditions, the Weed Project's headwater elevation is maintained at or within 6 inches of the normal pool elevation of 897.2 feet NGVD. A minimum flow of 7 cfs is maintained in the bypassed reach. The project is operated remotely by means of a SCADA system with programmable logic control. For low-flow conditions (about 100 cfs or less), river flows exceeding 10 cfs are passed through the smaller generating unit by adjusting its wicket gates up to unit's maximum hydraulic capacity of 90 cfs. When inflows exceed the small unit's maximum hydraulic capacity, the headwater level rises causing a portion of the inflows to pass over the spillway. When a pre-programmed reservoir level is achieved, the larger unit comes online and the smaller unit goes offline. If flows continue to rise to 250 cfs or greater, excess flows would either be passed over the spillways or the smaller generating unit may be placed online together with the larger unit. In the event flows begin to fall, the two turbines wicket gates are adjusted to match inflow.

Under high-flow conditions exceeding the combined hydraulic capacity of 330 cfs, one or more of the spillway's four Tainter gates are opened. The Tainter gates would also pass the entire river flow in case both units need to be taken offline for maintenance or for other reasons.

During cold weather, both projects are monitored for ice build-up. In case the gates freeze and need to be operated, a steamer truck is employed to de-ice them and maintain run-of-river operation. In addition, the Upper Red Lake Project is equipped with mechanical water agitators to prevent ice formation.

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[16] Supervisory Control and Data Acquisition (SCADA) is a computer system that monitors and controls equipment and machinery in real-time eliminating the need for routine checks and improving reliability of the plant.

Both projects have the headwater elevations and generated output recorded both electronically and manually. Tailwater elevations at the Weed Project are monitored by a pressure transducer and recorded hourly.

2.2 APPLICANT'S PROPOSAL

2.2.1 Project Facilities

Gresham proposes to modify the current project boundary at the Upper Red Lake Project to include a parking area at the South Shore access area, which provides access to the existing project boat launch and fishing/launching pier. Gresham also proposes to modify the project boundary to exclude privately-owned residences surrounding the Lions Club boat launch.[17]

Gresham proposes to modify the project boundary at the Weed Project to include the Geider Road access area, a project recreation facility that provides a winter "drive-on" access point for ice fishing and other winter lake activities. At the Geider Road access area, Gresham proposes to include the access area and its parking area, in the project boundary. At the Riverside Park, Gresham proposes to remove from the project boundary athletic fields and other buildings unrelated to project operation.

2.2.2 Proposed Project Operation

Gresham proposes to operate both projects in a run-of-river mode, whereby outflow from each project approximately equals inflow to each project reservoir. Under proposed project operation, the water surface elevation of the Upper Red Lake Project reservoir would be maintained at 933.0 feet NGVD ±3 inches and water surface elevation of the Weed Project reservoir would be maintained at 897.2 feet NGVD ±3 inches. Gresham proposes to operate the Weed Project in a run-of-river mode with minimum downstream fluctuations, and maintain the current project operation with a minimum flow of 7 cfs bypassed through the dam to the spillway. No new or upgraded facilities, structural changes, or operational changes are proposed for the projects.

2.2.3 Proposed Environmental Measures

In addition to the operational measure above, Gresham proposes the following measures to protect or enhance environmental resources and improve recreational opportunities at the projects.

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[17] The Gresham Lions Club boat launch is not a project recreation facility; however, it does provide access to the reservoir.

Upper Red Lake Project

- Operate the project in a run-of-river mode, maintaining the Upper Red Lake Project reservoir water surface elevation at 933.0 feet NGVD ±3 inches.
- Prepare an operation compliance monitoring plan to verify run-of-river operation, by monitoring: (1) headwater elevations in the Upper Red Lake Project reservoir with an existing headwater ultrasonic water surface elevation sensor; and (2) turbine output.
- Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation.
- Prepare a recreation plan within 1 year of license issuance to enhance recreation resources.[18]
- Continue to operate and maintain the boat landing, accessible fishing/launching pier, boat ramp, and parking area at the South Shore access area.
- Install picnic tables and benches at the South Shore access area.
- Implement an Historic Properties Management Plan (HPMP), filed on November 29, 2011.[19]

Weed Project

- Prepare an erosion management plan for the Weed Project tailrace channel to describe the potential factors for the erosion observed in the Weed Project tailrace channel and develop mitigation measures.
- Continue to operate the project in a run-of-river mode, maintaining the Weed Project reservoir water surface elevation at 897.2 feet NGVD ±3 inches.
- Continue to provide a minimum flow of 7 cfs to the spillway channel.
- Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation;
- Prepare a recreation plan within 1 year of license issuance to enhance recreation resources.[20]

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[18] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures. We assume that the purpose of the applicant's proposal to develop a recreation plan would be to guide the management of the existing recreation facilities, as well as any proposed recreation enhancements.

[19] The Wisconsin SHPO approved the HPMP, entitled *Historic Resources Management Plan for the Upper Red Lake Dam Hydroelectric Project, FERC No. 2484*, in a letter filed on November 9, 2011.

- Continue to operate and maintain: (1) Riverside Park; (2) the Geider Road access area; and (3) the swimming area, canoe/kayak put-in site, and parking area at the Red River walk-in site.
- Continue to maintain a tree berm[21] at the Red River walk-in site.
- Install a fishing dock and benches at the Riverside Park boat landing.
- Develop a picnic area at the Red River walk-in site.
- Install an ornamental fence and signage at an informal beach access site to eliminate use of the site and direct recreationists to the Red River walk-in site, located across the river.
- Implement an HPMP filed on November 29, 2011.[22]

2.3 STAFF ALTERNATIVE

Under the staff alternative, the projects would include the following modifications to Gresham's proposal and some additional staff-recommended measures, which apply to both projects unless otherwise noted.

- Prepare an erosion and sediment control plan for the Weed Project for the ground-disturbing activities associated with construction of the proposed recreation facility improvements.
- Modify the proposed operation compliance monitoring plan for the Upper Red Lake Project to include provisions to: (1) install staff gages both upstream and downstream of the project; (2) install an automatic water level recording device downstream of the project; and (3) maintain hourly records of project operation on a daily basis to document compliance with the operational requirements of any license issued for the project.
- Prepare an operation compliance monitoring plan for the Weed Project to include provisions to: (1) install staff gages both upstream and downstream of

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[20] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures. We assume that the purpose of the applicant's proposal to develop a recreation plan would be to guide the management of the existing recreation facilities, as well as any proposed recreation enhancements.

[21] The tree berm at the Red River walk-in site is located along the southeastern shoreline of the peninsula, and is also referred to in the application as a "tree buffer."

[22] The Wisconsin SHPO approved the HPMP, entitled *Historic Resources Management Plan for the Weed Dam Hydroelectric Project, FERC No. 2464*, in a letter filed on November 9, 2011.

the project; and (2) maintain hourly records of project operation on a daily basis to document compliance with the operational requirements of any license issued for the project.

- Modify the proposed invasive species management plan to include: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance; (3) educational signage; (4) staff training; and (5) monitoring.
- For the Weed Project, to protect northern long-eared habitat, avoid cutting northern long-eared bat forage or roosting trees between April 1 and October 31, and where trees need to be removed, only remove trees equal or greater than 3 inches in diameter at breast height between November 1 and March 31.
- Modify the proposed recreation plan for the Upper Red Lake Project to include: (1) all proposed recreation measures; (2) installing picnic tables and benches at the South Shore access area; and (3) conceptual drawings.
- Modify the proposed recreation plan for the Weed Project to include: (1) all proposed recreation measures; (2) upgrade the existing informal parking area by paving or with gravel; (3) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (4) signage for the existing facilities; (5) conceptual drawings; and (6) posting information on water levels downstream of the Weed Project on a public website.
- Implement the statewide Wisconsin PA for the projects.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing a non-power license; (2) Federal Government takeover of the project; and (3) retiring the project.

2.4.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license for either project, and we have no basis for concluding that the projects should no longer be used to produce power. Thus, we do not consider issuing a non-power license for either project a realistic alternative to relicensing in this circumstance.

2.4.2 Federal Government Takeover of the Projects

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the projects would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the projects.

2.4.3 Retiring the Projects

Project retirement could be accomplished with or without removal of the dams. Either alternative would involve denials of the license applications and surrender or termination of the existing licenses with appropriate conditions. No participant has suggested that dams or powerhouse removals would be appropriate in this case, and we have no basis for recommending it. The reservoirs formed by the dams serve other important purposes, such as use for recreational activities. Thus, dam removals are not a reasonable alternative to relicensing the project with appropriate protection, mitigation, and enhancement measures.

The second project retirement alternative would involve retaining the dams and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the projects is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

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3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the projects' vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative* of the EA.[23]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Upper Red Lake and Weed Projects are located on the Red River in Shawano County, Wisconsin, and are within the Red River Watershed. The drainage area at the Weed Project is estimated at 164 square miles. The Red River originates in Langlade County, near the community of Phlox, Wisconsin, flows southeast across the Stockbridge-Munsee Reservation, through Upper Red Lake and then Lower Red Lake (the reservoir for the Weed Project) in Gresham, Wisconsin, before its confluence with the Wolf River, approximately 12 miles east of Gresham, Wisconsin. The Upper Red Lake Project is located on the southeast portion of Upper Red Lake, and Weed Project is located less than two miles downstream on the southeast portion of Lower Red Lake. The Red River has a relatively steep gradient and many rapids and falls, with an average gradient of 13.5 feet per mile and some stretches having a gradient as high as 19 feet per mile.

The topography of northern Wisconsin reflects Pleistocene glaciations, which deposited glacial till and carved the landscape. Gresham, Wisconsin's terrain is relatively hilly, with elevation changes of up to 250 feet and land generally sloping towards the shorelines of Upper Red Lake and Lower Red Lake. The region's climate is strongly influenced by the waters of Green Bay and Lake Michigan. The climate is generally humid, and can be characterized by cold, snowy winters, and relatively short, warm summers. January is typically the coldest month, averaging 15.3 degrees Fahrenheit

[23] Unless otherwise indicated, our information is taken from the applications for license for these projects filed by Gresham on June 10, 2013, and the response to deficiencies and requests for additional information filed by the applicant on December 2, 2013, as noted in section 7.0, *Literature Cited*.

(°F); July is typically the warmest month, averaging 70.4°F. Average annual precipitation is 30.41 inches, with most precipitation usually occurring during June.

The Red River comprises 8 percent of the total land use area for the village of Gresham. Vegetated areas in the project area include forests, wetlands, and grasslands. Major land uses in the project area are agricultural, industrial, residential, and commercial.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

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

Based on our review of the license applications and agency and public comments, we have not identified any resources that may be cumulatively affected by the continued operation and maintenance of the Upper Red Lake and Weed Projects.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that geology and soils, aquatic resources, terrestrial, threatened and endangered species, recreation, and cultural resources may be affected by the proposed action and action alternatives. We have not identified any substantive issues related to socioeconomics associated with the proposed action; therefore, we do not assess environmental effects on socioeconomics in this EA. Land use is addressed in the terrestrial and recreation sections. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative* section.

3.3.1 Geological and Soil Resources

3.3.1.1 Affected Environment

The topography of northern Wisconsin reflects the effects of the last stage of Pleistocene glaciations. As recently as 12,000 years ago, an immense sheet of glacial ice

covered the region. Originating in the Hudson Bay region of Canada, this glacier flowed to the southwest, splitting into numerous glacial lobes as it move into the basins now occupied by the Great Lakes. One lobe, called the Green Bay lobe, flowed through the Green Bay basin and covered much of eastern Wisconsin. As it advanced and retreated, this lobe deposited large quantities of sediment (glacial drift or till), burying the pre-existing landscape and creating depositional landforms that remain to the present day.

A variety of glacial drift landforms are found near the Upper Red Lake and Weed Projects. Sand and gravel outwash sediments that were deposited by a relatively narrow melt water stream are found along the Wolf River from Keshena (located approximately 8 miles east-northeast of Gresham) to the Wolf and Red River confluence. Because the river has incised since the time of the outwash deposition, outwash deposits stand as dissected terraces 30 to 50 feet above the river. To the east of the confluence lies an area of ground moraine, which is composed of a heterogeneous mixture of sediments deposited directly beneath glacial till. The ground moraine is characterized by shallow swales and low hills. To the west lies an area of end moraine made up of glacial till deposited at the glacier's terminus. End moraine topography is characterized by steep-sided hills and enclosed depressions called "kettles."

To the south and east of the Weed and Upper Red Lake Projects lie extensive areas of lacustrine sediments. These sediments were deposited in a large pre-glacial lake that occupied a pre-existing bedrock valley, which extended from northeast of Shawano to the Lake Poygan-Lake Winnebago area in east-central Wisconsin. Near the City of Shawano, located approximately 15 miles southeast of both projects, lake deposits tend to be sandy and limited in a real extent, and to the south they are finer-grained and more widespread. Lacustrine plains typically feature large, shallow natural lakes. The county's largest lake, the 6,180-acre Shawano Lake, lies in the flat lacustrine plain immediately northeast of the city of Shawano.

The bedrock underlying the projects is the Wolf River Granite of the Middle Proterozoic Erathem within the Precambrian Eonothem. Outcrops of this red granite are massive with widely spaced joints. The foundation bedrock for the projects' impoundments is granite, a part of a primarily granitic and anorthositic intrusive pluton,[24] which is approximately 60 to 70 miles in diameter. The pluton is ringed by faults to the north, west, and south, with the reservoirs near the center of the pluton. In general, the pluton is bordered by metamorphic and igneous extrusive rocks to the north, west, and south. Toward the east to southeast, undifferentiated sandstones, limestones, shales, and mudstones of the Cambrian System border the pluton and apparently overlie the ring-faults in this area.

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[24] A pluton is igneous rock that is crystallized from magma slowly cooling below the surface of the Earth.

The terrain in the vicinity of the village of Gresham is relatively hilly with elevation changes of up to 250 feet. Within the village, land generally slopes toward the shorelines of Upper Red Lake and Lower Red Lake. Soils in the vicinity of both projects are predominantly loamy sands.

3.3.1.2 Environmental Effects

Gresham conducted an assessment of the stream bank erosion in the both Weed Project tailrace channel and bypassed reach. An evaluation of erosion factors in the Weed Project tailrace channel identified a "very high" potential for stream bank erosion at three locations and a "moderate" potential at two locations. Six locations of active erosion were observed in the Weed Project tailrace channel. To address the erosion along the Weed Project tailrace channel, Gresham proposes to develop an erosion management plan.

Gresham proposes improvements to the recreational facilities at the Weed Project that would result in land-disturbing activities, which could cause localized soil erosion. Soil and sediments eroded from construction sites would adversely affect water clarity, which would reduce sunlight penetration and thereby limit photosynthesis by aquatic plants. Eroded soils and sediments would also cause the transfer of nutrients and other pollutants downstream, and degrade habitats and spawning areas of aquatic organisms.

Our Analysis

Upper Red Lake was formed by the construction of the Upper Red Lake Project dam in 1880. The Upper Red Lake Project powerhouse discharges directly into the pool of Lower Red Lake, which was formed by the construction of Weed dam in 1967. The shoreline of both Upper Red Lake and Lower Red Lake consist of bedrock or boulders or are covered with vegetation such as grass or cattail marsh, which serves to protect the shoreline from erosion. A survey was conducted to document reservoir shoreline erosion for both the Upper Red Lake and the Weed Projects. Survey results indicate that the shorelines of both reservoirs do not have any areas of active erosion and appear to be stable. Also, because the Upper Red Lake Project discharges directly to the Weed Project reservoir, there is no potential for the Upper Red Lake Project to cause stream bank erosion.

The Weed Project powerhouse discharges into the tailrace channel and joins the tailrace channel approximately 300 feet downstream of the powerhouse. Sand, with some gravel, is the dominant sediment along the toe of the streambanks as well as immediately upstream of the tailrace channel confluence with the bypassed channel. Figure 4 shows the distribution of sediment sizes in the tailrace channel. The thalweg[25] of the tailrace

[25] The lowest points along the length of a river bed.

channel is comprised of bedrock to a point approximately 150 feet downstream from the powerhouse, where it begins to be covered with coarse sediment. Downstream of the bedrock, the flow depth decreases and the coarse sediment transitions to finer materials such as gravel and sand. A large riffle, which is located at the confluence of the tailrace channel with the bypassed reach channel consists primarily of gravel and cobble mixed with a significant amount of sand. Although a significant amount of sand is present within the riffle, the gravel and cobble were not embedded. The sediment present in the tailrace is characteristic of a stream channel within equilibrium, and there is no evidence of aggradation or degradation of the stream bed.

An assessment of the stream bank erosion potential was made downstream of Weed Project dam by evaluating multiple stream bank erosion factors using the Bank Erosion Hazard Index (BEHI) methodology. BEHI includes the following factors: bank height ratios, rooting density, vegetation characteristics, bank angle, and bank material characteristics. The stream bank erosion assessment also included the use of Wisconsin DNR's Bank Erosion Potential Index (BEPI) methodology, which was adapted from BEHI methodology. BEPI integrates an estimate of near bank stress and the potential hydraulic influence of structures. The BEHI and BEPI methodologies were used to evaluate the erosion potential at five locations in the tailrace channel, two locations on the left (north) bank[26] and three on the right (south) bank. For comparison, four locations were evaluated in the bypassed reach, three locations on the left (north) bank and one location on the right (south) bank.

The assessment found a "very high" potential for stream bank erosion at three locations in the tailrace channel, and a "moderate" potential for stream bank erosion at three locations in the bypassed channel and at two locations in the tailrace channel. Figure 4 shows the locations of the assessment results that were assigned a "moderate" or "very high" erosion potential. The "very high" potential for stream bank erosion at the three locations in the tailrace channel results from high stream bank height ratios, unconsolidated stream bank soils, stratification of stream bank soils at or near ordinary high water, and vegetation characteristics such as shallow rooting depth and low root densities. The stratified layer consists of unconsolidated sand / gravel beneath a thin clay/loam soil layer.

Although the BEHI / BEPI assessment found three locations with a "moderate" potential for stream bank erosion in the bypassed reach, no areas of active stream bank erosion were observed in the bypassed reach channel.

[26] When looking downstream.

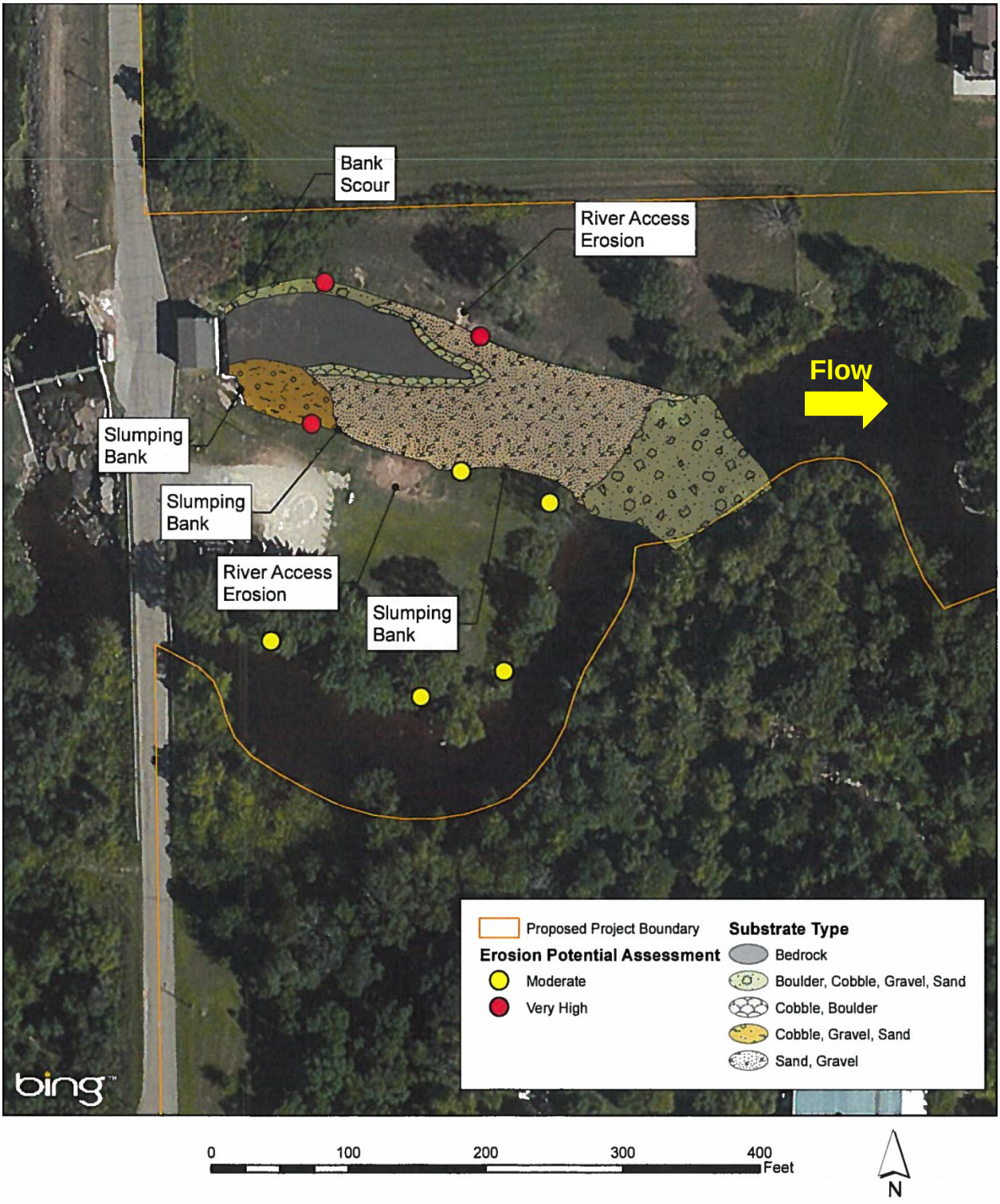

Figure 4. Locations of stream bank erosion of the Weed Project (Source: Gresham, 2013a).

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Six areas of stream bank erosion were observed in the tailrace channel with two areas of erosion located on the left (north) bank and four areas located on the right (south) bank. Figure 4 shows the locations of stream bank erosion. Two isolated areas of significant stream bank erosion were identified along both the left (north) and right (south) banks of tailrace channel approximately 170 feet downstream of the powerhouse. This erosion is likely caused by human and animal foot traffic because the erosion is concentrated at recreational access points to the river.

One area of erosion is present on the left (north) bank of the tailrace channel immediately downstream of the Weed Project powerhouse. This area of erosion, which is adjacent to the thalweg appears to be caused by high near-bank stress resulting from flow exiting the powerhouse. The stream bank material is comprised primarily of non-cohesive sand and gravel. The stream bank is stabilized by dense riparian woody tree and shrub vegetation having root depths extending below ordinary high water. Although stream bank erosion exists in the tailrace channel on the left (north) bank immediately downstream of the powerhouse, no active slumping or potential failure of the stream bank was observed to be present at this location.

Three areas of erosion caused by slumping failures were observed to be present along the right (south) bank of the tailrace channel. One area of slumping is adjacent to the powerhouse and the other areas of slumping are located about 100 feet and 200 feet downstream of the powerhouse. The slumping failures likely result from seepage from the noncohesive layer of sand and gravel that lies below a thin layer of clay / loam soil that is approximately 6 inches thick. The shallow root system of the herbaceous groundcover allowed the stream flow at and below ordinary high water to erode the clay / loam soil, to expose the underlying sand and gravel.

The six areas of stream bank erosion observed in the tailrace channel result from three separate processes including: (1) human and animal traffic that are concentrated at recreational access points to the river (see section 3.3.6, *Recreation and Land Use Resources)*; (2) high near-bank stress resulting from flow exiting the powerhouse; and (3) slumping failures from seepage from the noncohesive layer of sand and gravel that lies below a thin layer of clay / loam soil that is approximately 6 inches thick.

Gresham proposes to develop an erosion management plan that would outline procedures to implement mitigation measures to comply with state water quality standards. Elements of the proposed erosion management plan would include:

- a description of the active erosion areas within the Weed Project tailrace channel;
- a description of the potential contributing factors causing erosion at the site;
- a description and evaluation of erosion abatement alternatives;
- justification for a selected alternative;
- the cost to implement the selected alternative; and
- a schedule to implement the selected alternative.

Although Gresham proposes to develop an erosion management plan, it did not state that the plan would be prepared after consultation with the Wisconsin DNR. Consulting with the Wisconsin DNR would ensure that appropriate assessment methods would be included in the plan and would also ensure the potential mitigation measures included in the plan would be appropriate and consistent with measures used on other streams in Wisconsin.

The implementation of measures to mitigate channel bed and bank erosion areas would maintain the stability of the Red River, limit the amount of sediment entering the water, protect lands adjacent to the channel bank, and protect water quality and aquatic habitat.

Gresham proposes improvements to the recreational facilities at the Weed Project that would result in land-disturbing activities, which could cause localized soil erosion and adversely affect water quality. Developing an erosion and sediment control plan to include appropriate measures that, when implemented, would limit the quantity of soil eroded from the proposed construction areas and the subsequent transport of the eroded soil from these disturbed areas. The erosion and sediment control plan should include a schedule for revegetating disturbed areas, including a specific provision for replacing vegetation with plant species indigenous to Wisconsin. Implementing BMPs during construction of the proposed improvements to the recreational facilities at the Weed Project would protect water quality, terrestrial resources, and aquatic habitat from construction-related activities through avoidance and minimization of soil erosion and sediment mobilization.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

The Red River is 43 river miles (RM) long and empties into the Wolf River near Shawano, Wisconsin. The Weed Project is located on the Red River in the Village of Gresham, Wisconsin, approximately 1.5 RM downstream of the Upper Red Lake Project dam and 10.5 RM upstream of the confluence of the Red and Wolf Rivers. The Upper Red Lake Project discharges directly into the reservoir of the Weed Project, which then discharges into the Red River. The Upper Red Lake Project dam impounds approximately 239 acres, with a storage capacity of 1,300 acre feet, and the Weed Project dam impounds approximately 244 acres and has a storage capacity of 1,200 acre feet. The drainage areas at the Upper Red Lake and Weed Projects are approximately 134 and 164 square miles, respectively.

The USGS operates a stream gage (USGS gage no. 04077630) on the Red River, near Morgan, Wisconsin, located about 5 RM upstream of Upper Red Lake Project. For each project, streamflows were estimated by prorating the gaged flows by 24 percent at the Upper Red Lake Project dam and 44 percent at the Weed Project dam to account for

the larger drainage areas at the projects. Based on the period of record, 1992 to 2012, for USGS gage no. 04077630, the lowest and highest mean monthly flows at the Weed Project occur in January (132 cfs) and April (297 cfs), respectively (table 1); the mean annual flow at the Weed Project is about 180 cfs. For the Upper Red Lake Project, the lowest and highest mean monthly flows occur in January and February (108 cfs) and April (241 cfs), respectively (table 2); the mean annual flow at the Upper Red Lake Project is about 146 cfs.

Data collected USGS gage no. 04077630 for the period of record was also used to create annual flow-duration curves[27] for the Weed (figure 5) and Upper Red Lake Projects (figure 6). Based on the period of record, 1992 to 2013, median flow, which is the flow that occurs approximately 50 percent of the time (50th percentile) in a given year, is approximately 120 and 150 cfs for the Upper Red Lake Project and Weed Project, respectively(table 1).

Table 1. Estimated Minimum, Mean, and Maximum Monthly Flows (cfs) at the Weed Project, prorated from USGS (gage no. 04077630) flow data using the period of record (1992-2012) (Source: Gresham, 2013a).

Month	Minimum	Mean	Maximum
January	81	132	216
February	86	133	428
March	98	194	1202
April	112	297	1050
May	96	221	563
June	102	216	1371
July	92	164	576
August	94	158	867
September	86	152	262
October	95	171	471
November	105	171	467
December	84	146	317

[27] A flow duration curve, also known as a flow exceedance curve, is a graphical representation of the percentage of time in the historical record that a water flow of any given magnitude has been equaled or exceeded (U.S. Environmental Protection Agency, 2011).

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Table 2. Estimated Minimum, Mean, and Maximum Monthly Flows (cfs) at the Upper Red Lake Project, prorated from USGS (gage no. 04077630) flow data using the period of record (1992-2012) (Source: Gresham, 2013a).

Month	Minimum	Mean	Maximum
January	66	108	176
February	70	108	347
March	80	158	977
April	91	241	853
May	78	180	457
June	83	175	1114
July	75	133	468
August	76	129	704
September	70	124	509
October	77	139	383
November	85	139	374
December	68	118	257

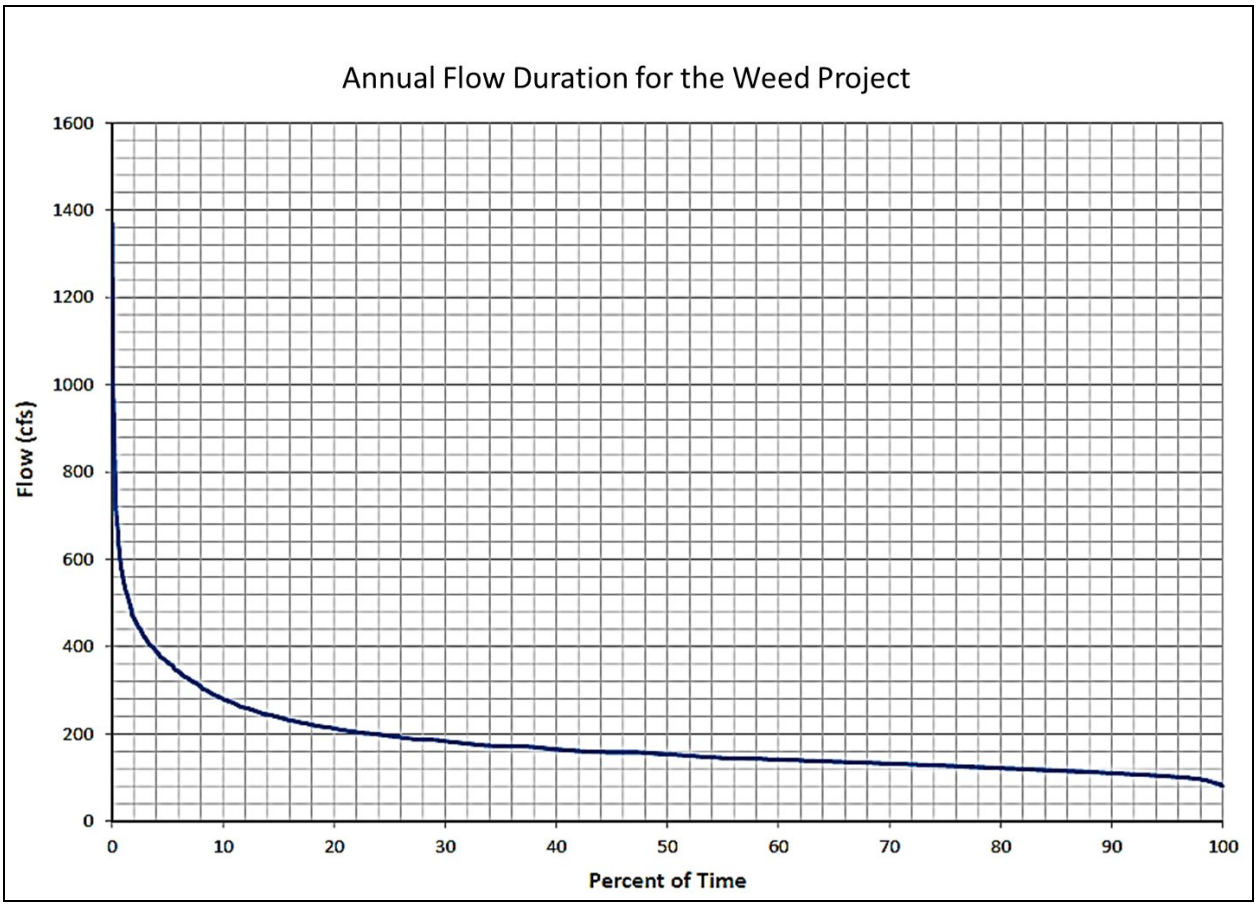

Figure 5. Percent of time flows exceed the associated daily mean annual flow at the Weed Project from October 1992 through April 2013 (Source: Gresham, 2013a; as modified by staff).

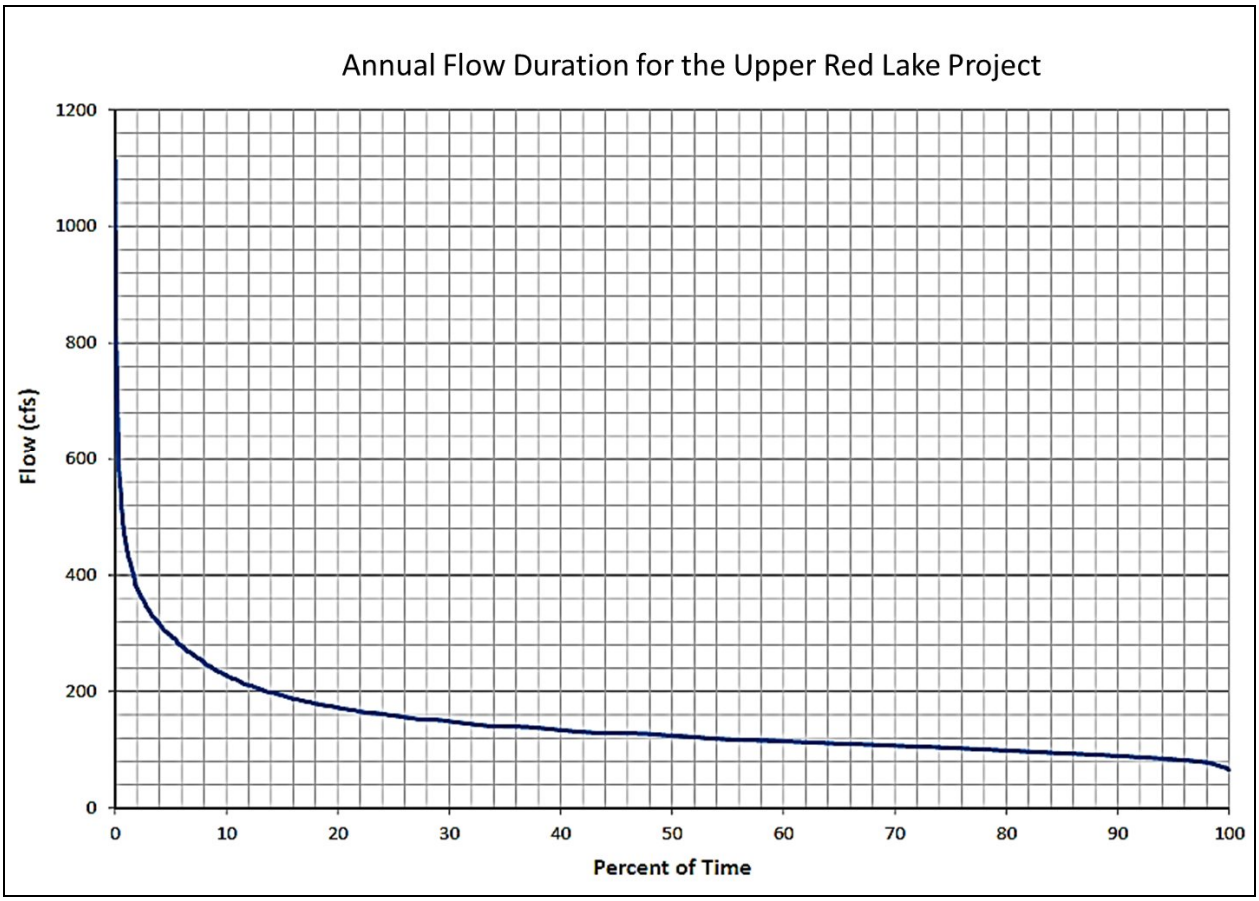

Figure 6. Percent of time flows exceed the associated daily mean annual flow at the Upper Red Lake Project from October 1992 through April 2013 (Source: Gresham, 2013a; as modified by staff).

Existing Project Operation

Under the existing licenses, both the Upper Red Lake Project and Weed Project are required to operate in a run-of-river mode. The Weed Project is required to maintain a minimum bypass spillway flow of 7 cfs; there are no minimum flow requirements for the Upper Red Lake Project. Operation of the projects is further discussed in section 2.1.3, *Existing Project Operation*.

Water Quality

The State of Wisconsin sets surface water quality standards based on specified designated uses. Designated uses are goals or intended uses for surface waterbodies in Wisconsin which are classified into the categories of: (1) Fish and Aquatic Life; (2) Recreation; (3) Public Health and Welfare; and (4) Wildlife (Wisconsin DNR, 2012a):

• Fish and Aquatic Life: All surface waters are considered appropriate for the protection of fish and other aquatic life. Surface waters vary naturally with respect to factors like temperature, flow, habitat, and water chemistry. This variation allows

different types of fish and aquatic life communities to be supported. This category has subcategories as described below.

• Recreational Use: All surface waters are considered appropriate for recreational use unless a sanitary survey has been completed to show that humans are unlikely to participate in activities requiring full body immersion.

• Public Health and Welfare: All surface waters are considered appropriate to protect for incidental contact and ingestion by humans. All waters of the Great Lakes as well as a small number of inland water bodies are also identified as public water supplies and have associated water quality criteria to account for human consumption.

• Wildlife: All surface waters are considered appropriate for the protection of wildlife that relies directly on the water to exist or rely on it to provide food for existence.

Waters are monitored to collect water quality data to determine, or assess, its current status or condition. Wisconsin's assessment process begins with water quality standards. Wisconsin DNR is authorized to establish water quality standards that are consistent with the Federal Clean Water Act (Public Law 92-500) through Chapter 281 of the Wisconsin Statutes. These water quality standards are explained in detail in chapters: NR 102, 103, 104, 105, and 207 of the Wisconsin Administrative Code. Table 3 provides a summary of the Wisconsin water quality standards for temperature and dissolved oxygen (DO) applicable to the Red River and the projects reservoirs for fish and aquatic life.

Table 3. Summary of selected Wisconsin water quality standards applicable to the Upper and Lower Red Lakes and the Red River (Source: Gresham, 2013a and Wisconsin DNR, 2012a, as modified by staff).

	Water Quality Criteria	
Water Body	Dissolved Oxygen (DO)	Temperature
Red River	no lower than 6.0 milligrams per liter (mg/L) and no lower than 7.0 mg/L during fish spawning season	no greater than 73 degrees Fahrenheit (ºF)
Upper and Lower Red Lakes	no lower than 5.0 mg/L	no greater than 86 ºF

For reservoirs, the Wisconsin DNR focuses its monitoring efforts on game fish population dynamics along with water quality parameters (e.g., temperature, DO) to assess a specific lake or reservoir's fish and aquatic life designated use. These

parameters correlate strongly with fish and other aquatic life communities (e.g., macroinvertebrates and aquatic plants) within a lake or reservoir. For rivers, the Wisconsin DNR uses biological indices[28] to determine whether current water quality conditions support the Fish and Aquatic Life designated use.

The Wisconsin DNR uses monitoring to assess waters and place evaluated waters into condition categories (excellent, good, fair and poor). Waters assigned the condition category of "excellent" are considered to be attaining applicable water quality standards and fully supporting their assessed designated uses. Waters assigned the condition category of "good" are also considered to be attaining applicable water quality standards and supporting their assessed designated uses. Waters described as "fair" are also meeting their designated uses, but may be in a condition that warrants additional monitoring in the future to assure water conditions are not declining. Waters assigned the "poor" condition category may not be attaining water quality standards or assessed designated use(s).

According to the Wisconsin DNR (2013, 2015a, 2015b, and 2015c), each project reservoir as well as the Red River (upstream of the Upper Red Lake Project and downstream of the Weed Project) have been recently assessed for the following designated uses: (1) Fish and Aquatic Life; and (2) Public Health and Welfare (Fish Consumption). Table 4 provides a summary of results of these condition assessments. Overall, the results show that both projects' reservoirs and the Red River are meeting applicable water quality standards and supporting their assessed designated uses.

Table 4. State of Wisconsin condition assessment results for each project reservoir and the Red River (Source: staff).

	Condition		
Designated Use	**Upper Red Lake Project reservoir**	**Weed Project reservoir**	**Red River**
Fish and Aquatic Life	Excellent	Good	Good
Public Health and Welfare (Fish Consumption)	Good	Good	Good

[28] Biological indices are numerical index values or narrative expressions that describe the presence, condition, and quantities of different aquatic organisms (e.g., fish, mussels, macroinvertebrates) in order provide information about the health of an aquatic ecosystem.

Fishery Resources

Fish Community

The Red River basin supports a diverse fishery. Common fish species found in the Upper Red Lake and Weed Project reservoirs include northern pike, largemouth bass, smallmouth bass, perch, black bullhead, and various species of sunfish (e.g., bluegill, black crappie, and pumpkinseed). River reaches upstream and downstream of the Upper Red Lake and Weed Project reservoirs are commonly inhabited by hornyhead chub, common shiner, white sucker, northern hog sucker, shorthead redhorse, and smallmouth bass.

During 2007, the Wisconsin DNR (2007) conducted fish surveys in both the Upper Red Lake and Weed Project reservoirs. Results of the surveys are summarized below:

Upper Red Lake Project Reservoir

Northern pike was the dominant gamefish[29] sampled in the Upper Red Lake Project reservoir and abundance was above average compared to other impoundments in the area. Largemouth bass were found slightly below average abundance and made up a small portion of the gamefish population. However, according to the Wisconsin DNR (2007), the northern pike and largemouth bass population in the project reservoir could be considered one of the highest quality fisheries in the area.

Bluegill was the dominant panfish[30] sampled in the Upper Red Lake Project reservoir and abundance appeared to be above average when compared to other water bodies in the area. Black crappie was found in above average abundance and made up a substantial portion of the panfish catch. Yellow perch were found in low abundance and made up a very small portion of the overall catch. Other species sampled in lesser numbers included rock bass, pumpkinseed, brown bullhead, yellow bullhead, white sucker, warmouth, golden shiner, shorthead redhorse, and common shiner.

Weed Project Reservoir

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[29] Wisconsin DNR (2015d) defines gamefish as all varieties of fish (including those commonly referred to as panfish), except rough fish and minnows. Rough fish include: suckers, common carp, Asian carp (silver, bighead, black and grass), goldfish, redhorse, freshwater drum, burbot, bowfin, gar, buffalo, lamprey, alewife, gizzard shad, smelt, mooneye, and carpsuckers. Minnows include: suckers, mud minnow, madtom, stonecat, killifish, topminnow, silverside, sticklebacks, trout perch, darters, sculpins, and all species in the minnow family (except goldfish and carp).

[30] Panfish are a type of gamefish that are considered small at maturity.

Similar to the Upper Red Lake Project reservoir, Northern pike was the dominant gamefish sampled in the Weed Project reservoir; however, abundance was below average when compared to other impoundments in the area. Largemouth bass were found in low abundance and made up a small portion of the gamefish population. However, the Wisconsin DNR (2007) states that the Weed Project reservoir supports quality largemouth bass and northern pike populations.

Bluegill was also the dominant panfish sampled in the Weed Project reservoir and abundance was considered to be above average when compared to other water bodies in the area. Black crappie made up a small portion of the panfish catch. Bullhead species (mostly brown bullhead) were found in high abundance and made up a large portion of the overall catch. Other species sampled in lesser numbers included rock bass, pumpkinseed, yellow perch, white sucker, green sunfish, golden shiner, and walleye.

Red River

In 2011, the Wisconsin DNR (2012b) conducted a comprehensive fish, mussel, and aquatic habitat survey (comprehensive aquatic survey) of the Red River downstream of the Weed Project. A total of 3,502 fish representing 33 species were collected during the survey. The most frequently encountered and common species were common shiner, hornyhead chub, bluegill, smallmouth bass, rock bass, white sucker, and logperch. The most frequently encountered and common gamefish were bluegill, smallmouth bass, and rock bass. Index of biotic integrity[31] scores based on warmwater fish assemblages ranged from 90 to 100, indicating the overall environmental quality of the Red River below the Weed Project is excellent. Logperch, the primary host for the federally endangered snuffbox mussel, were collected at the lower three sites but were not found at the sampling site immediately downstream of the Weed Project. Although several state threatened and special concern fish species occur in the Wolf River, downstream of the Shawano Dam, located approximately 4 RM downstream of the Red River's confluence with the Wolf River, none were collected in the Red River during the survey. Relative abundance and size structure metrics for smallmouth bass, an important and popular gamefish in the Red River, were considered above average when compared to other Northern Wisconsin warmwater rivers and natural reproduction was evident at all sampling sites (Wisconsin DNR, 2012b).

Aquatic Habitat

As part of Wisconsin DNR's (2012b) comprehensive aquatic survey, aquatic habitat conditions were qualitatively examined for the Red River from the Weed Project dam downstream to its confluence with the Wolf River. For the survey, the Red River

[31] The index of biotic integrity is a multi-metric index that rates the existing structure, composition, and functional organization of a fish assemblage and is used to assess the health of aquatic ecosystems.

was broken down into four reaches (figure 7); results are summarized below according to reach:

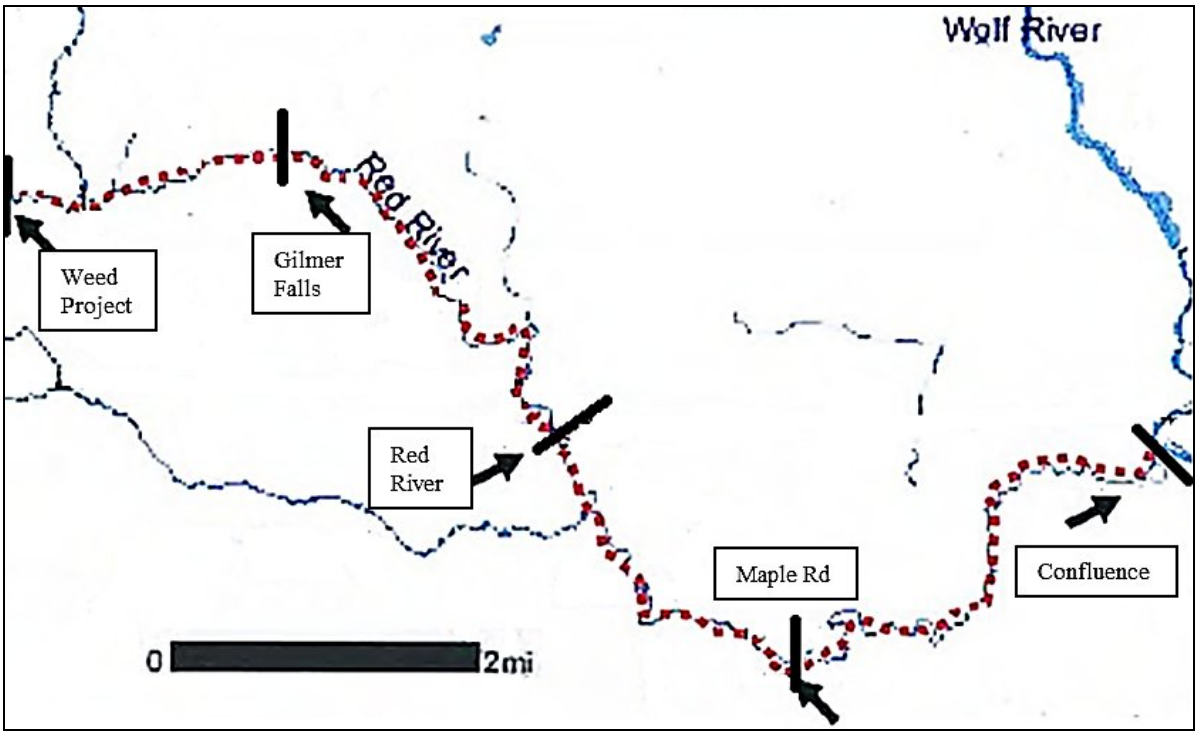

Figure 7. Map showing reaches one through four assessed during Wisconsin DNR's (2012b) comprehensive aquatic survey in the Red River downstream from the Weed Project (Source: Gresham 2013a, as modified by staff).

Reach 1 (Weed Project to base of Gilmer Falls): The stream channel in this reach consisted primarily of deeper run and pool habitats. Substrates consisted of primarily gravel, cobble, and bedrock. Submergent vegetation was found throughout the entire length of the reach. Several granitic bedrock outcroppings were found in this reach that creates substantial chutes/waterfalls. Freeman Falls and Gilman Falls, located approximately 1.3 and 2.1 miles, respectively, downstream from the Weed Project were identified as potential barriers to upstream fish movement.

Reach 2 (Gilmer Falls to Red River): Several small waterfalls are located in this reach. Both the downstream and upstream ends of the station were delineated by a large pool. Habitat was predominantly riffle and runs. Substrates consisted of gravel, cobble, sand and granitic bedrock.

Reach 3 (Red River to Maple Rd): Riffle and runs dominated the reach with some pool habitat. Substrates were dominated by gravel and cobble. Aquatic vegetation was present in some of the deeper run habitats.

Reach 4 (Maple Rd to Confluence): This portion of the Red River is characterized by lower gradient and more sinuosity. Substrates appeared to be dominated by sand and silt with lesser amounts of gravel.

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Freshwater Mussels

As part of the Wisconsin DNR's (2012b) comprehensive aquatic survey, a freshwater mussel distribution and abundance study was conducted on the Red River in 2011. Specifically, three qualitative surveys were conducted upstream of the Upper Red Lake Project and five qualitative and two quantitative surveys were conducted downstream of the Weed Project (figure 8). Qualitative sampling at nine sites on the Red River collected a total of 15 freshwater mussel species, two of which were represented by dead shells only. Eight mussel species were found in the upper reach, but only four were represented by live individuals, as compared to 13 mussel species found in the lower reach with 12 represented by live individuals (table 5). Quantitative sampling conduced at two sites on the Red River collected a total of 14 mussel species, four of which were represented by dead shells only (table 6). Mussel density and diversity showed an increase with increasing depths, and were greater in water velocities between 0.5 and 1.3 feet per second (fps) and decreased with lower or higher velocities. Seven state listed species were found during sampling; however, the federally endangered snuffbox mussel was not observed (see table 5 and table 6). The snuffbox mussel is further discussed in section 3.3.5, *Threatened and Endangered Species*.

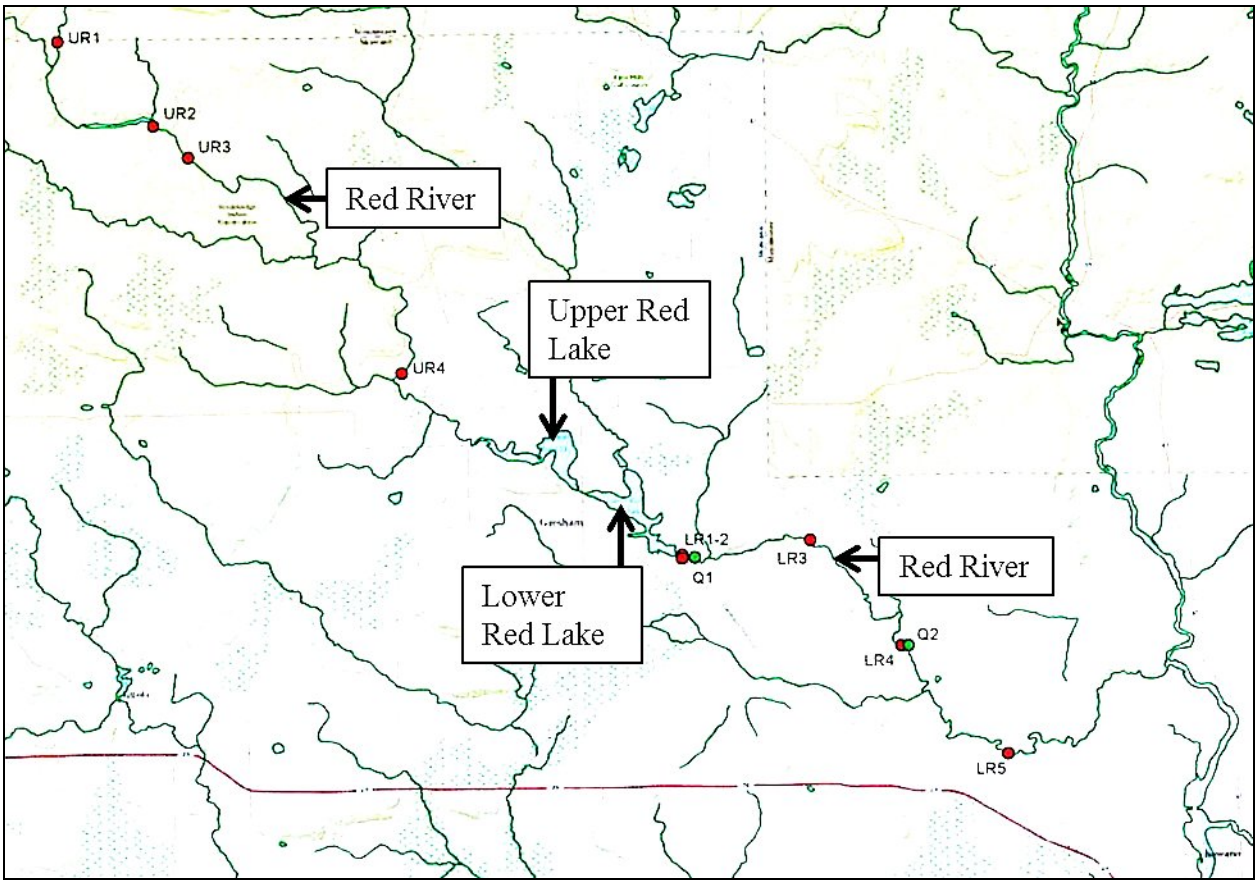

Figure 8. Map of Wisconsin DNR's (2012b) mussel survey site locations on the Red River. Red dots indicate qualitative site locations and green dots indicate quantitative site locations. UR = Upstream of the Upper Red Lake Project, LR = Downstream of the Weed Project, and Q = quantitative sampling site (Source: Gresham, 2013a; as modified by staff).

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Table 5. Number and percent (%) of live mussels collected in the Red River both upstream of the Upper Red Lake Project and downstream of the Weed Project during qualitative sampling in 2011. SC =State special concern species, ST =State threatened, SW = State watch, and FE = Federal endangered (Source: Gresham, 2013a, as modified by staff).

SPECIES		Red River: Above Upper Red Lake Project		Red River: Below Weed Project		Total	
		Live	%	Live	%	Live	%
Actinonaias ligamentina	SW	0	0.0	413	23.6	413	23.2
Alasmidonta marginata	SC	0	0.0	10	0.6	10	0.6
Alasmidonta viridis	ST	0	0.0	0	0.0	0	0.0
Anodontoides ferussacianus		0	0.0	3	0.2	3	0.2
Amblema plicata		-	-	-	-	-	-
Elliptio dilatata		0	0.0	560	32.0	560	31.4
Epioblasma triquetra	FE	-	-	-	-	-	-
Fusconaia flava		0	0.0	33	1.9	33	1.9
Lampsilis cardium		0	0.0	65	3.7	65	3.6
Lampsilis siliquoidea		4	12.5	7	0.3	11	0.6
Lasmigona complanata		-	-	-	-	-	-
Lasmigona compressa	SW	5	15.6	0	0.0	5	0.3
Lasmigona costata		22	68.8	605	34.6	627	35.2
Leptodea fragilis		-	-	-	-	-	-
Ligumia recta	SW	0	0.0	5	0.3	5	0.3
Obliquaria reflexa		-	-	-	-	-	-
Obovaria olivaria		-	-	-	-	-	-
Pleurobema sintoxia	SW	0	0.0	2	0.1	2	0.1
Potamilus alatus		-	-	-	-	-	-
Pyganodon grandis		1	3.1	37	2.1	38	2.1
Quadrula pustulosa		-	-	-	-	-	-
Quadrula quadrula	SC	-	-	-	-	-	-
Simpsonaias ambigua	ST	-	-	-	-	-	-
Strophitus undulatus		0	0.0	11	0.6	11	0.6
Toxolasma parvus		-	-	-	-	-	-
Tritogonia verrucosa	ST	-	-	-	-	-	-
Truncilla truncata		-	-	-	-	-	-
Uterbackia imbecillis	SW	0	0.0	0	0	0	0.0
Total live mussels		32		1751		1783	
Total live species		4		12		13	

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Table 6. Number of live mussels and dead shells found by species according to site (Q1 and Q2) during quantitative sampling conducted on the Red River downstream of the Weed Project in 2011. SC =State special concern species, ST =State threatened, and SW = State watch (Source: Gresham, 2013a, as modified by staff).

Site		Species	Alive	Dead
Q1	SW	A. ligamentina	154	144
Q1	SC	A. marginata	3	32
Q1		P. grandis	61	88
Q1		A. ferussacianus	8	18
Q1		E. dilatata	27	49
Q1		F. flava	53	47
Q1		L. siliquoidea	0	8
Q1		L. cardium	14	133
Q1	SW	L. compressa	1	6
Q1		L. costata	244	153
Q1	SW	L. recta	1	0
Q1		P. sintoxia	0	3
Q1		S. undulates	28	67
Site total			594	748
Q2	SW	A. ligamentina	70	87
Q2	ST	A. viridis	2	0
Q2		A. marginata	1	0
Q2		P. grandis	4	1
Q2		E. dilatata	464	559
Q2		F. flava	2	3
Q2		L. siliquoidea	0	99
Q2		L. cardium	1	11
Q2		L. costata	7	15
Q2	SW	L. recta	0	4
Q2		S. undulates	4	5
Site total			555	784

Aquatic Invasive Species

Eurasian milfoil and curly-leaf pondweed, exotic invasive aquatic plant species found throughout Wisconsin, are present in both the Upper Red Lake Project reservoir and Lower Red Lake Project reservoir. Eurasian water milfoil is particularly abundant, and was the most dominant aquatic species (out of 20 total species) found in the Weed Project reservoir and the second most dominant aquatic species (out of 16 total species) found in Upper Red Lake Project reservoir (Hoyman and Heath, 2008). Invasive species are further discussed in section 3.3.4, *Terrestrial Resources.*

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3.3.2.2 Environmental Effects

Mode of Operation

Fluctuations in reservoir levels and instream flows downstream of hydropower projects have the potential to adversely affect water quality and aquatic resources by contributing to shoreline erosion; increasing water turbidity; dewatering macroinvertebrates, mussels, fish, and fish nests; and preventing the establishment of aquatic vegetation that can provide cover and forage for fish. The extent of such effects depends to a large extent on the timing, magnitude, and frequency of the reservoir or instream flow fluctuations. To minimize the fluctuation of the water surface elevations in both project reservoirs and maintain stable flows and water surface levels downstream of each project, Interior recommends and Gresham proposes to operate both projects in a run-of-river mode.[32]

Gresham proposes to continue to operate the Upper Red Lake and Weed Projects as currently operated. Specifically, Gresham proposes to maintain the Upper Red Lake Project reservoir at a normal pool elevation of 933.0 feet NGVD and the Weed Project reservoir at a normal pool elevation of 897.2 feet NGVD such that these headwater elevations do not fluctuate beyond ±0.25 foot (±3.0 inches). Similarly, Interior recommends that Gresham maintain each reservoir at a normal pool elevation such that the elevation does not fluctuate beyond ±0.30 foot (±3.6 inches). Interior also recommends that the headwater elevation at each project reservoir not fluctuate the full range of its recommended ±0.30 foot within a 24-hour period. Further, Interior recommends that: (1) any deviations from this range be returned to the target elevation[33] as soon as possible and reported to the FWS via email within 2 hours of discovery; and (2) any planned deviation outside of ±0.30 foot be considered in consultation with the resource agencies, including the FWS, prior to implementing any such deviation.

Our Analysis

Operating the projects in a run-of-river mode, whereby outflow from each project approximately equals inflow to each project reservoir, and maintaining each reservoir at a target elevation such that the reservoir elevation does not fluctuate beyond ±0.25 foot, as proposed by Gresham, would enable project operation to maintain reservoir levels the

[32] Operating in a run-of-river mode is defined here as operating a project such that outflow from the project approximately equals inflow to the project reservoir.

[33] Because Interior recommends that Gresham maintain each reservoir at a specified water surface elevation within a range of ±0.30 foot, we assume that Interior defines "target elevation" as 933.0 feet NGVD (±0.30 foot) for the Upper Red Lake Project and 897.2 feet NGVD (±0.30 foot) for the Weed Project.

same as those experienced under existing conditions. Maintaining these relatively stable reservoir levels would protect fish and other aquatic organisms that rely on nearshore habitat for feeding, spawning, and cover. Interior's recommendation to maintain each reservoir at a target elevation ±0.30 foot, which is similar but less restrictive than Gresham's proposal, would enable project operation to maintain reservoir levels comparable to those experienced under existing conditions. However, because Gresham's proposal is more restrictive than Interior's recommendation, it would likely be more protective of potentially affected resources. Interior also recommends that the headwater elevation at each project reservoir not fluctuate the full range of its recommended ±0.30 foot range within a 24-hour period. However, Interior did not provide a rationale for specifically limiting fluctuations to no more than 0.30 foot over a 24-hour period and it is unclear what benefit would be gained from implementing this measure.

Scheduled maintenance activities and dam safety inspections, as well as adverse conditions or emergencies, may create situations whereby Gresham is unable to comply with its proposal to continue operating the projects in a run-of-river mode. Interior's recommendation for Gresham to consult with the resource agencies prior to any planned deviations outside of its recommended ± 0.30 foot range and return the reservoir target elevations to within its recommended range as soon as possible after such a deviation would help to prevent or alleviate any negative effects that exceedances of the recommended range may have on fish and wildlife resources. However, taking actions to remediate deviations and contacting the resource agencies, not only for planned deviations outside of either Interior's recommended ± 0.30 foot range or Gresham's proposed ± 0.25 foot range, but for all planned or unplanned deviations whereby Gresham is unable to comply with its run-of-river operation, would add an extra level of protection for resources that could be affected by such an event.

Interior recommends that any deviations outside of the ± 0.30 foot range be reported to FWS via email within 2 hours of discovery. However, Interior did not provide a rationale for recommending such a specific reporting requirement and it is unclear what added benefit emailing the FWS within such a short, 2-hour period of time upon discovering a deviation would have in protecting potentially affected resources or in preventing future deviations. Rather, in the event of any deviation from run-of-river operation, remediating the deviation first, and then contacting the resource agencies and the Commission as soon as possible, but no later than 10 days after an incident, would allow for Gresham to focus its efforts on resolving any such noncompliance event and develop methods to avoid future deviations, as necessary.

Operation Compliance Monitoring

For the Upper Red Lake Project, Gresham proposes to prepare an operation plan to specify measures that would be implemented to monitor and verify its proposed run-of-river operation. The plan would also contain provisions for monitoring headwater elevations with an existing headwater ultrasonic water surface elevation sensor and

recording turbine generator output. Gresham does not formally propose to prepare an operation plan for the Weed Project; however, as discussed below, the Weed Project is currently operating under a run-of-river plan that was approved by Commission order issued June 18, 2010.[34]

For both projects, Interior recommends that Gresham develop a plan to monitor compliance with its recommendations for project operation, as discussed above, and employ mechanisms to document inflow to and discharge from the projects. Specifically, Interior recommends that the plan include provisions for: (1) installing automatic digital water level and flow recorders both upstream and downstream of each project; [35] (2) installing publically visible staff gages both upstream and downstream of each project; and (3) making flow information publicly available on a website and electronically on demand. Similarly, Wisconsin DNR recommends that Gresham prepare an operation plan for the projects that details how compliance with run-of-river will be achieved and maintained. Specifically, Wisconsin DNR recommends that the plan includes provisions for: (1) installing water level recorders; (2) installing staff gages; and (3) reporting deviations from run-of-river operational requirements. [36]

Additionally, because Gresham has had a history of non-compliance with the run-of-river operation requirement under the existing license for the Weed Project, Interior recommends that Gresham either modify or replace their current turbines, or discontinue use of the larger of the two turbines under conditions that could produce rapid or frequent fluctuations in downstream flows.

Compliance History

Gresham has been in overall compliance with its current run-of-river operation requirement under the existing license for the Upper Red Lake Project. However, Gresham has had difficulties complying with its current run-of-river operation requirement under the existing license for the Weed Project because of the automation of power generation and the size differential of the two turbine units, which results in pulsing when the project switches between turbines. During the switch from one turbine to the other, there is a period when outflow from the powerhouse nearly stops, which results in downstream flow fluctuations.

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[34] 131 FERC ¶ 62,245 (2010).

[35] In its letter filed June 4, 2014, Interior emphasized its recommendation that digital water level and flow sensors be installed upstream of the Upper Red Lake Project and downstream of the Weed Project (downstream of the tailrace and spillway confluence) to document and monitor compliance with run-of-river operation.

[36] Wisconsin DNR did not state how many staff gages or water level recorders it was recommending or specify where its recommended staff gages and water level recorders would be located.

During the Commission's 2007 investigation of compliance with the run-of-river requirement, records showed that water levels downstream of the Weed Project fluctuated by approximately 1 foot multiple times per day. In a letter issued by the Commission on January 17, 2008, Gresham was requested to file a run-of-river plan. After consultation with FWS and Wisconsin DNR, on November 11, 2009, Gresham filed a run-of-river plan, which was approved in a Commission order issued on June 18, 2010.[37] The 2010 order noted that Gresham's run-of-river plan includes all the necessary equipment to monitor run-of-river compliance,[38] and that operation records for the period of December 1, 2009 through March 1, 2010 showed that adjustments made to the automated system had reduced downstream fluctuations by approximately 6 inches. The Commission's order also noted that the licensing process would provide an opportunity for Gresham to further address run-of-river operation and that Gresham should continue to make any necessary adjustments to its generation units or automated system to further reduce downstream fluctuations.

Our Analysis

Preparing an operation compliance monitoring plan for each project, after consultation with the resource agencies, would enable Gresham to document the procedures it would employ to demonstrate compliance with any license requirements for operating the projects, including but not limited to, operating the projects in a run-of-river mode and maintaining reservoir level requirements.

Installing automatic digital water level and flow recorders both upstream and downstream of each project, as recommended by Interior, would likely provide information that would be beneficial to monitoring compliance with run-of-river operation at the projects. However, installing new digital water level and flow recorders would not be necessary to monitor compliance at the projects given that other options, as discussed below, are available that would include using Gresham's monitoring equipment that is already installed at the projects.

Reservoir water levels at both projects are currently monitored by headwater ultrasonic water surface elevation sensors that includes an automated dialer system that notifies operators if headwater levels exceed pre-determined levels. Including in an operation compliance monitoring plan for each project a provision for publically visible staff gages to be installed upstream of each project, as recommended by Wisconsin DNR

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[37] 131 FERC ¶ 62,245 (2010).

[38] To monitor and verify run-of-river operation at the Weed Project, Gresham maintains records of: (1) headwater elevations using an ultrasonic water surface elevation sensor; (2) tailwater elevations using a pressure transducer; and (3) turbine generator output.

and Interior, [39] and including a provision to clearly demarcate the required reservoir water elevation limits on the agencies recommended staff gages, would provide an informational tool regarding the operational requirements of each project compared to existing water surface elevations within each reservoir and would help ensure that the operational requirements of each project are met.

Gresham's existing pressure transducer at the Weed Project is adequate for detecting the magnitude and duration of any downstream flow fluctuations that may occur as a result of project operation. Additionally, the location of Gresham's existing pressure transducer at the Weed Project allows for monitoring on a year-round basis. Conversely, placing a digital flow/ water level recording device downstream of the tailrace and spillway confluence of the Weed Project, as recommended by the Interior, could subject the device to potential malfunction due to ice buildup during the winter months.

Currently, Gresham does not actively monitor tailwater elevations at the Upper Red Lake Project and Gresham's proposed operation plan does not include a provision to monitor tailwater elevations. Including in an operation compliance monitoring plan, a provision to install an automatic water level recording device downstream of the Upper Red Lake Project would enable water levels to be electronically recorded and monitored on a continual basis. Also, installing visible staff gages both upstream and downstream of each project would provide a numerical benchmark for the water surface elevation of each project reservoir and tailrace, and enable for Gresham to calibrate each water level sensor, as necessary.

Gresham currently maintains records of turbine generator output for each of the projects, which can be used to calculate flows by developing turbine generator rating curves. According to USGS (2014), calculated discharge ratings from project generation are considered very reliable and accurate as long as project turbines are well-maintained. Additionally, there is a USGS gaging station (No. 04077630) located approximately 5 RM upstream of the Upper Red Lake Project that provides real-time and historical flow (i.e., discharge) information that Gresham uses as a benchmark to help determine flows at the projects. Therefore, Interior's recommendation to install new automatic digital flow and water level recorders would not be necessary to determine inflows and outflows at the projects.

Preparing an operation compliance monitoring plan for each project with provisions to: (1) maintain the existing reservoir ultrasonic water surface elevation sensors at each project; (2) maintain the existing pressure transducer below the Weed

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[39] Given that both Interior and Wisconsin DNR recommend installing staff gages, for the purposes of this analysis, we assume that Wisconsin DNR's recommendation for staff gages is the same as Interior's in terms of quantity and placement locations.

Project; (3) install an automatic water level recording device downstream of the Upper Red Lake Project; and (4) install staff gages both upstream and of each project, would include all the necessary equipment needed to monitor run-of-river compliance at the projects.

Additionally, preparing an operation compliance monitoring plan for each project, after consultation with the resource agencies, that includes a provision to specify the procedures and protocols for maintaining, locating, and calibrating all monitoring equipment and any other measuring devices that Gresham would use to confirm compliance with run-of-river operation, would provide quality assurance and quality control for all collected data that would be used to measure water levels and determine inflows and outflows at the projects. This, in turn, would eliminate the need for Interior's recommended streamflow monitoring devices at the projects.

Availability of Compliance Data

Interior recommends that Gresham make flow information publicly available on a website and available in electronic format upon request.

Our Analysis

As noted in the 2010 Commission order approving Gresham's run-of-river plan, the Weed Project already has all the necessary equipment to monitor run-of-river compliance. Therefore, web-based discharge (i.e., flow) and stage (i.e., water level) data is not necessary to ensure the compliance with run-of river license requirements at the Weed Project. However, as discussed above, Gresham has had difficulties complying with its current run-of-river operation requirement under the existing license for the Weed Project due to downstream flow fluctuations, and these fluctuations have the potential to adversely affect aquatic resources in the Red River downstream of the project. Posting downstream water level/flow information on a public website for the Weed Project would allow the Commission and the resource agencies to access and monitor downstream water level/flow fluctuation any time without making a specific data request to Gresham. Because Gresham already measures and records water levels downstream of the Weed Project using its existing pressure transducer, it would be practicable for Gresham to provide this type of information to the public via a website. Additionally, as discussed in section 3.3.6, *Recreation and Land Use Resources*, because the Red River walk-in site downstream of the Weed Project is popular for whitewater rafting and kayaking, posting water surface elevations and correlated flows on a public website would allow recreational users to efficiently plan trips to the project site as well as help inform recreational users of safe boating conditions.

Currently, real-time discharge and stage information from USGS stream gage no. 04077630 located approximately 5 RM upstream of the Upper Red Lake Project is

available online.[40] Given the close proximity of the USGS gage to the Upper Red Lake Project, and the fact that Gresham uses this gage as a benchmark to help determine inflows to each of the projects, posting flow information online would not likely provide any additional information beyond that already provided by the USGS that would be beneficial to inform the public or resource agencies of flows entering either project. Additionally, Gresham has not had difficulties maintaining stable surface water levels in either the Upper Red Lake Project reservoir or the Weed Project reservoir. Given that each project operates in such a manner as to maintain stable reservoir levels within a specified range, clearly marking the required reservoir water elevation limits on the agencies recommended reservoir staff gages would largely serve the same purpose as posting any flow/water level related information online.

However, preparing an operation compliance monitoring plan for each project, with provisions to maintain hourly records of project operation on a daily basis, including reservoir elevations, tailwater elevations, turbine output, and calculated flows through each project, and providing this information in electronic format to the agencies upon request, would allow for independent review of water levels and flows at each of the projects by the resource agencies. Additionally, providing this information to the Commission upon request would allow the Commission to verify and document compliance with the operational provisions of any licensed issued for either project. Verifying compliance would, in turn, prevent possible misunderstandings of project operation and reduce the likelihood of noncompliance.

Weed Project Turbine Modifications

As discussed above, during operation at the Weed Project when switching between the different sized turbines, there is a period when outflow from the powerhouse nearly stops, which results in downstream flow fluctuations. Therefore, to protect aquatic resources downstream of the project from the negative effects of these unnatural flow fluctuations, Interior recommends that Gresham either modify or replace their current turbines or discontinue use of the larger of the two turbines under conditions that could produce rapid or frequent fluctuations in downstream flows.

Our Analysis

In a letter filed June 4, 2014, Interior acknowledged that Gresham has been working diligently to correct this flow fluctuation issue, but that fluctuating flows are still occurring as a result of project operation. On October 5, 2015, Gresham filed the results of a trial run-of-river operation plan, which was initiated as part of the relicensing process in the summer of 2013. Included in the filing was a summary of a teleconference held between Gresham and Wisconsin DNR on September 3, 2015 to discuss the results of the

[40] See: http://waterdata.usgs.gov/nwis/uv/?site_no=04077630&agency_cd=USGS.

trial run-of-river operation plan. In the summary, Gresham noted that data from May through August of 2015 showed a marked reduction in the frequency of downstream fluctuations compared to the 2014 data. Gresham attributed these reductions, in part, to a refurbishment of the larger generating unit that now allows it to pass lower flows. [41] According to the summary, Wisconsin DNR agreed with Gresham's assessment, concluding that the 2015 data demonstrates a substantial improvement in run-of-river operation. The teleconference summary was distributed to Wisconsin DNR and FWS via email on September 3, 2015; no follow up comments were filed by the resource agencies.[42]

Based on the information provided in Gresham's October 5, 2015 filing, the modification of the large generating unit that allows it to pass lower flows appears to meet the intent of Interior's recommendation. Moreover, for any license issued for the project, the Commission would reserve the authority to require Gresham to make modifications to its project facilities or operation in the event it can no longer demonstrate compliance with run-of-river operation.

Communication and Consultation

Interior recommends that Gresham consult with the FWS on matters affecting fish and wildlife throughout the term of any licenses issued for the projects. The Wisconsin DNR recommends that Gresham prepare a communication/consultation plan to consult with the resource agencies for all aspects of the hydroelectric operation and site management with the potential to affect natural resources.

Our Analysis

As stated above in *Project Operation*, Gresham proposes to operate both projects in a run-of-river mode. Contacting the resource agencies for all planned or unplanned deviations whereby Gresham is unable to comply with its run-of-river operation would be a component of the operation compliance monitoring plan, and would allow for the resource agencies to be promptly alerted to any deviation which could potentially affect fish and wildlife resources. Additionally, Gresham proposes to prepare numerous plans after consultation with the resource agencies related to fish and wildlife resources, such as plans to manage invasive species and control erosion. Moreover, plans considered under the staff alternative would be prepared after consultation with the resource agencies. Because each plan includes consultation with the resource agencies, it would allow the opportunity to develop protocols, as necessary, for communication over the

[41] The Commission's 2010 order allowed for Gresham to make adjustments to its generation units for the purpose of reducing downstream fluctuations.

[42] See email correspondence between Commission staff and Gresham (filed October 19, 2015).

term of any subsequent licenses issued for the projects. Therefore, developing a separate communication/consultation plan to consult with the agencies on the operation and site management of the projects would be redundant and unnecessary.

Freshwater Mussels

Hydropower project operation that causes large or rapid fluctuations in impoundment levels and release volumes have the potential to adversely affect aquatic habitat by contributing to shoreline erosion, exposing shallow water shoreline habitats, and stranding mussel and fish species. To minimize reservoir fluctuations and maintain stable conditions for aquatic resources (e.g., mussels) in the Red River downstream of the Weed Project, the Interior recommends and Gresham proposes to operate the projects in a run-of-river mode.

Our Analysis

Freshwater mussels are considered good indicators of the health of aquatic ecosystems because of habitat requirements that include free-flowing streams and rivers with stable substrates composed of a mixture of gravel, sand, and silt deposits (Parmalee and Bogan, 1998; Williams et al. 1993). Excess sedimentation in river systems has been shown to adversely affect mussel species, which as filter feeders, require clean, well-oxygenated water (Brim-Box and Mossa, 1999). The disappearance of native freshwater mussels may indicate degraded water quality and habitat.

As discussed in section 3.3.1, *Geological and Soil Resources*, an assessment of the stream bank erosion conducted at five locations in the tailrace channel of the Weed Project found a "very high" potential for stream bank erosion at three locations with the other two locations considered to have a "moderate" potential. Of the areas of active stream bank erosion determined to be present in the tailrace channel, two locations were considered to have significant erosion. Therefore, preparing an erosion management plan for the Weed Project tailrace channel, as discussed in section 3.3.1, *Geological and Soil Resources*, would help ensure that project operation does not adversely affect mussels and other aquatic species by protecting water quality and aquatic habitat in the project area.

Freshwater mussels are especially sensitive to changes in hydraulic conditions. Their complex life cycle and sedentary adult life stage require adequate stream flows that permanently maintain wetted habitat, buffer water quality and provide adequate food (Gates et al., 2015). Unlike highly mobile species such as fishes, which can move rapidly in and out of microhabitats with changes in water levels, mussels move slowly and are unable to respond to sudden drawdowns. Fluctuating flows also mean that transport of particulates will vary; depending on the flow schedule and the materials normally transported in the water column, there is the potential for loss of the organic materials that are the food base for mussels (Mehlhop & Vaughn 1994). Because water level fluctuations can leave newly deposited juveniles exposed, unnatural pulses in stream

discharge have the potential to reduce mussel reproductive success if such events occur during the critical periods in the mussel reproductive cycle.

As discussed above, Gresham has had difficulties complying with the current run-of-river operation requirement under the existing license for the Weed Project due to downstream flow fluctuations caused by switching between the two different sized turbine units. During the Wisconsin DNR's (2012b) comprehensive fish and mussel survey, flows (water levels) within the lower Red River were observed to vary by more than 6-inches within a 30 minute time period during quantitative mussel sampling at the first site (Q1) and more than about 8-inches in a day at the second quantitative sampling site (Q2) (see figure 8 for locations). According to the Wisconsin DNR (2012b), the effects of flow variation were not as evident at site Q1 compared to site Q2 due to narrower stream width and deeper depths; as stream width increases and depth decreases further downstream at site Q2. According to the Wisconsin DNR (2012b), the effects of flow variation became more evident as mussel species diversity at site Q2 was half of that observed at site Q1 (figure 6). The Wisconsin DNR (2012b) concluded that mussels were largely absent from shallow water areas likely due to dewatering leading to direct mortality from stranding and that daily water level fluctuations were limiting the amount of habitat available to mussels preventing mussels from colonizing shallow areas. As discussed above, Gresham has taken measures, including refurbishment of the larger generating unit, to minimize fluctuations downstream of the Weed Project. Therefore, continuing to operate the Weed Project in a run-of-river mode with minimal downstream flow fluctuations, as recommended by the Interior and proposed by Gresham, would likely benefit the overall mussel community in the lower Red River by decreasing stranding related mortality and stabilizing available habitat needed for reproduction and colonization.

Minimum Bypassed Flows

Gresham proposes and Interior recommends continued compliance with the current minimum flow through the Weed Project bypassed spillway channel (or spillway channel), which is currently estimated to be approximately 7 to 10 cfs. The current license requires Gresham to provide a continuous flow of not less than 7 cfs for the benefit of aquatic resources in the bypassed 700-foot-spillway channel located between Weed Project dam and the end of the tailrace. In 1985, the Wisconsin DNR and Gresham agreed that a minimum flow of 7 cfs was an adequate flow to be discharged through the spillway channel.[43] The 7 cfs minimum flow requirement is maintained via a submerged gravity fed 16-inch-diameter culvert from the reservoir to the spillway channel. According to Gresham, flow measurements in the culvert are approximately 10 cfs, which likely accounts for leakage from the dam.

[43] A copy of the 1985 correspondence between the Wisconsin DNR and Gresham is contained in an October 6, 2000 filing from the FWS to the Commission.

On July 9, 1999, the Commission issued a letter to Gresham requesting documentation of compliance with its license requirement to bypass 7 cfs through the spillway channel. In response, Gresham filed a letter on November 29, 1999, stating that it has not been collecting flow data for the spillway channel. In that same letter, Gresham provided an assessment conducted by the Great Lakes Environmental Center, Inc. (GLEC) of potential environmental damage in the spillway channel due to reduced minimum flows (GLEC, 1999), which confirmed noncompliance. During GLEC's (1999) assessment, flows through the spillway channel were approximately 1.0 cfs, with the only water sources coming from dam leakage and the small tributary stream,[44] and no flows were being passed through the 16-inch-diameter culvert. Similarly, in a letters to the Commission (filed September 27, 1999 and October 6, 2000), the Wisconsin DNR and FWS, respectively, noted that during previous site visits to the project, flows were not being released into the spillway channel.

During follow up discussions between Gresham and the Commission, it was determined that compliance with the 7 cfs minimum flow requirement could be maintained by orifice plate with a 7.75-inch hole at the end of the culvert, which was installed in October of 2000. Since then, Gresham has been in compliance with its minimum bypassed spillway channel flow requirement.

Our Analysis

Results from GLEC's (1999) survey showed that when flows were approximately 1.0 cfs, depths in the center of the spillway channel ranged from approximately 2 to 4 feet. The report also noted that about one to two feet of substrate was exposed along the shoreline of the spillway channel, but attributed that to flow fluctuation in the tailrace caused by project operation. According to GLEC (1999), live fish and a variety of invertebrates (e.g., water bugs, snails, crayfish, isopods, and mussels) were observed in the spillway channel during the survey. However, "piles" of dead mussels were also observed, which GLEC (1999) attributed to predation by mammals. GLEC (1999) concluded that the characteristics of the spillway channel indicate that non-compliant flows do not appreciably reduced the available aquatic habitat in the bypass channel.

Results of the Wisconsin DNR's (2012b) mussel survey showed that 4 species of live mussels were found over a 650 foot search area in the spillway channel, compared to 10 live species in a 130 foot area collected in the adjacent tailrace channel. According to the Wisconsin DNR (2012b), dead shells of 10 mussel species were abundant throughout the spillway channel with the plain pocketbook mussel being the most abundant. Additionally, the Wisconsin DNR (2012b) noted that most of the shells observed were

[44] In the report, it was estimated that about 0.5 cfs was coming from the tributary stream.

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chalky in appearance, indicating they had been dead for some time, with many of the plain pocketbook shells being over 20 years of age.

Unusually extended periods of low flow (e.g., drought conditions) have been shown to decrease mussel abundance and species richness (Haag and Warren, 2008). Because of their limited mobility, decreased flows can result in the standing of mussels. However, even for those mussels that remain in a wetted portion of a channel, they are highly susceptible to secondary effects of low flows such as low dissolved oxygen levels and extreme temperatures (Haag and Warren, 2008). Additionally, those species that remain in water can become concentrated into remaining pools, which can result in increased predation by terrestrial and avian predators, as well as increased competition for food and space (Gore et al., 1990).

Maintaining the current minimum flow through the bypassed spillway would help stabilize available habitat in the spillway channel, thereby reducing the risk of mussel stranding and predation. Also, because the bypassed spillway can receive immigrants from the nearby tailrace channel, recolonization of mussels to those sections of the spillway channel favorable to mussels would be possible by maintaining a constant minimum flow. Reducing flow fluctuations in the tailrace of the Weed Project, as discussed above, would further help to stabilize available habitat in the lower sections of spillway channel.

Fish Impingement and Entrainment

Operation of the projects has the potential to result in some fish losses from impingement on the projects' trashracks or entrainment through the projects' turbines. Gresham does not propose any changes to its current trashrack configurations for the Upper Red Lake (table 7) or Weed Projects (table 8).

To minimize fish mortality related to operating the projects, Interior recommends installing trashracks at both projects that have a maximum of 1-inch clear horizontal spacing between the bars with average (i.e., mean) normal intake approach velocities no greater than 2.0 fps.[45]

[45] Intake approach velocities are defined as the average water velocity measured a few inches in front of an intake screening device (e.g., trashrack), and were calculated by dividing the turbines hydraulic capacity by the cross-sectional area of each intake (EPRI, 2000).

Table 7. Existing trashrack bar spacing and intake approach velocities at the Upper Red Lake Project according to turbine capacity under various flow conditions (Source: Gresham, 2013b; as modified by staff).

2.2-inch clear bar spacing	
Range of flows (cfs)	**Intake approach velocity (fps)**
250	2.8
200	2.2
150	1.7
120	1.3
100	1.1
50	0.6

Table 8. Existing trashrack bar spacing and intake approach velocities at the Weed Project according to turbine capacity under various flows conditions (Source: Gresham, 2013b; as modified by staff).

2.6-inch clear bar spacing			
Turbine unit 1		**Turbine unit 2**	
Range of flows (cfs)	**Intake approach velocity (fps)**	**Range of flows (cfs)**	**Intake approach velocity (fps)**
240	2.7		
200	2.3		
180	2.0	90	1.5
150	1.7	45	0.8

Our Analysis

Water intake structures at hydropower projects can injure or kill fish that are either impinged on intake screens/trash racks, or entrained through turbines. The level of fish entrainment and impingement at the project is dependent upon many factors; including age, swim speeds, size, and the seasonality of entrainment and impingement patterns of

fish present at project sites (EPRI, 1992). Although turbine passage mortality rate estimates can be relatively variable, some trends have been recognized. For example, certain species typically dominate entrainment collections, and the dominant fishes entrained usually represent those species that are highly abundant (FERC, 1995) and are usually fish species that are very fecund, with high reproductive rates (EPRI, 1992). However, fish size rather than species is usually the primary factor influencing the rates of turbine-related mortality. In general, most fish entrained at hydroelectric projects tend to be smaller fish less than 4 to 6 inches long and are often juvenile fish or species such as minnows that never exceed a length of 3 or 4 inches (FERC, 1995; EPRI, 1997). However, these smaller fish are also less prone to turbine injury resulting from shear stresses and rapid pressure changes. The Electric Power Research Institute (EPRI) (1992) found that survival through hydropower facilities usually exceeded 90 percent for naturally-entrained resident fish for both Kaplan and Francis turbines, although survival was reduced as fish length increased.

The velocity of water upstream of a hydroelectric water intake is also an important component in determining the level of potential fish entrainment and impingement. Most resident fish species are at risk of impingement or entrainment if their burst swim speed[46] is less than the approach velocity at a trashrack or other intake screening device (Peake, 2004; Boys et al, 2013). Gresham does not propose any changes to the current trashrack configurations at either the Upper Red Lake Project (table 7) or Weed Project (table 8); however, Interior recommends that Gresham install new trashracks at both projects that have a maximum of 1-inch clear horizontal spacing between the bars and average normal intake approach velocities of no greater than 2.0 fps. Because the Interior did not provide a definition of "average normal intake approach velocities," our analysis is based on our interpretation of "average normal intake approach velocities;" the details of which are provided below.

To determine the "average normal intake approach velocities," we estimated the existing intake velocities under mean annual (see table 1 and table 2) and median (50th-percentile) flows (see figure 5 and figure 6) at each project. The mean annual flow at the Upper Red Lake and Weed Projects is approximately 146 and 180 cfs, respectively. The median annual flow at the Upper Red Lake and Weed Projects is approximately 120 and 150 cfs, respectively. Therefore, based on the existing intake approach velocities during mean or median flow conditions for the Upper Red Lake Project (< 1.7 fps) and the Weed Project (≤ 2.0 fps), intake velocities under proposed project operation at both projects would continue to be at or below 2.0 fps during mean or median flow conditions and meet Interior's recommended "average normal intake approach velocities" of no more than 2.0 fps.

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[46] Burst speeds are the highest speeds attainable by fish and can be maintained for brief periods of less than approximately 20 seconds (Beamish, 1978).

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Research has shown that a fish can swim about 8 to 12 body lengths per second in a burst mode that can last up to 20 seconds (Bell, 1986; Videler and Wardle, 1991; Wolter and Arlinghaus, 2003; Aadland, 2010). For example, a four-inch long fish would have a burst speed of around 2.7 to 4.0 fps. Therefore, during mean or median flow conditions, most fish species greater than 4 inches in length that are exposed to the current intake approach velocities (maximum of 2.0 fps) at each project, and the Interior's recommended "average normal intake approach velocities" of no more than 2.0 fps, are likely to escape impingement or entrainment. However, at maximum capacity of the turbines at the Upper Red Lake Project (250 cfs) and Weed Project (240 cfs), the maximum intake velocities would be 2.8 fps and 2.7 fps, respectively. These maximum intake velocities have the potential to increase impingement and entrainment and both projects. However, exposure to these maximum intake velocities would be limited. Specifically, maximum intake velocities at the Upper Red Lake Project would only occur about eight percent of the time (annually) and maximum intake velocities at the Weed Project would only occur about 14 percent of the time (annually) (see figure 5 and figure 6).

Interior justified its recommendation for Gresham to install trashracks with 1-inch clear horizontal spacing at each project by citing a 1995 Commission report (FERC, 1995) that concluded that thousands of fish, mainly small fish, are entrained annually at hydroelectric projects in Wisconsin and that a portion of these fish (2 to 20 percent or more) are killed. Interior states that trashracks with its recommended 1-inch spacing would protect more small fish from entrainment-related mortality, such as mortality from turbine strike at the projects than Gresham's current trashrack configurations with 2.2-inch (Upper Red Lake Project) and 2.6-inch (Weed Project) bar spacing.

FERC (1995) used data from 45 hydroelectric projects located east of the Mississippi River to identify common trends in fish entrainment. The results of this assessment found no consistent association between trashrack bar spacing and the size of entrained fish; however, the analysis did show that more than 75 percent of fish entrained were measured at 6 inches in length or less (FERC, 1995). Similarly, Winchell et al. (2000), using data from the EPRI (1997) database, showed there was little difference in the size distributions of entrained fish from 39 hydropower projects with trash rack spacing ranging from 1 to 10 inches (table 9). Based on the results of Winchell et al. (2000) (table 9) and FERC's (1995) analysis, under Interior's 1-inch trashrack recommendation and Gresham's current 2.2- and 2.6-inch bar spacing configuration, the majority of fish entrained would likely be made up of fish less than 6 inches in length.

Table 9. Size composition of fish entrained according to trashrack bar spacing from 39 entrainment studies included in the EPRI (1997) database. Bar spacing of 1.0-inch and 2.0 to 2.75 inches are used to represent Interior's recommendation of trashracks with 1-inch clear bar spacing and Gresham's proposed trashracks with 2.2 and 2.6-inch clear bar spacing, respectively (Source: Winchell et al. 2000, as modified by staff).

		Mean composition of fish entrained by size class (percent)					
Clear Bar Spacing (inches)	**N**	**0 to 4 inches**	**4 to 8 inches**	**8 to 15 inches**	**15 to 30 inches**	**> 30 inches**	**Representative recommended/ proposed bar spacing**
1.0	3	61.5	32.2	5.5	0.9	0	Interior (1-inch)
1.5–1.8	10	64.8	27.1	7.5	0.6	0	
2.0–2.75	12	68.9	25.3	5.1	0.7	0	Gresham (2.2 and 2.6 inches)
3.0–10.0	14	80.0	15.7	3.9	0.3	0	
All	39	71.3	22.9	5.3	0.5	0	

Results from a fish entrainment study conducted at the nearby Shawano Hydroelectric Project No. 710 (Shawano Project), which is located in the same river system as the Upper Red Lake and Weed Projects,[47] showed that sunfishes (60.8 percent), carps/minnows (15.8 percent), and suckers (9.4 percent) were the most susceptible to entrainment (table 8). Because the Shawano Project is similar to the projects in terms of reservoir size, species composition, and geographic region, and that the Shawano Project also operates in a run-of-river mode and has a similar plant capacity as the Weed Project, the results of this entrainment study likely provide an accurate representation of the composition of fish species susceptible to entrainment at the Upper Red Lake and Weed Projects.

[47] The Shawano Project dam is located approximately four RM downstream of the Red River's confluence with the Wolf River.

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Table 10. Percent composition of fish, according to family, collected during an entrainment study conducted at the Shawano Project (Data Source: FERC, 1994, as modified by staff).

Scientific family name	Common family name	Entrainment composition (percent)
Centrarchidae	sunfishes	60.8
Cyprinidae	carps and minnows	15.8
Catostomidae	suckers	9.4
Ictaluridae	catfishes	7.0
Percidae	perches	3.7
Atherinopsidae	silversides	1.3
Salmonidae	trout	1.0
Esocidae	pikes	0.7
Gasterosteidae	sticklebacks	0.1

Overall, some entrainment-related fish mortality would be inevitable as a result of continued operation of the projects. Our analysis indicates that various species of sunfish, carps/minnows, and suckers would be most susceptible to entrainment through project facilities, particularly those individuals that are less than 6 inches in length and have burst speeds of less than 2.0 fps. However, according to EPRI (1992), survival rates would be upwards of 90 percent for resident fish passing through the projects' turbines. Additionally, the fish species most likely to become entrained at the projects have rapid growth rates and reproductive characteristics (e.g., excavating spawning sites, guarding eggs and fry, frequent spawning intervals, high fecundity) that increase their dispersal abilities by increasing their reproductive potential (Bert, 2007). Furthermore, losses of both juvenile and adult fish through the projects' facilities may be offset by increased survival and growth of the remaining fish within the projects' reservoirs due to reduced competition for limited resources (Ricker, 1975; Winchell et al., 1992; Therrien and Bourgeois, 2000).

Although impingement and turbine entrainment at the projects likely causes some losses of resident fish, these losses do not approach a magnitude that adversely affects fish on a population level, which is supported by the general overall condition (i.e., good to excellent) of fish and aquatic life currently present within the Weed and Upper Red Lake reservoirs (Wisconsin DNR, 2015b; 2015c). Furthermore, nothing in the record for either project suggests that impingement or entrainment is currently having an adverse effect on fish populations in the project areas. Therefore, continued operation of the projects with Gresham's current trashracks in place, would likely have little to no adverse effect on the overall fish community in the projects' reservoirs.

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3.3.4 Terrestrial Resources

3.3.4.1 Affected Environment

Vegetation

The proposed projects are located on the Red River in Shawano County, slightly north of the transition zone between Wisconsin's two major plant communities, the northern hardwood province and southern prairie-forest province. The transition zone is characterized by mesic species endemic to both southern and northern Wisconsin. Approximately one-third of this transition zone in Shawano County is dominated by hardwood and coniferous forests, while the remainder is classified as a northern Michigan coastal ecological community. Commonly found tree species include sugar maples, hemlock, white pine, yellow birch, basswood, American elm, red oak, red maple, white ash, aspens, white birch, cedar, balsam fir, black ash, walnut, and various spruce species. Although much of the county is wooded or wetlands, there are also significant areas of grassland within the vicinity of the projects, as well as cropland and developed areas.

Wetlands

Wetlands comprise approximately 22 percent of Shawano County's total land area. According to the National Wetland's Inventory map, forested and scrub-shrub wetlands are the dominant wetland type within a 2 mile radius of the Upper Red Lake Project dam.

Gresham conducted a qualitative assessment of the projects and identified 22 sites exhibiting non-tidal wetland characteristics. The 22 sites were further classified as representing three types of non-tidal wetland communities, following the Cowardian classification system, as shown in table 11 and described in the study results below:

(1) *Palustrine Emergent, persistent (PEM):* These wetlands were generally located along the shoreline and were considered fringe wetlands. The herbaceous species observed within this wetland community included spotted touch-me-not, fringed sedge, tussock sedge, soft-stem bulrush, sensitive fern, narrow leaf-cattail, and broad-leaf cattail.

(2) *Palustrine Forested, broad-leaf deciduous and evergreen (PFO)*: These wetlands were generally located at a slightly higher elevation, further from the shoreline. Commonly found species in this community include red maple, silver maple, paper birch, black willow, and slippery elm, eastern hemlock, eastern white cedar, green ash, black ash, red-stem dogwood, grey dogwood, speckled alder, sensitive fern, sedge species, deertongue grass, scouring rush, and riverbank grape.

(3) *Palustrine Scrub-Shrub, broad-leaved deciduous (PSS)*: These wetlands were generally located adjacent to the emergent wetland areas, prior to transitioning into forested wetland areas. The characteristic species in these areas included speckled alder, grey dogwood, red-stem dogwood, staghorn sumac, black willow, tartarian

honeysuckle, river-bank grape, soft rush, broad-leaved cattail, tussock sedge, fringe sedge, reed canary grass, and grape fern species.

Table 11. Number and type of wetlands in Lower and Upper Red lakes (Source: staff).

Wetland Classification	Lower Red Lake (Weed Project reservoir)	Upper Red Lake
PEM	1	4
PFO	1	2
PEM/PSS	1	0
PEM/PFO	2	1
PEM/PSS/PFO	7	3

Invasive Species

Wisconsin DNR and the Red Lakes Management District conducted an aquatic plant survey in preparation for the Red Lakes Comprehensive Management Plan. The surveys were conducted in each reservoir in 2006 and determined that both Eurasian milfoil and curly-leaf pondweed, exotic invasive aquatic plant species found throughout Wisconsin, are present in the Upper and Lower Red Lakes. Eurasian water milfoil is particularly abundant, and was the most dominant species found in the Lower Red Lake and second most dominant in Upper Red Lake. Both species reproduce prolifically and hold numerous competitive advantages over native species. They can easily outcompete other aquatic species and can cause both ecological and recreational challenges as they become more abundant.

Wildlife

The project provide habitat for numerous species of wildlife. The habitat surrounding the projects support the following bird species: wood ducks, mallards, common and hooded mergansers, American black ducks, blue-winged teals, turkeys, sandhill cranes, Canada geese, American bitterns, yellow-headed blackbirds, ruffled grouse, wood cocks, pheasants, swallows, grosbeaks, finches, flycatchers, woodpeckers, red-shouldered hawks, black terns, northern harriers, yellow-billed cuckoo, common moorhen, king rails, bald eagles, and osprey. Warblers and great blue herons are also known to use riparian habitats seasonally.

The most common large mammal species is the white-tailed deer. Other wildlife species include black bears, bobcats, fishers, beavers, muskrats, otters, minks, red fox,

gray fox, gray squirrels, eastern chipmunks, woodchucks, eastern cottontails, snowshoe hares, garter snakes, numerous turtle species, mud puppies, American tree frogs, green frogs, leopard frogs, and Blanding turtles.

The wetland and herptile assessment conducted for the projects indicated that suitable habitat is present for Blanding's turtles and wood turtles, both state-threatened species, as well as mudpuppies, a state species of special concern. Mudpuppies are also a host species to the state-threatened salamander mussel. Suitable habitat for Mudpuppies within the projects includes emergent shrub-scrub and forest wetlands. Upper and Lower Red Lakes also contains appropriate habitat for the mudpuppy, including large boulders, submerged large woody debris, and submerged flats of vegetation.

Special Status Terrestrial Species

There is one special status species of concern, the bald eagle, which has been documented foraging along the nearby Wolf River. Although no longer listed as threatened under the Endangered Species Act (23), bald eagles are still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (72 FR 130).

3.3.4.2 Environmental Effects

Effects of Project Operation on Vegetation

Gresham proposes to continue to operate the Weed and Upper Red Lake Projects in a run-of-river mode. Gresham has been working with resource agencies to decrease the amount of fluctuation in flow and water levels downstream of the Weed Project in an effort to maintain a more stable run-of-river mode.

Our Analysis

Under current project operation, the shoreline vegetation at the Upper Red Lake is stable, and as discussed in section 3.3.1, *Geological and Soil Resources*, the project shoreline does not exhibit any erosion. The project would continue to operate in a run-of-river mode, which would ensure stable littoral and riparian habitat.

Under proposed operation, the more regulated management of run-of-river mode for the Weed Project would reduce or eliminate existing downstream flow fluctuations and the frequency of shoreline substrate exposure, thereby establishing a more stable littoral and riparian habitat. Changes to existing inundation patterns would primarily affect bank vegetation within the fluctuation zone that previously would have experienced a more irregular inundation pattern. As a result, some short-term shifting of riparian vegetation is likely to occur within this zone, likely promoting a plant community adapted to more stable mesic environment. A more stable inundation pattern could also provide a less favorable environment for invasive plant species that are generally more adapted to disturbed environments.

Invasive Species Management

Two invasive aquatic plant species, Eurasian watermilfoil and curly-leaf pondweed occur within the projects reservoirs. Also, as discussed in section 3.3.5, *Recreation and Land Use,* at the Weed Project, Gresham proposes to develop a small picnic area with tables at the Red River walk-in site, install a fishing dock at the Riverside Park boat landing, and manage the tree berm at the Red River walk-in site, located in the southeast corner of the recreation site, in order to improve views to and from the river. Management of the tree berm would include selective removal of low vegetation growth and dead or dying trees.

To address invasive species, Gresham proposes to develop a comprehensive invasive species management plan for each project, including both terrestrial and aquatic invasive species, within 1 year of license issuance. The proposed plan would include: (1) a description of proposed measures; (2) a description of where selected measures would be implemented; (3) a description of the implementation approach and schedule, based on any license issuance date; and (4) a description of the purpose and benefits of the measures.

The FWS and the Stockbridge-Munsee Tribe recommend an invasive species management plan.

Our Analysis

Eurasian watermilfoil and curly-leaf pondweed would likely continue to proliferate at both projects without effective management. These species spread through competitive advantage and by boaters using the Upper and Lower Red Lakes and the Red River who do not properly clean and dry boats between launches. Developing signage, after consultation with the Wisconsin DNR, regarding cleaning and drying of boats between launches, and posting the signage at the applicant-owned projects' boat launches, as identified in section 3.3.6, *Recreation and Land Use*, would help inform the public of proper management techniques to reduce the spread of curly-leaf pondweed and Eurasian watermilfoil.

Although it is unclear exactly how much ground disturbance and/or land clearing would be necessary to complete the installation and development of the proposed recreational features, there is the potential for temporary and permanent vegetation loss, compaction of soils, and the inadvertent spread of invasive plant species. Though the implementation of the picnic area and fishing dock would occur in areas that have been previously highly disturbed, prolonged exposure of denuded land areas can encourage the establishment or proliferation of invasive plants. Once established, these species are notoriously difficult to eliminate, which could have long-term environmental and financial consequences. The planned construction of the picnic area should be conducted in a manner that would protect botanical resources and promote the establishment and protection of native species.

Gresham's proposal to remove some low-lying vegetation and dead or dying trees within the tree berm at the Red River walk-in site could result in the incidental removal of native plant species. Vegetation removal may also encourage the growth of invasive species within the disturbed areas.

An effective invasive species management plan that identifies control methods and monitoring would ensure the protection of terrestrial and wetland habitat along both project reservoirs from the spread of invasive plants, and enhance the littoral and riparian zone for native plant and wildlife species. Although Gresham proposes an outline for an invasive species management plan, the proposed plan is general and does not include specific management and implementation measures. Therefore, an effective invasive species management plan for each project that would aid in the management of existing invasive species and help establish of native vegetation would contain: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance, including the tree berm at the Red River walk-in site; (3) educational signage, at applicant-owned boating access areas, that contains information on curly-leaf pondweed and Eurasian watermilfoil and how to prevent their spread; (4) staff training in invasive species identification and prevention; and (5) monitoring to evaluate the success of revegetation and invasive plant control efforts. Implementing this plan at each project would ensure the protection of the terrestrial habitat along the projects' reservoirs from invasive plants, and enhance the littoral and riparian zone for native plant and wildlife species.

Bald Eagle

New construction and vegetation disturbance would occur only at the previously described recreational facilities; no additional construction is proposed. Gresham proposes to continue to manage the tree berm at the Red River walk-in site for the Weed Project, in order to improve views to and from the river. Management of the tree berm would include selective removal of dead or dying trees.

Gresham proposes no wildlife-specific mitigation measures. The Wisconsin DNR recommends compliance with the FWS's National Bald Eagle Management Guidelines and Conservation Measures (FWS, 2007).

Our Analysis

Bald eagles have been documented foraging in the nearby Wolf River, but no bald eagle sightings or nesting sites have occurred at the projects. Vegetation removal within the tree berm located in the southeast corner of the Red River walk-in site at the Weed Project would be limited to a small area and only dead or dying trees would be removed. Because, bald eagles prefer to nest in live trees, project maintenance activities at the Weed Project would not affect bald eagles because tree removal would not include trees used for nesting. Tree removal is not proposed at the Upper Red Lake Project; therefore, the project would not affect bald eagles.

3.3.5 Threatened and Endangered Species

3.3.5.1 Affected Environment

By letter filed May 21, 2014, the FWS identified four federally listed species that may occur in the county for each project, including the: (1) northern long-eared bat, listed as endangered; (2) whooping crane, listed as an endangered species, but considered a non-essential experimental population in Shawano County; (3) Karner blue butterfly, listed as endangered; and (4) snuffbox mussel, listed as endangered. Review of the FWS's website also indicates that the gray wolf, listed as endangered, may also occur in the county for each project.

Northern Long-Eared Bat

On April 2, 2015, the FWS listed the northern long-eared bat as a threatened species. The range of the northern long-eared bat includes much of the eastern and north-central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species hibernates in caves and mines during winter months, typically using those with large passages and entrances, constant temperatures, and high humidity. In the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Suitable northern long-eared bat roosts are live, dying, dead, or snag trees with a diameter at breast height[48] of 3 inches or greater that exhibit any of the following characteristics: (1) exfoliating bark, (2) crevices, (3) cavity, or (4) cracks. Males and non-reproductive females may also roost in cooler places, like caves and mines.

White-nose syndrome is the largest threat to the northern long-eared bat. Bats with white-nose syndrome act strangely during cold winter months, including flying outside during the day and clustering near the entrances of caves and other hibernation areas. Bats have been found sick and dying in unprecedented numbers in and around caves and mines. Other threats to this species include summer habitat loss and degradation and gates or other structures that exclude bats from caves and mines, restricting bat flight and movement and changing airflow and internal cave and mine microclimates. Cave-dwelling bats are vulnerable to human disturbance while hibernating (FWS, 2015).

[48] Diameter at breast height is a term for the measurement acquired by measuring the diameter of an individual tree by using a special diameter at breast height measuring tape, wrapped around the circumference of the tree at approximately the chest-height of the individual taking the measurement. The diameter at breast height measuring tape translates a circumference measurement to a diameter measurement.

Whooping Crane

The whooping crane is a federally listed endangered native North American bird species that exists in the wild at three locations and in captivity at 12 sites. Whooping cranes are found in open wetlands and lakeshores. A small migratory population was introduced to the Midwestern and Southeastern United States in 2001, and migrates between Wisconsin and Florida. The population within Shawano County is listed as a non-essential, experimental population.

Karner Blue Butterfly

The Karner blue butterfly is a federally listed endangered species and a species of special concern in Wisconsin. Wisconsin supports the largest widespread Karner blue butterfly population in the world. The only known host plant for their larvae is wild lupine, which occurs throughout much of the Midwest, Southern, and Eastern United States. Natural habitats that Karner blue butterflies occupy include sandy pine and oak barrens, pine prairies, oak savannas, and some lake shore dunes. Unsuitable habitat includes wetlands, mowed areas, agricultural areas, and dense forests. Although the Karner blue butterfly is found in Shawano County, the project area is not within the FWS's High Potential Range[49] for the butterfly, and no Karner blue butterflies are known to occur within the project boundaries.

Gray Wolf

The gray wolf is a federally listed endangered species whose potential range includes forested areas within Shawano County. No gray wolfs have been reported within the project area.

Snuffbox Mussel

The snuffbox mussel was listed as federally endangered in 2012. No recovery plan has been issued for the snuffbox mussel, and no critical habitat has been designated by the FWS. Historically, the snuffbox mussel was a widespread species, occurring in 208 streams and lakes in 18 states, including Wisconsin and Ontario, Canada. However, the population has been reduced to 74 streams and lakes in 14 states and Ontario, which is a 65-percent range-wide decline. Dams, pollution, sedimentation, and invasive species are the main causes of decline for this species (FWS, 2012). Known populations in Wisconsin are small and localized, and remaining populations are generally geographically isolated from one another, further increasing their risk of extinction (FWS, 2010).

The snuffbox mussel is usually found in small to medium-sized creeks in areas with a swift current, although it is also found in Lake Erie and some larger rivers. Adults

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[49] The "High Potential Range" indicates an area in which there is a 50 percent or greater probability that the Karner blue butterfly is present.

often burrow deep in sand, gravel or cobble substrates, except when they are spawning or the females are attempting to attract host fish (FWS, 2012). In Wisconsin, the host fish for the snuffbox mussel is the logperch with breeding occurring from May through July (Wisconsin DNR, 2016).

Snuffbox mussels have been documented in the nearby Wolf River; however, no live specimens or weathered dead shells of the snuffbox were collected in the Red River during mussel surveys conducted in 2011. The survey downstream of the Weed Project dam suggests that snuffbox mussels do not occur in the Red River between the Weed Project dam and its confluence with the Wolf River. To date, the Snuffbox mussel has never been documented in the Red River, and the absence of dead or pre-fossilized snuffbox shells during the study suggests this species may never have occurred in the river. However, suitable snuffbox mussel habitat and populations of logperch, the snuffbox mussel's host fish, have been documented downstream of the Weed Project.

3.3.5.2 Environment Effects

As discussed in section 3.3.6, *Recreation and Land Use*, Gresham proposes for the Weed Project tree removal of dead or dying trees at the tree berm at the Red River walk-in site.

A 2011 mussel survey in the Red River downstream of the Weed Project dam did not document any live specimens or relic shells of the snuffbox mussel, and no records of snuffbox mussels exist within the Red River between the Weed Project and its confluence with the Wolf River. However, FWS states that because the presence of suitable snuffbox habitat and populations of logperch, the snuffbox mussel's primary host fish, have been documented in the nearby Wolf River, downstream of the Shawano Project dam,[50] it should be assumed that snuffbox mussels could occur within the vicinity of the project.

Our Analysis

Northern Long-Eared Bat

Although northern long-eared bat have not been documented[51] within the projects' boundaries, the project area is included in the FWS's geographic distribution for the species, indicating that the species could be present. Gresham's proposal to maintain the tree buffer located at the southeast corner of the Red River walk-in site at the Weed

[50] The Red River flows directly into the Wolf River, approximately 4 RM upstream of the Shawano Project dam.

[51] Although no bats have been documented in the projects area, the most recent survey was in 2001, prior to the northern long-eared bat's listing as a threatened species.

Project to provide views from the access site to and from the river could remove potential summer roosting habitat for northern long-eared bat populations.

Although the project is within the White Nose Syndrome Zone, it is not near any know hibernacula or maternity roost trees and would therefore not disturb hibernating Northern long-eared bats, alter the entrance or interior environment of known hibernaculum. Also the project would not include prescribed fire or install new wind turbines.

Although Gresham does not propose when it would cut the dead and dying trees at Weed Project, avoiding removing trees with equal or greater than 3 inches in diameter at breast height from April 1 to October 31 would protect the northern long-eared bat by preserving potential habitat. Tree removal in the cooler winter months (i.e., November 1 through March 31) at the project would coincide with the period of time when northern long-eared bats are likely utilizing cave hibernacula. Also restricting tree removal at the project to seasonal periods when bats are less likely to be roosting in the area would help lessen disturbance to late-summer breeding and newly born pups. Overall, operation and maintenance of the Weed Project, with tree removal restrictions, is not likely to adversely affect northern-long eared bats.

At the Upper Red Lake Project, Gresham does not propose to remove trees during project operation and maintenance. Although the project is within the White Nose Syndrome Zone, it is not near any know hibernacula or maternity roost trees and would therefore not disturb hibernating Northern long-eared bats, alter the entrance or interior environment of known hibernaculum. Also the project would not include prescribed fire or install new wind turbines. The continued operation of the Upper Red Lake Project would have no effect on the northern-long eared bat.

Whooping Crane

No whooping cranes have been reported at the Upper Red Lake and Weed Projects. The continued operation of the projects would have no effect on the non-essential experimental population.

Karner Blue Butterfly

No Karner blue butterflies have been reported in the vicinity of the projects. Both projects are located well outside of the FWS's High Potential Range and a high percentage of the projects' boundaries are classified as wetlands, unsuitable habitat for the butterfly. The continued operation of the projects would have no effect the Karner Blue Butterfly.

Gray Wolf

No gray wolfs have been reported in the projects vicinity. Therefore, continued project operation at both projects would have no effect on the gray wolf.

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Snuffbox Mussel

As discussed above in section 3.3.2, *Aquatic Resources*, comprehensive mussel and fish surveys were conducted upstream of the Upper Red Lake Project and downstream of the Weed Project in 2011. During the survey, most mussel species were observed downstream of the Weed Project, as habitat conditions were typically more conducive to mussels, with a mix of cobble, gravel, and sand substrates being present in those areas. Logperch, a confirmed host fish of the snuffbox mussel, were also documented in several locations during the study. However, the study did not document any live specimens, fresh dead, or relic shells of the snuffbox mussel. Additionally, there are no historical records of snuffbox mussels existing in the Red River.

FWS states that because the presence of suitable snuffbox habitat and populations of logperch have been documented in the nearby Wolf River downstream of the Shawano Project dam, it should be assumed that snuffbox mussels could occur within the vicinity of the project. Fish hosts, such as logperch, do not depend on mussels, such as snuffbox, to complete their life cycles. As a result, geographic ranges of mussel species are often much smaller than those of their hosts (Strayer, 2008). For example, in Wisconsin, logperch are known to occur in all 72 counties (USGS, 2015), whereas the snuffbox mussel is listed as occurring in only seven counties (FWS, 2015). Although suitable snuffbox mussel habitat was documented in the Red River during the survey, snuffbox mussel habitat is not uncommon in Wisconsin, as snuffbox have been documented as occurring in a variety of habitats from small creeks to large rivers, as well as impoundments and lakes (Cummings and Mayer 1992, Parmalee and Bogan 1998, Watters et al. 2009).

The distribution of snuffbox mussels is dependent on the transport of glochidia by a host fish. Currently, the population of snuffbox that occurs in the Wolf River resides downstream of Shawano Project dam, which would restrict any upstream movements of logperch into the Red River. Results from the Wisconsin DNR (2012b) study showed that a total of ten mussel species that are known to be present in the Wolf River downstream of the Shawano Project were not documented in the Red River during the study, which further demonstrates that Shawano Project dam serves as a barrier to upstream fish movement.

Overall, no evidence exists to suggest that snuffbox mussels are present in the vicinity of the Upper Red Lake or Weed Projects. Therefore, we conclude that continued operation of the projects would have no effect on this species.

3.3.6 Recreation and Land Use Resources

3.3.6.1 Affected Environment

Regional Recreation Resources

Regional recreation resources include two state parks, the Jung Hemlock-Beech Forest and Kroenke Lake state natural areas, which offer recreational opportunities such as hunting, fishing, trapping, gathering wild edibles, wildlife viewing, trails, and picnicking. Of the two state natural areas, Kroenke Lake allows motorized and non-motorized boating. Nearby, the County of Shawano and the City of Shawano operate several recreation sites, wildlife areas and open space. Amenities include playground equipment, picnic and swimming areas, tennis and volleyball courts, basketball hoops, softball and baseball fields, hiking and walking trails (also used for snowshoe and cross-country skiing in the winter), horseback riding, tent and RV camping, fishing and hunting, boat launches and landing for motorized and non-motorizing boating, and drive-on access sites for ice fishing and other winter activities.

Existing Project Facilities

Upper Red Lake Project

There are two recreation areas located within the Upper Red Lake, totaling 2.8 acres of land.

South Shore Boat Landing

The village of Gresham owns and maintains the South Shore boat landing, a 1-acre area located on West River Street near the Upper Red Lake Project dam. Facilities include a floating handicap-accessible fishing/launching pier and a boat ramp with parking for up to 30 vehicles with trailers.

Gresham Lions Club Boat Launch

The Gresham Lions Club, a private entity, owns and maintains a 1.8-acre parcel on the north shore of Upper Red Lake on Upper Red Lake Road. The Gresham Lions Club boat launch is not a project recreation facility; however, it does provide public access to the reservoir. Facilities include a small picnic area, restrooms, and a gravel boat launch ramp and parking for about 10 cars with trailers. The ramp provides "drive-on" access during the winter months for ice fishing and other winter activities.

Weed Project

There are three recreation areas located within the Weed Project, totaling approximately 9.7 acres.

Riverside Park

Riverside Park is situated between Lower Red Lake (Weed Project reservoir) and Upper Red Lake, along a short section of the Red River that connects the two lakes. The

8.7-acre park is owned and operated by the village of Gresham, and facilities include a baseball stadium and street parking for about 20 vehicles; picnic tables, grills, and a shelter; playground equipment; and a floating dock, shoreline fishing, boat landing, and parking for about 20 vehicles and trailers.

Geider Road Access Area

Geider Road access area, owned and operated by the village of Gresham, is located on the west shore of the north bay of Lower Red Lake. The site serves as a winter "drive-on" access point for ice fishing and other winter lake activities.

Red River Walk-in Site

The Red River walk-in site is a 1-acre recreation site, owned and operated by the village of Gresham, and located about 1 mile east of Gresham on the east side of Lower Lake Road. Originally, an informal river access point, this facility became a popular recreation site because of its easy access, favorable river bottom, and water clarity. The informal parking area was improved during the current license, and the facility currently features an informal swimming area, launch site for canoeists and kayakers, and bank fishing. There is occasional conflict between the boaters and swimmers due to encroachment of the user groups into one another's undefined user areas.

There is also an informal beach access site located on the north shore, across the river from the Red River walk-in site. Erosion is occurring at this informal beach access area due to use by recreationists.

Recreation Use

Upper Red Lake Project

Gresham conducted spot count surveys at the South Shore access area and Lions Club boat launch from April 1, 2011 to March 31, 2012. There was relatively low recreational use at the project, with a total of 1,083 recreation users resulting from 130 spot counts. The South Shore access area received about 40 percent of total visitors (reaching 12.1 percent capacity during peak use in June and July), with the most popular activities being boat and ice fishing. The Lions Club boat launch received 60 percent of total visitors (reaching 82.5 percent capacity during peak use) during spot counts, with the most popular activity being ice fishing in January and February. The spot count survey included a special pro-vintage snowmobile day in February, which may have resulted in higher than normal visitation levels.

Weed Project

Gresham conducted spot count surveys at the Riverside Park boat landing, Geider Road boat landing, and Red River walk-in site from April 1, 2011 to March 31, 2012. There were a total of 1,817 recreation users resulting from 130 spot counts. Riverside Park received about 28 percent of total visitors (reaching 27.1 percent capacity during peak use), with the most popular activities being shoreline and boat fishing between June

and August. Geider Road received about 30 percent of total visitors; however, during the winter months, anglers accessed the Weed Project reservoir for ice fishing in higher numbers than observed throughout the remainder of the year. In December, capacity at the parking area reached 90 percent, while in January and February, the parking area at the Geider Road boat landing exceeded capacity. Red River walk-in site received 41 percent of total visitors (reaching 60.8 percent capacity during peak use) during spot counts. Sunbathing and swimming were observed to be the most popular activities at Red River walk-in site between June and August.

Based on the spot counts at both projects and the number of vehicles observed at the surveyed recreation areas, all recreation areas are currently under capacity throughout the year, aside from Geider Road boat landing during the winter months, December through February. The Wisconsin Statewide Comprehensive Outdoor Recreation Plan shows a 6 percent increase in population between 2010 and 2015 and a 12 percent increase in population between 2010 and 2030; however, the State of Wisconsin Department of Administration estimates a 0.7 percent decline in population for the village of Gresham from 2010 to 2013. In addition, projected recreation demand at the facilities is not anticipated to increase over the term of the next license.

Between 2009 and 2011, the village of Gresham prepared the *Comprehensive Plan* and the *Open Space and Recreation Plan* to explore factors influencing the village's growth and development, which included public participation in a survey to evaluate the types of growth local property owners might support in the village. The results of the survey concluded that local property owners feel there are enough parks and green space and that there is no need for improvement.

Land Use

The Weed and Upper Red Lake Projects are located in a rural area along the Red River, which feeds into the Wolf River downstream. Project lands are dominated by open water, open space, and forests. Lands adjacent to the project boundaries are mostly undeveloped, with agriculture, forestry, open space, and some residential development being the predominant land uses.

3.3.6.2 Environmental Effects

Recreation Facilities

Upper Red Lake Project

To enhance recreation resources, Gresham proposes to prepare a recreation plan for the Upper Red Lake Project.[52] Also the applicant proposes to: (1) continue operating and maintaining the boat landing, floating and accessible fishing/launching pier, boat

[52] Gresham did not include any proposed measures for the recreation plan.

ramp, and parking area at the South Shore access area; and (2) install picnic tables and benches at the South Shore access area.

Weed Project

To enhance recreation resources, Gresham proposes to prepare a recreation plan for the Weed Project.[53] Gresham proposes to continue operating and maintaining: (1) Riverside Park, to include picnic tables and grills, playground equipment, floating dock, boat landing, and parking area; (2) the Geider Road access area; and (3) the informal swimming area, informal canoe/kayak put-in site, and improved parking area at the Red River walk-in site. Gresham also proposes to continue maintaining the tree berm at the Red River walk-in site. Finally, Gresham proposes to implement the following recreational enhancements at the existing facilities:

- install one fishing dock at the boat landing and install two benches at the boat landing at Riverside Park; and
- develop a small picnic area with picnic tables; install an ornamental fence to prohibit access to the informal beach access site, located on the north shore, across from the Red River walk-in site; and install signage at the informal beach access site, redirecting recreationists to the Red River walk-in site.

Interior recommends the installation of a real-time water level and stream gaging station downstream of the dam at the Weed Project to inform whitewater boaters of current conditions.[54] Interior states that under previous project operation,[55] the flows were predictable to boaters; however, under the proposed run-of-river operation, boaters would be unable to plan their trips. Interior also recommends that a stream gaging station be installed where it can record flows released through the powerhouse and the spillway to capture cumulative river flow data and monitor run-of-river compliance. Further, Interior requests that flow data be made available to the public via a website for both projects. Interior and the Wisconsin DNR also recommend that Gresham to include a provision, as part of a plan to monitor project operation, to install a publically visible staff gage downstream of the Weed Project.

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[53] Gresham did not include any proposed measures for the recreation plan.

[54] Interior's recommendation was filed under 4(e) of the FPA. There are no federal lands or lands held in reservation within either project boundary; therefore, we analyze Interior's recommendations under 10(a) of the FPA.

[55] Interior states that the Weed Project operated in a peaking mode; however, the project operated in a run-of-river mode. As discussed in section 3.3.2 *Aquatic Resources*, Gresham had previously experienced difficulty operating the project as run-of-river, which may have accounted for downstream water fluctuations.

Our Analysis

Gresham's proposal to continue operating and maintaining the South Shore access, Riverside Park, the Geider Road access area, and the Red River walk-in site would help ensure that any existing and new recreational facilities and amenities would be properly maintained. Further, Gresham's proposed enhancements of the South Shore access area would improve recreationists' experiences at the Upper Red Lake Project. There are currently no picnic tables at the South Shore access area, so the addition of these amenities would meet the needs of local residents, as discussed in the *Village of Gresham Open Space and Recreation Plan (2012-2016)*.[56] Similarly, Gresham's proposed enhancements of Riverside Park and the Red River walk-in site would improve recreationists' experiences at the Weed Project. There are currently no benches or dock from which recreationists are able to fish at Riverside Park, nor is there a picnic area or picnic tables at the Red River walk-in site. Therefore, the addition of these amenities would add to the enjoyment of the recreation area and help meet the needs of local residents.

At the Weed Project, recreationists have caused shoreline erosion at an informal beach access site, located on the north shore directly across from the Red River walk-in site. Implementing the applicant's proposal to prohibit access by installing ornamental fencing around the site would permanently eliminate recreation use of the informal beach access site. However, prohibiting access would enable the eroded area to stabilize naturally over time. Also Gresham's proposal to provide directional signage to the Red River walk-in site, which provides beach access, would redirect recreationists to the site and provide recreational access to the same waterbody as the informal beach access site. Any signage posted should be clearly visible to the public at the normal point of entry to the informal area.

At the Red River walk-in site, the beach is undefined for usage. Recreationists use the beach as a canoe/kayak put-in and swimming area. Occasionally there are conflicts between the boaters and swimmers because the put-in and swimming areas are undefined. We anticipate the conflicts to increase once the recreationists that use the informal beach access site are redirected to the Red River walk-in site. Modifying the Weed Project recreation plan to include: (1) upgrading the existing parking area by paving or with gravel; (2) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (3) signage for the existing facilities; (4) conceptual drawings would ensure ease of use and access and help reduce conflict between user groups.

[56] See appendix 31 of the license application for the Upper Red Lake Project, filed on June 10, 2013.

The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures. We assume that the purpose of the applicant's proposal to develop a recreation plan within 1 year of license issuance would be to guide the management of the existing recreation facilities, as well as any proposed recreation enhancements. The recreation plans proposed for each project would provide a framework by which Gresham would implement the proposed recreational enhancements of recreation sites located within the project boundaries. However, the applicant does not propose to include in the proposed recreation plans: (1) its proposed measures; and (2) conceptual drawings for any new facilities or amenities. Therefore, the proposed recreation plan for the Weed Project should be modified to include these provisions. Preparing recreation plans with staff modifications would help to ensure that any existing and proposed facilities and amenities are suitably constructed and maintained.

Gresham's proposal to continue maintaining a tree berm located on the southeast side of Red River walk-in site to provide a view of the river would provide an enhanced viewshed for recreationists at the Red River walk-in site. However, vegetation removal could encourage the growth of invasive species or affect potential roosting habitat for the endangered northern long-eared bat. This is further discussed in sections 3.3.4, *Terrestrial Resources*, and 3.3.5, *Threatened and Endangered Species.*

Interior recommends the installation of a stream gaging station because it states that under current project operation, the peaking operation provides the predictable flows, whereas the proposed run-of-river operation would result in more unpredictable flow conditions. However, the Weed Project was never licensed to operate in a peaking mode. As discussed in section 3.3.2, *Aquatic Resources*, Gresham previously had difficulty complying with its run-of-river operation, but recently implemented measures to ensure run-of-river operation. As such, there would be no provided benefit to implement measures based on the project's non-compliance.[57]

Gresham currently uses the existing pressure transducer to measure water levels downstream of the Weed Project, as discussed in section 3.3.2, *Aquatic Resources*, which is an adequate tool for detecting the magnitude and duration of any downstream flow fluctuations that may occur as a result of project operation. As such, it would be practical and cost-effective for Gresham to use the existing pressure transducer, rather than install a stream gaging station as proposed by the Interior. However, Interior's recommendation to post downstream water levels would allow recreational users to efficiently plan trips to the project site as well as help inform recreational users of safe boating conditions. This recommendation could be achieved more economically by posting downstream water levels based on readings taken from the existing pressure transducer, versus a stream

[57] The Weed Project is currently in compliance with it current run-of-river operation requirement.

gaging station. Including in a recreation plan for the Weed Project, a provision to post downstream water surface elevations, correlated to flows (cfs), on a public website would allow recreational users to efficiently plan trips to the project site as well as help inform recreational users of existing flow and safe boating conditions. Further, Interior's and Wisconsin DNR's recommendation for Gresham to include a provision to install a publically visible staff gage downstream of the Weed Project, as discussed in section 3.3.2, would serve as a simple and effective tool to inform boaters of on-site river conditions.

There is a USGS gage located in close proximity to, and upstream of, the Upper Red Lake Project, which posts real-time discharge and stage information. Therefore, as discussed in section 3.3.2, *Aquatic Resources,* posting flow data online for the Upper Red Lake Project reservoir would be unnecessary, and would not serve any additional benefits to boaters that are not already provided by the USGS gage.

Project Boundary

Upper Red Lake Project

Gresham proposes to modify the project boundary at the Upper Red Lake Project dam to include lands that it states are necessary for project operation. Gresham proposes to include the existing parking area at the South Shore access area into the project boundary. The parking area provides access to the shoreline, boat launch, and fishing/launching pier. Adjacent to the Gresham Lions Club boat launch, Gresham proposes to remove privately owned residences on approximately 2.25 acres of land currently within the project boundary, and more accurately reflect Gresham's flowage rights in the area.

Weed Project

Gresham proposes to modify the project boundary at the Weed Project to include lands that it states are necessary for project operation. Gresham proposes to remove the athletic fields and other buildings unrelated to project operation from the project boundary at Riverside Park. At the Geider Road access area, Gresham proposes to add the access area into the project boundary.

Our Analysis

Upper Red Lake Project

Commission regulations require that all lands necessary for the operation and maintenance of the project be included within a project boundary.[58] The lands proposed for removal from the project boundary adjacent to the Lions Club boat launch are privately owned and would not be needed for project operation and maintenance or for other project purposes such as recreation, protection of cultural resources, or protection of other environmental resources. These lands contain private residences and are not used for project purposes. As such, the lands adjacent to the Lions Club boat launch should not be included in the proposed project boundary for the Upper Red Lake Project.

The lands proposed for inclusion in the project boundary at the South Shore access area include a parking area which provides access to, and parking for, the South Shore access area. The parking area would be needed for recreationists to access the facility. As such, these lands should be included in the proposed project boundary for the Upper Red Lake Project.

Weed Project

The lands proposed for removal from the project boundary at Riverside Park are municipal athletic fields that do not provide project-related recreation, and other buildings unrelated to project operation. Also the lands would not be needed for the protection of cultural resources or protection of other environmental resources. As such, these lands should not be included in the proposed project boundary for the Weed Project.

The lands proposed for inclusion in the project boundary at the Geider Road access area include a small parking area to provide access to the Geider Road access area. The parking area would be needed to provide access to the recreation at the project. As such, these lands should be included in the proposed project boundary for the Weed Project.

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Under section 106 of the NHPA of 1966, as amended, the Commission must take into account whether any historic property within the project's APE could be affected by the project. The Advisory Council on Historic Preservation defines an APE as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.

The APE for the Upper Red Lake and Weed Projects includes: (a) lands enclosed by the project boundary; (b) attached or associated buildings and structures extending

[58] *See* 18 C.F.R. 4.41(h)(2) (2015).

beyond the project boundary, which contribute to the National Register eligibility of the hydroelectric generating facility; and (c) lands or properties outside the project boundary, in which project operation or project-related actions may cause changes in the character or use of historic properties, if any exist.

Regional History

The earliest evidence of Native American occupation in Wisconsin dates to the Paleo-Indian period (10,000-8500 B.C.). Occupation continued through the Archaic (8,000-1,000 B.C.), Woodland (1000-300 B.C.), and Mississippian periods (A.D. 900-1600). Upon European contact, the project area was home to the Menominee and Ojibwe Native American tribes, which hunted the transition zone between northern hardwood forests and prairies, and fished its abundant waters. In the early 1800s, much of the land originally occupied was taken from the Menominee and Ojibwe. The tribes later repurchased some of these lands.

European exploration of the region began in 1673, but settlement did not occur until 1843 when Samuel Farnsworth arrived in the region and recognized its potential for logging. By 1851, logging had become prevalent on both the Wolf River and its tributaries, and in 1853, Shawano County was established with a population 254 inhabitants. Farms developed on the lands that had once been forested, and the village of Gresham was incorporated in 1908, shortly after the arrival of the railroad in 1906.

The first dam spanning the Red River at Gresham was constructed in 1885 and functioned as a grist mill and saw mill, which were converted to generate hydroelectric power in 1910. The facility was purchased by the village of Gresham in 1917 and has been under its ownership since the early twentieth century. In 1963, the Public Service Commission of Wisconsin approved the construction of the Weed Project to replace an existing natural dam created by an overgrowth of aquatic plants. The facility was designed to generate hydroelectric energy and promote recreation.

Archaeological and Historic Resources

Upper Red Lake Project

The Upper Red Lake Project was previously surveyed in 1990, and six sites were identified and evaluated to determine if any were eligible for listing on the National Register, including project features and a bridge. None were determined to be eligible. Since the evaluation, some components reached 50 years of age, and Gresham consequently reevaluated the project and bridge for eligibility. Neither the hydroelectric facility or bridge were determined to be eligible for the National Register because they do not retain sufficient architectural interest or integrity, and no evidence supports that either played an important role in the evolution of the hydroelectric industry in northern Wisconsin.

A phase I archaeological survey of the shoreline of the APE, conducted in June 2011, revealed no surface or sub-surface archaeological resources, artifacts, or buildings or structures that would be eligible for the National Register.

Weed Project

A literature review and archives research showed that one known archaeological site was located in the APE. A phase I archaeological survey of the shoreline of the APE, conducted in June 2011, revealed no evidence of the previously identified archaeological site. Also, the survey determined that there were no surface or sub-surface archaeological resources, Euro-American artifacts, or buildings or structures that would be eligible for the National Register.

As part of the historical and cultural resources assessment, a reconnaissance survey identified the hydroelectric facility and the Lower Lake Road Bridge (P-58-0092) within the APE. The hydroelectric facility was recommended as not eligible for listing on the National Register, whereas the bridge was determined to be eligible for listing under *Criterion C*: *Engineering*. Constructed in 1930, the bridge's multi-plate arch design represented a new engineering and technological advance that relied upon modular construction and was designed to complement concurrent New Deal beautification projects.

3.3.7.2 Environmental Effects

Continued operation and maintenance of the projects may affect unknown historic properties within the APEs. Future maintenance of the Weed Project may adversely the historic Lower Lake Road Bridge, which is eligible for listing on the National Register under *Criterion C: Engineering*. The executed state-wide PA requires that every proposed hydroelectric project in Wisconsin develop an HPMP to avoid, lessen, or mitigate for any adverse effects on both identified and unidentified historic properties within the APE. To address any potential adverse effects on both identified and unidentified historic properties, Gresham proposes to implement both HPMPs,[59] filed on November 29, 2011. The Wisconsin SHPO concurred with the proposed HPMPs on November 9, 2011.[60]

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[59] *Historic Properties Management Plan, Upper Red Lake Dam, FERC Project No. 2484*, and *Historic Properties Management Plan, Weed Lake Dam, FERC Project No. 2464* (Source: Gresham 2011).

[60] Pursuant to section II.B., *Historic Resources Management Plan,* of the executed PA, if the Wisconsin SHPO agrees with the HPMPs, then Gresham would implement the HPMPs, if a license is issued for each project.

Our Analysis

The Phase I archaeological survey was conducted along the shorelines of the projects' APE; however, the remaining lands within the APE were not surveyed. There may be unknown archaeological resources that could be adversely affected by future operation and maintenance for the projects. Proposed operation for the Weed Project would not affect the historic bridge; however, future project maintenance[61] may adversely affect the bridge, or emergency situations could potentially affect the bridge at the Weed Project. The HPMP contains procedures to mitigate for any adverse effects.

To ensure that any unanticipated discoveries are adequately addressed, the HPMPs for each project, developed based on requirements of the executed statewide Wisconsin PA,[62] contain procedures and requirements for: (1) the treatment of unanticipated archaeological resource discoveries, historic properties, traditional cultural properties, or human remains; and (2) future reviews and revisions of the HPMP. In addition to the above listed measures, the HPMP for the Weed Project contains the following measures to avoid, lessen, or mitigate any adverse effects to the historic bridge: (1) preserving and maintaining the Lower Lake Road Bridge in accordance with *The Secretary of the Interior's Standards for Rehabilitation*; (2) minimizing and mitigating the project's adverse effects; (3) and implementing mitigation measures during emergency situations.

We anticipate that any effects on unknown historic properties would be taken into account through the executed state-wide PA and HPMP for each project. The documents would ensure that any adverse effects on historic properties within the APEs would be resolved.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Upper Red Lake and Weed Projects would continue to operate in their current manner. There would be no changes to the physical, biological, or cultural resources of the area.

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[61] Future maintenance to the dam that causes vibrations could adversely affect the bridge.

[62] The full name of the PA is "Programmatic Agreement Among the Federal Regulatory Commission, the Advisory Council on Historic Preservation, the State of Wisconsin, State Historic Preservation Officer, and the State of Michigan, State Historic Preservation Officer, for managing Historic Properties that May Be Affected by New and Amended Licenses Issuing for the Continued Operation of Existing Hydroelectric Projects in the State of Wisconsin and Adjacent Portions of the State of Michigan."

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4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the projects' use of the Red River for hydropower purposes to see what effect various environmental measures would have on the projects' costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[63] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost for construction, operation, maintenance, and environmental measures; and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECTS

Table 12 summarizes the assumptions and economic information we use in our analysis for the projects. This information was provided by Gresham in its license applications and subsequent submittals. We find that the values provided by the applicants are reasonable for the purposes of our analysis. Each of the cost items and cost values shown in table 12 are common to both projects.

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[63] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

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Table 12. Parameters for economic analysis of the projects (Source: Gresham and staff).

Parameter	Value
Parameters and values common to both projects	
Period of analysis (years)	30
Federal income tax rate (%)[a]	0
Local income tax rate (%)[a]	0
Net investment (each project) ($)[b]	584,932
Operation and Maintenance (O&M) (each project)($)[c]	55,904
Licensing cost (each project) ($)[b]	158,566
Insurance (each project)	included in O&M
Energy value (both projects) ($/MWh)[b]	70.20
Short term interest rate (both projects) (%)[b]	2.75
Long term interest rate (both projects) (%)[b]	2.00
Discount rate (%)[b]	4.90

[a] Gresham is a municipality. As such, it does not pay federal and local taxes.

[b] Gresham provided additional information via email, filed on September 16, 2015, and June 23, 2016. In it, Gresham furnished updated values for the net investment, the cost to develop the license applications, the cost of the project's alternative power value, the discount rate that it uses, and the long- and short-term interest rates at which Gresham currently borrows funds via bonds or other financial vehicles.

[c] Gresham says that O&M expenses for both projects averaged $83,435 for the three-year period ending in 2013, $197,627 in 2014, and $111,114 in 2015. Staff averaged these costs to $55,904 per year, each project.

As currently operated, the Upper Red Project has an installed capacity of 275 kW and generates an average of 1,918 MWh annually. The Weed Project has an installed capacity of 620 kW and generates an average of 1,487 MWh annually. The value of power for each project is $70.20/MWh in 2015, which represents the cost Gresham pays to purchase power, as explained in their emails filed on September 16, 2015 and June 23, 2016. This cost includes energy and capacity as well as ancillary services.

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4.2 COMPARISON OF ALTERNATIVES

Table 13 and table 14 summarize for the Upper Red Lake and Weed Projects, respectively, the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this EA: no-action, the applicant's proposal, and the staff alternative. All costs are in 2015 dollars.

Table 13. Summary of the annual cost of alternative power and annual project cost for three alternatives for the Upper Red Lake Project (Source: staff).

	No Action	Gresham's Proposal	Staff Alternative
Installed capacity (MW)	0.275	0.275	0.275
Annual generation (MWh)	1,918	1,918	1,918
Dependable Capacity (MW)	0.0	0.0	0.0
Annual cost of alternative power ($/MWh)	$134,623 70.20	$134,623 70.20	$134,623 70.20
Annual project cost ($/MWh)	$92,754 48.3744.55	$114,286 59.60	$120,080 62.62
Difference between the cost of alternative power and project cost ($/MWh)	$41,869 21.83	$20,336 10.60	$14,543 7.58

Table 14. Summary of the annual cost of alternative power and annual project cost for three alternatives for the Weed Project (Source: staff).

	No Action	Gresham's Proposal	Staff Alternative
Installed capacity (MW)	0.620	0.620	0.620
Annual generation (MWh)	1,487	1,487	1,487
Dependable Capacity (MW)	0.0	0.0	0.0
Annual cost of alternative power ($/MWh)	$104,359 70.20	$104,359 70.20	$104,359 70.20
Annual project cost ($/MWh)	$92,754 62.39	$123,459 83.05	$131,329 88.34
Difference between the cost of alternative power and project cost ($/MWh)	$11,606 7.81	($19,100)[a] (12.85)[a]	($26,969)[a] (18.14)[a]

[a] A number in parentheses denotes that the difference between the alternative power cost and project cost is negative, thus the cost of producing power at the project is greater than the cost of alternative power.

4.2.1 No-Action Alternative

Under the no-action alternative, the projects would operate as they do currently. There are no costs associated with this alternative other than the cost for preparing the license applications for the Upper Red Lake and Weed Projects ($158,566 for each project).

4.2.2 Applicants' Proposals

Under Gresham's proposal, the Upper Red Lake Project would have a total installed capacity of 275 kW, no dependable capacity, and an average annual generation of 1,918 MWh. The average annual cost of alternative power would be $134,623, or $70.20/MWh. The average annual project cost would be $114,286, or $59.60/MWh. The project would produce power at a cost which is $20,336, or $10.60/MWh, less than the cost of alternative power.

Under Gresham's proposal, the Weed Project would have a total capacity of 620 kW, no dependable capacity, and an average annual generation of 1,487 MWh. The average annual cost of alternative power would be $104,359, or $70.20/MWh. The average annual project cost would be $123,459, or $83.05/MWh. The project would produce power at a cost which is $19,100, or $12.85/MWh, more than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes the same developmental components as the applicants' proposals and, therefore, would have the same capacity and energy values described above for the applicants' proposals. For the Upper Red Lake and Weed Projects, table 15 and table 16 show the respective staff-recommended additions, deletions, and modifications to each applicant's proposed environmental protection and enhancement measures, and the estimated cost of each.

For the Upper Red Lake Project, based on a total installed capacity of 275 kW, no dependable capacity, and an average annual generation of 1,918 MWh, the cost of alternative power would be the same as for the applicant's proposal: $134,623, or $70.20/MWh. The average annual project cost would be $120,080, or $62.62/MWh. The project would produce power at a cost which is $14,543, or $7.58/MWh, less than the cost of alternative generation.

For the Weed Project, based on a total installed capacity of 620 kW, no dependable capacity, and an average annual generation of 1,487 MWh, the cost of alternative power would be the same as for the applicant's proposal: $104,359, or $70.20/MWh. The average annual project cost would be $131,329, or $88.34/MWh. The project would produce power at a cost which is $26,969, or $18.14/MWh, more than the cost of alternative generation.

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4.3 COST OF ENVIRONMENTAL MEASURES

Table 15 and table 16 give the cost of each of the environmental enhancement measures considered in our analysis for the Upper Red Lake and Weed Projects, respectively. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 15. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the Upper Red Lake Project (Source: staff).

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
General					
1. Prepare a communications plan in consultation with the resource agencies for all aspects of hydroelectric operation and site management with potential to affect natural resources.	Wisconsin DNR	$1,000	$0	$50	f
Aquatic Resources					
2. Operate the project in a run-of-river mode.	Gresham, Interior, Wisconsin DNR, Staff	$0	$0	$0	e
3. Prepare an operation compliance monitoring plan.	Gresham, Interior, Wisconsin DNR, Staff	$2,000	$0	$100	f
4. Install physical staff gages both upstream and downstream of the project.	Interior, Wisconsin DNR, Staff	$1,000	$100	$150	f

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
5. Install water level recorders.	Wisconsin DNR	$0	$0	$0	g
6. Install automatic digital water level and flow recorders both upstream and downstream of the project.	Interior	$27,500	$16,000	$17,360	f
7. Install an automatic water level recording device downstream of the project.	Staff	$1,000	$150	$200	f
8. Calculate flows through the project.	Staff	$0	$0	$0	e
9. Make water level and flow information publicly available on a website.	Interior	$3,000	$600	$750	f
10. Make headwater and tailwater elevations and flows through the project available to the Commission and resource agencies upon request.	Staff	$0	$0	$0	e
11. Maintain the reservoir water surface elevation at 933.0 feet NGVD ±3.0 inches.	Gresham, Staff	$0	$0	$0	e

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
12. Maintain the reservoir water surface elevation at 933.0 feet NGVD ±3.6 inches.	Interior	$0	$0	$0	e
13. Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate the full range of ±3.6 inches within a 24-hour period.	Interior	$0	$0	$0	e
14. Return any deviations outside the ±3.6 inches range to the target elevation (±3.6 inches) as soon as possible and report such events to the FWS via email within 2 hours.	Interior	$0	$0	$0	e
15. Consult with the resource agencies prior to any planned deviation outside of ±3.6 inches.	Interior	$0	$0	$0	e
16. Consult with the resource agencies prior to any planned deviation from run of river operation requirements.	Staff	$0	$0	$0	e
17. Install trash racks with 1 inch-clear horizontal spacing between the bars.	Interior	$10,500	$0	$525	f

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
18. Maintain average normal intake approach velocities of no more than 2 fps.	Interior, Staff	$0	$0	$0	e
Terrestrial Resources					
19. Comply with the FWS's National Bald Eagle Management Guidelines and Conservation Measures.	Wisconsin DNR	$0	$0	$0	d
20. Prepare an invasive species monitoring/control plan.	Wisconsin DNR, Interior	$0	$0	$0	d
21. Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation.	Gresham, Staff	$20,000	$15,000	$16,000	h

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
22. Modify the applicant's proposed invasive species management plan to include: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance; (3) educational signage; (4) staff training; and (5) monitoring.	Staff	$6,000	1,000	$1,300	f
Recreation and Land Use					
23. Prepare a recreation plan.	Gresham, Staff	$1,000	$1,000	$1,050	h
24. Continue to operate and maintain the boat landing, accessible fishing/launching pier, boat ramp, and parking area at the South Shore access area.	Gresham	$0	$2,000	$2,000	h
25. Install picnic tables and benches at the South Shore access area.	Gresham	$3,000	$2,000	$2,150	h
26. Modify the proposed recreation plan to include the applicant's proposed measures listed in items 24 and 25.	Staff	$3,000	$4,000	$4,150	h

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
Cultural Resources					
27. Implement Historic Properties Management Plan.	Gresham, Staff	$5,000[b]	$0	$250	f
28. Execute the statewide Wisconsin PA.	Staff	$0	$0	$0	e

[a] All capital and annual costs given in the application were escalated to 2014 dollars using the Bureau of Reclamation Construction Cost Trends found at http://www.usbr.gov/pmts/estimate/cost_trend.html.

[b] Annual costs typically include operational and maintenance costs and any other costs that occur on a yearly basis.

[c] All capital and annual costs are converted to equal annual costs (levelized) over a 30-year period to give a uniform basis for comparing all costs.

[d] Cost cannot be estimated because no plan and specifications were provided by the Wisconsin DNR or Interior.

[e] Staff estimates the cost of this measure to be negligible.

[f] Cost estimated by staff.

[g] We are unable to estimate a cost for this measure because the Wisconsin DNR did not specify how many water level recorders it is recommending.

[h] Cost provided by the applicant in an email filed in project's record on August 18, 2015 and April 4, 2016.

Table 16. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the Weed Project (Source: staff).

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
General					
1. Prepare a communications plan in consultation with the resource agencies for all aspects of hydroelectric operation and site management with potential to affect natural resources.	Wisconsin DNR	$1,000	$0	$50	e
Geologic and Soil Resources					
2. Prepare an erosion management plan for the Weed Project tailrace.	Gresham, Staff	$2,500	$0	$125	e
3. Develop and implement an erosion and sediment control plan associated with construction of the proposed improvements to the recreation facilities.	Staff	$5000	$0	$250	e, l
Aquatic Resources					
4. Continue to operate the project in a run-of-river mode.	Gresham, Interior, Wisconsin DNR, Staff	$0	$0	$0	f

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
5. Modify or replace the current turbines or discontinue use of the larger of the two turbines under conditions that could produce rapid or frequent fluctuations in flow downstream.	Interior	$0	$0	$0	g
6. Prepare an operation compliance monitoring plan.	Interior, Wisconsin DNR, Staff	$7,000	$0	$350	e
7. Install physical staff gages both upstream and downstream of the project.	Interior, Wisconsin DNR, Staff	$1,000	$100	$150	e
8. Install water level recorders.	Wisconsin DNR	$0	$0	$0	h
9. Install automatic digital water level and flow recorders both upstream and downstream of the project and make the information available on a public website.	Interior	$27,500	$16,000	$17,375	e, k
10. Make headwater and tailwater elevations and flows through the project available to the Commission and resource agencies upon request.	Staff	$0	$0	$0	f

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
11. Maintain the reservoir water surface elevation at 933.0 feet NGVD ±3.0 inches.	Gresham, Staff	$0	$0	$0	f
12. Maintain the reservoir water surface elevation at 933.0 feet NGVD ±3.6 inches.	Interior	$0	$0	$0	f
13. Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate the full range of ±3.6 inches within a 24-hour period.	Interior	$0	$0	$0	f
14. Return any deviations outside the ±3.6 inches range to the target elevation (±3.6 inches) as soon as possible and report such events to the FWS via email within 2 hours.	Interior	$0	$0	$0	f
15. Consult with the resource agencies prior to any planned deviation outside of ±3.6 inches.	Interior	$0	$0	$0	f
16. Consult with the resource agencies prior to any planned deviation from run of river operation requirements.	Staff	$0	$0	$0	f

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
17. Continue compliance with the current minimum flow of 7 cfs through the bypassed spillway channel.	Gresham, Interior, Staff	$0	$0	$0	f
18. Install trashracks with 1-inch clear horizontal spacing between the bars.	Interior	$17,500	$0	$875	e
19. Maintain average normal intake approach velocities of no more than 2 fps.	Interior, Staff	$0	$0	$0	f
Terrestrial Resources					
20. Implement the northern long-eared bat avoidance and protection measures.	Staff	$6,000	$400	$700	e
21. Comply with the FWS's National Bald Eagle Management Guidelines and Conservation Measures.	Wisconsin DNR	$0	$0	$0	d
22. Prepare an invasive species monitoring/control plan.	Wisconsin DNR, Interior	$0	$0	$0	i

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
23. Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation.	Gresham, Staff	$20,000	$15,000	$16,000	k
24. Modify the applicant's proposed invasive species management plan to include: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance; (3) educational signage; (4) staff training; and (5) monitoring.	Staff	$6,000	$1,000	$1,300	e
Recreation and Land Use					
25. Prepare a recreation plan within 1 year of license issuance to enhance recreation resources.	Gresham, Staff	$1,000	$1,000	$1,050	j

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
26. Continue to operate and maintain Riverside Park, which includes picnic tables and grills, playground equipment, a floating dock, boat landing, and parking area.	Gresham	$0	$4,000	$4,000	j
27. Continue to operate and maintain the Geider Road access area.	Gresham	$0	$1,000	$1,000	j
28. Continue to operate and maintain the swimming area, canoe/kayak put-in site, and parking area at the Red River walk-in site.	Gresham	$0	$3,000	$3,000	j
29. Continue to maintain the tree berm at the Red River walk-in site.	Gresham	$0	$1,000	$1,000	j
30. Install one fishing dock at Riverside Park's boat landing.	Gresham	$5,000	$2,000	$2,250	j
31. Install two benches at Riverside Park's boat landing.	Gresham	$1,000	$0	$50	j

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
32. Develop a small picnic area with picnic tables at the Red River walk-in site.	Gresham	$0	$1,000	$1,000	j
33. Install an ornamental fence and signage at an informal beach access site, located on the north shore, across from the Red River walk-in site.	Gresham	$0	$1,000	$1,000	j

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
34. Modify the applicant's proposed recreation plan to include: (1) the applicant's proposed measures listed in items 27 through 34; (2) provisions for upgrading the existing informal parking area by paving or with gravel; (3) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (4) signage for the existing facilities; (5) conceptual drawings; and (6) posting information on water levels downstream of the Weed Project on a public website.	Staff	$36,000[a]	$16,650	$18,450	k, m
35. Install a real-time water level and stream flow gaging station downstream of the Weed Project, and make the data publicly available on a website.	Interior	$0	$0	$0	n

Enhancement/ Mitigation Measure	Entity	Capital Cost[a] (2015$)	Annual Cost[a, b] (2015$)	Levelized Annual Cost[c] (2015$)	Notes
Cultural Resources					
36. Implement Historic Properties Management Plan.	Gresham, Staff	$5,000[a]	$0	$250	e
37. Execute the statewide Wisconsin PA.	Staff	$0	$0	$0	f

[a] All capital and annual costs given in the application were escalated to 2014 dollars using the Bureau of Reclamation Construction Cost Trends found at http://www.usbr.gov/pmts/estimate/cost_trend.html.

[b] Annual costs typically include operational and maintenance costs and any other costs that occur on a yearly basis.

[c] All capital and annual costs are converted to equal annual costs (levelized) over a 30-year period to give a uniform basis for comparing all costs.

[d] We were unable to estimate the cost for this item because no measures were specified by the Wisconsin DNR.

[e] Cost estimated by staff.

[f] Staff estimates that the cost to implement this measure would be negligible.

[g] We are unable to estimate a cost for this measure because the costs associated with modifying or replacing turbines vary greatly.

[h] We are unable to estimate a cost for this measure because the Wisconsin DNR did not specify how many water level recorders it is recommending.

[i] We are unable to estimate the cost for this item because no measures were specified by the Wisconsin DNR or Interior.

[j] Cost provided by the applicant in an email filed in the project's record on August 18, 2015 and April 4, 2016.

[k] The cost of this measure is assumed to be included in the cost for recreational enhancements.

[l] One-time expense.

[m] Costs to develop and implement an erosion and sediment control plan are included in Geological and Soil Resources.

[n] The cost of this measure is assumed to be included in the cost for Interior's recommendation to install an automatic digital water level and flow recorder downstream of the Weed Project.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any licenses issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Upper Red Lake and Weed Projects. We weigh the costs and benefits of our recommended alternative against proposed measures.

Based on our independent review of agency and public comments filed on these projects and our review of the environmental and economic effects of the proposed projects and their alternatives, we selected the proposed projects with staff-recommended modifications as the preferred alternative for both projects. This alternative includes elements of the applicant's proposals with additional staff-recommended measures. We recommend this alternative because: (1) issuance of an subsequent license for each project would allow Gresham to operate the Upper Red Lake and Weed Projects and provide beneficial and dependable sources of electrical energy; (2) the combined 895 kW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative in both cases would exceed those of the no-action alternative; and (4) the recommended measures would protect and improve fish, wildlife, recreational and cultural resources.

In the following section, we make recommendations as to which environmental measures proposed by Gresham, or recommended by agencies or other entities should be included in any licenses issued for the projects. In addition to applicant's proposed environmental measures, we recommend additional staff-recommended environmental measures to be included in any licenses issued for the projects.

5.1.1 Measures Proposed by the Applicant

Based on our environmental analysis of the applicant's proposal in section 3, and the costs presented in section 4, we conclude that the following environmental measures proposed by the applicants would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any licenses issued for the Upper Red Lake and Weed Projects.

5.1.1.1 Upper Red Lake Project

- Operate the project in a run-of-river mode, maintaining the Upper Red Lake Project reservoir water surface elevation at 933.0 feet NGVD ±3 inches.
- Prepare an operation compliance monitoring plan to verify run-of-river mode of operation, by monitoring: (1) headwater elevations in the Upper Red Lake Project reservoir with an existing headwater ultrasonic water surface elevation sensor; and (2) turbine output.
- Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation.
- Prepare a recreation plan within 1 year of license issuance to enhance recreation resources.[64]
- Continue to operate and maintain the boat landing, accessible fishing/launching pier, boat ramp, and parking area at the South Shore access area.
- Install picnic tables and benches at the South Shore access area.
- Add the parking area at the South Shore access area, which provides access to the shoreline, boat launch, and fishing/launching pier, to the project boundary.
- Remove certain privately owned residences surrounding the Lion's Club boat launch from the project boundary, and modify the project boundary to more accurately reflect Gresham's flowage rights in the area.
- Implement an HPMP, filed on November 29, 2011.[65]

5.1.1.2 Weed Project

- Prepare an erosion management plan for the Weed Project tailrace channel to describe the potential contributing factors for the erosion observed in the Weed Project tailrace channel and develop mitigation measures.
- Continue to operate the project in a run-of-river mode, maintaining the Weed Project reservoir water surface elevation at 897.2 feet NGVD ±3 inches.

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[64] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures. We assume that the purpose of the applicant's proposal to develop a recreation plan within 1 year of license issuance would be to guide the management of the existing recreation facilities, as well as any proposed recreation enhancements.

[65] The Wisconsin State Historic Preservation Office (Wisconsin SHPO) approved the HPMP, entitled *Historic Resources Management Plan for the Upper Red Lake Dam Hydroelectric Project, FERC No. 2484*, in a letter filed on November 29, 2011.

- Continue to provide a minimum flow of 7 cfs to the spillway channel.
- Prepare an invasive species management plan to limit the proliferation of invasive species during project maintenance and operation.
- Prepare a recreation plan within 1 year of license issuance to enhance recreation resources.[66]
- Continue to operate and maintain: (1) Riverside Park; (2) the Geider Road access area; and (3) the swimming area, canoe/kayak put-in site, and parking area at the Red River walk-in site.
- Continue to maintain a tree berm[67] at the Red River walk-in site.
- Install a fishing dock and benches at the Riverside Park boat landing.
- Develop a picnic area at the Red River walk-in site.
- Install an ornamental fence and signage at an informal beach access site to eliminate use of the site and direct recreationists to the Red River walk-in site, located across the river.
- Remove the athletic fields and other buildings unrelated to project operation from the project boundary at Riverside Park.
- Add the Geider Road access area to the project boundary, including a small parking area that provides access to the Geider Road access area.
- Implement an HPMP filed on November 29, 2011.

5.1.2 Additional Measures Recommended by Staff

In addition to Gresham's proposed measures described above, we recommend the following measures in any license issued to Gresham. Unless otherwise noted, each measure applies to both projects.

- Prepare an erosion and sediment control plan for the Weed Project for the ground-disturbing activities associated with construction of the proposed recreation facility improvements.
- Modify the proposed operation compliance monitoring plan for the Upper Red Lake Project to include provisions to: (1) install staff gages both upstream and downstream of the project; (2) install an automatic water level recording device downstream of the project; and (3) maintain hourly records of project

[66] The intent of the recreation plan is to enhance recreation resources, but, as proposed, the recreation plan does not include a purpose or any specific proposed measures.

[67] The tree berm at the Red River walk-in site is located along the southeastern shoreline of the peninsula, and is also referred to in the application as a "tree buffer."

operation on a daily basis to document compliance with the operational requirements of any license issued for the project.

- Prepare an operation compliance monitoring plan for the Weed Project to include provisions to: (1) install staff gages both upstream and downstream of the project; and (2) maintain hourly records of project operation on a daily basis to document compliance with the operational requirements of any license issued for the project.
- Modify the proposed invasive species management plan to include: (1) a description of target invasive species; (2) site specific measures to be used during project operation and maintenance; (3) educational signage; (4) staff training; and (5) monitoring.
- For the Weed Project, to protect northern long-eared habitat, avoid cutting northern long-eared bat forage or roosting trees between April 1 and October 31, and where trees need to be removed, only remove trees equal or greater than 3 inches in diameter at breast height between November 1 and March 31.
- Modify the proposed recreation plan for the Upper Red Lake Project to include: (1) all proposed recreation measures; (2) installing picnic tables and benches at the South Shore access area; and (3) conceptual drawings.
- Modify the proposed recreation plan for the Weed Project to include: (1) all proposed recreation measures; (2) upgrade the existing informal parking area by paving or with gravel; (3) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (4) signage for the existing facilities; (5) conceptual drawings; and (6) posting information on water levels downstream of the Weed Project on a public website.
- Implement the statewide Wisconsin PA for the projects.

Below, we discuss the rationale for modifying Gresham's proposal and the basis for our additional staff-recommended measures.

Erosion Management Plan

As discussed in section 3.3.1, *Geological and Soil Resources*, Gresham identified six areas of stream bank erosion in the Weed Project tailrace channel resulting from three separate processes including foot traffic at the recreational access points to the river, flow exiting the powerhouse and seepage. Gresham's proposed erosion management plan would describe the areas of active erosion within the Weed Project tailrace channel, describe the contributing factors for the areas of active erosion, develop and evaluate mitigation measures, justify the selection of the mitigation measures, and develop a cost and schedule to implement the selected alternative. Implementation of the erosion management plan would help ensure that project operation does not cause stream bank

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erosion that adversely affects water quality, resident aquatic species, and their respective instream habitats in the project area.

In section 4, *Developmental Analysis*, we determined that the levelized annual cost of preparing an erosion management plan would be $125. Implementation of an erosion management plan would identify the causes of stream bank stability in the Weed Project tailrace channel and propose measures that are needed to mitigate the effects of project operation. We find that the benefits associated with this plan would be worth this cost to ensure that project operation is not adversely affecting stability of the project's tailrace channel.

Erosion and Sediment Control Plan

As discussed in section 3.3.1.2, *Geological and Soil Resources,* Gresham proposes improvements to recreation facilities at the Weed Project that would result in land-disturbing activities, which could cause localized soil erosion. Soil and sediments eroded from construction of the sites would adversely affect water clarity, which would reduce sunlight penetration and thereby limit photosynthesis by aquatic plants. Eroded soils and sediments would also cause the transfer of nutrients and other pollutants downstream, and degrade habitats and spawning areas of aquatic organisms.

In section 3.3.1.2, *Geological and Soil Resources,* we concluded that implementing BMPs during construction of the recreation facilities at the Weed Project would protect water quality, terrestrial resources, and aquatic habitat from construction-related activities through avoidance and minimization of soil erosion and sediment mobilization. An erosion and sediment control plan would provide detail and specificity regarding how the BMPs would be implemented to address soil erosion from ground-disturbing activities that would occur during construction. To maximize the effectiveness of the plan, the plan should be based on actual site geological, soil, and ground water conditions. The plan, at a minimum, must include:

(1) site-specific measures proposed to control erosion, to prevent slope instability, and to minimize the quantity of sediment resulting from the project construction activities;

(2) detailed drawings and specific topographic locations of all control measures;

(3) a specific provision for replacing vegetation with plant species indigenous to Wisconsin;

(4) an implementation schedule;

(5) details for monitoring the effectiveness of the control measures;

(6) a provision to file a report with the Commission within 10 days of any temporary or emergency deviations from the plan's requirements.

Implementation of a detailed erosion and sediment control plan would protect water quality and aquatic habitat from construction-related activities by better ensuring the minimization of soil erosion and sedimentation.

In section 4, *Developmental Analysis,* we determined that the development and implementation of a detailed erosion and sediment control plan would result in an additional annualized cost of only $250 and would be a reasonable cost to provide the necessary detail to ensure that project construction would not adversely affect the water and aquatic resources in the project area. For this reason, we recommend our proposal to prepare a detailed erosion and sediment control plan.

Project Operation and Compliance

Interior recommends and Gresham proposes to operate both projects in a run-of-river mode. As discussed in section 3.3.2, *Aquatic Resources*, operating the projects in a run-of-river mode, whereby outflow from each project approximately equals inflow to each project reservoir, would help protect aquatic resources by minimizing the fluctuation of the water surface elevations in both project reservoirs and help maintain stable flows and water surface levels downstream of each project. Therefore, we recommend that projects operate in a run-of-river mode.

Gresham proposes to prepare an operation plan for the Upper Red Lake Project that would contain provisions for monitoring: (1) headwater elevations with an existing headwater ultrasonic water surface elevation sensor; and (2) recording turbine generator output. Gresham does not propose to prepare an operation plan for the Weed Project; however, the Weed Project is operating under a run-of-river operation plan that was approved by Commission order issued June 18, 2010.[68] The plan contains provisions for monitoring: (1) headwater elevations with an existing headwater ultrasonic water surface elevation sensor; (2) tailwater elevations using a pressure transducer; and (3) recording turbine generator output.

As discussed in section 3.3.2, *Aquatic Resources*, including in an operation compliance monitoring plan for the Upper Red Lake Project a provision to install an automatic water level recording device downstream of the project would enable water levels to be electronically recorded and monitored on a continual basis in a cost-effective manner.

As also discussed in section 3.3.2, *Aquatic Resources*, preparing an operation compliance monitoring plan for not only the Upper Red Lake Project, but also the Weed Project, and including in each plan, a provision to install publically visible staff gages both upstream and downstream of each project, would provide a numerical benchmark for the water surface elevation of each project reservoir and tailrace and allow an opportunity for Gresham to calibrate each water level sensor, as necessary, in a cost effective manner. Additionally, including a provision to clearly demarcate the required reservoir water elevation limits on the upstream staff gages would provide an

[68] 131 FERC ¶ 62,245 (2010).

informational tool regarding the operational requirements of each project compared to existing water surface elevations within each project reservoir and would help ensure that the operational requirements of each project are met.

The plans should also include provisions to: (1) maintain hourly records of project operation on a daily basis, including reservoir elevations, tailwater elevations, turbine output, and calculated flows through both projects; (2) specify the procedures and protocols for maintaining, locating, and calibrating all monitoring equipment and any other measuring devices used to confirm compliance with run-of-river operation; and (3) provide compliance data in electronic format to the resource agencies and the Commission upon request.

Overall, developing an operation compliance monitoring plan for each project would provide a means to verify compliance with the operational requirements of any licenses issued for the projects. Therefore, we recommend that Gresham prepare, after consultation with the Wisconsin DNR and Interior, an operation compliance monitoring plan for each project that provides a detailed description of the procedures and techniques that Gresham would employ to demonstrate compliance with any license requirements, including but not limited to, operating the projects in a run-of-river mode and maintaining reservoir level requirements.

Preparing an operation compliance monitoring plan for each project with our recommended measures would result in an annualized cost of $100 for the Upper Red Lake Project and $350 for the Weed Project. We find that the benefits of these plans would be worth these costs to ensure an adequate means by which the Commission could track compliance with the operational terms of any license issued for each project.

Invasive Species Management Plan

As discussed in section 3.3.4 *Terrestrial Resources*, preparing an invasive species management plan would ensure the protection of terrestrial and wetland habitat along both project reservoirs from the continued spread of invasive species and enhance the littoral and riparian zone for native plant and wildlife species. Although Gresham's plan provides an outline for an invasive species management plan, the proposed plan is general and does not include specific management and implementation measures. Therefore, we recommend that Gresham's proposed invasive species management plan for each project include:

(1) a description of target invasive species;

(2) site-specific measures to be used to limit the spread of invasive species during project operation and maintenance, including the tree berm at the Red River walk-in site;

(3) educational signage, at applicant-owned boating access areas, that contains information on curly-leaf pondweed and Eurasian watermilfoil and how to prevent their spread;

(4) staff training in invasive species identification and prevention; and

(5) monitoring to evaluate the success of revegetation and invasive plant control efforts.

Also criteria that define when revegetation and control of invasive species is successful should also be included in the plan. We conclude that the implementation of an invasive species plan with staff's modification would be worth the levelized annual cost of $17,300 for the Upper Red Project and $17,300 for the Weed Project.

Northern Long-eared Bat Avoidance and Protection Measure

As discussed in section 3.3.5, *Threatened and Endangered Species*, Gresham's proposal to maintain the tree buffer located at the southeast corner of the Red River walk-in site of the Weed Project to provide views from the access site to and from the river could remove potential roosting habitat for current or future northern long-eared bat populations. Northern long-eared bat avoidance and protection measures for the Weed Project would protect potential northern long-eared bat habitat while maintaining public safety. Avoidance and protection measures would include:

(1) avoid cutting northern long-eared bat forage or roosting trees between April 1 and October 31; and

(2) where trees need to be removed, only remove trees equal or greater than 3 inches in diameter at breast height between November 1 and March 31.

The proposed seasonal tree clearing restrictions would avoid the time period when northern long-eared bats would likely be occupying potential roosts, thereby reducing adverse effects to any northern long-eared bats that may be in the project boundaries. We conclude that staff's recommended implementation of the northern long-eared bat avoidance and protection measures would be worth the levelized annual cost of $700 for the Weed Project.

Recreation Plan

As discussed in section 3.3.6, *Recreation and Land Use Resources*, recreation plans can provide a framework for implementing recreation facility enhancements and monitoring future recreational use and needs of those sites. However, the recreation plans proposed by Gresham do not include a purpose or any specific proposed measures. Therefore, modifying the proposed recreation plans to include Gresham's proposed recreation measures for each project would ensure that facilities and amenities are suitably constructed and maintained.

At the Weed Project, recreationists currently use an informal beach access site,[69] causing shoreline erosion at the site. Implementing the applicant's proposal to prohibit access by installing ornamental fencing around the site would permanently eliminate recreation use of the informal beach access site. However, prohibiting access would enable the eroded area to stabilize naturally over time. Also Gresham's proposal to provide directional signage to the Red River walk-in site, which provides beach access, would redirect recreationists to the site.

The Red River walk-in site provides swimming opportunities and a canoe/kayak put-in. Occasionally there are conflicts between the boaters and swimmers because the put-in and swimming areas are undefined. We anticipate the conflicts to increase once the recreationists that use the informal beach access site are redirected to the Red River walk-in site. Modifying the Weed Project recreation plan to include: (1) upgrade the existing parking area by paving or with gravel; (2) constructing new paths to connect the existing informal parking lot with the existing canoe/kayak launch and swimming area; (3) signage for the existing facilities; (4) conceptual drawings would ensure ease of use and access and help reduce conflict between user groups.

Interior's recommendation to post downstream water levels would allow recreational users to efficiently plan trips to the project site as well as help inform recreational users of existing flow and safe boating conditions; however, this could be achieved more economically by posting downstream water levels based on readings taken from the existing pressure transducer, versus the recommended stream gaging station. Therefore, the proposed recreation plan for the Weed Project should include a provision to post downstream water levels, correlated to flows on a public website.

Preparing the overall recreation plans with staff modifications would help to ensure that any facilities and amenities are suitably constructed and maintained. We conclude that the preparation of each overall recreation plan with staff's modification would be worth the levelized annual cost of $5,200 for the Upper Red Lake Project and $19,500 for the Weed Project.

Cultural Resources

The Commission is the party responsible for carrying out section 106 of the NHPA. We anticipate that any effects on unknown historic properties for both projects would be taken into account through the executed PA and HPMPs. The PA and HPMP for the Weed Project would also ensure that Gresham implements measures avoid, lessen, or mitigate for any effect to the Lower Lake Bridge if future project maintenance may require the modification to the bridge or emergency situations arise. We conclude that

[69] The site is located on the north shore directly across from the Red River walk-in site.

implementing the executed statewide Wisconsin PA would be negligible in cost, and implementing the HPMP would be worth the levelized cost of $250 at the Upper Red Lake Project and $250 at the Weed Project.

5.1.3 Measures Not Recommended by Staff

Communication/Consultation Plan

The Wisconsin DNR recommends that Gresham prepare a communication / consultation plan to consult with the resource agencies for all aspects of hydroelectric operation and site management that have the potential to affect natural resources. We recommend that Gresham prepare staff-recommended plans related to fish and wildlife resources after consultation with the resource agencies, which would include plans to: monitor compliance for project operation, control erosion, and manage for invasive species at both of the projects. Because each plan includes a provision to consult with the resource agencies, it would allow the opportunity to develop protocols for communication over the term of any subsequent licenses, if issued for the projects. Therefore, we conclude that developing an additional communication/consultation plan would be unnecessary and not worth the estimated levelized annual cost of approximately $50 for the Upper Red Lake Project and $50 for the Weed Project.

Reservoir Fluctuation and Deviation Reporting

Interior recommends that the headwater elevation at each project reservoir not fluctuate the full range of its recommended ± 0.30 foot within a 24-hour period. As discussed in section 3.3.2, *Aquatic Resources*, Interior did not provide a rationale for specifically limiting fluctuations to no more than ± 0.30 foot over a 24-hour period. Although we recommend that Gresham maintain its reservoir surface elevations within its proposed ± 0.25 foot range, which is slightly more restrictive than Interior's ±0.30 foot range, it is unclear what benefit would be gained from implementing Interior's recommended measure. We, therefore, have no justification for recommending Interior's recommendation for limiting fluctuations to no more than ± 0.30 foot over a 24-hour period.

Interior also recommends that any deviations outside of the ± 0.30 foot range be reported to FWS via email within 2 hours of discovery. As discussed in section 3.3.2, *Aquatic Resources*, Interior did not provide a rationale for recommending such a specific reporting requirement and it is unclear what added benefit emailing the FWS within such a short, 2-hour period of time upon discovering a deviation would have in protecting potentially affected resources. Additionally, a requirement to contact FWS within two hours "upon discovery" of a deviation could detract from Gresham's efforts to resolve any such noncompliance event. Therefore, we do not recommend adopting Interior's deviation reporting recommendation. Rather, in the event of any deviation from run-of-river operation, remediating any deviation first, and then contacting the resource agencies

and the Commission, as soon as possible, but no later than 10 days, would allow for Gresham to focus its efforts on resolving any such issue and develop methods to avoid future deviations, as necessary.

Digital Water Level and Flow Recorders

As a provision of its recommend operational compliance plan, Interior recommends that Gresham install new digital water level and flow recorders both upstream and downstream of each project. As discussed in section 3.3.2, *Aquatic Resources*, installing new digital water level and flow recorders both upstream and downstream of each project would not be necessary to monitor compliance at the projects given that other more cost effective options are available such as using Gresham's monitoring devices that are already installed at the projects. Our analysis in section 3.3.2, *Aquatic Resources*, indicates that maintaining the existing headwater ultrasonic water surface elevation sensors at each project and the existing pressure transducer downstream of the Weed Project, as well as staff's recommendation to install an automatic water level recording device downstream of the Upper Red Lake Project, and installing staff gages both immediately upstream and downstream of the projects, would be sufficient to monitor and document compliance with run-of-river operation. Additionally, Interior's recommendation to install automatic digital flow and water level recorders would not be necessary to determine inflows and outflows at the projects because flows at each project are currently calculated using a USGS gaging station located approximately 5 RM upstream of the Upper Red Lake Project and could also be determined using discharge ratings from power generation.

Therefore, we conclude that installing new digital water level and flow recorders both upstream and downstream of each project would provide few, if any, benefits and would not be necessary to document compliance with the operational requirements of any license issued for either project. For these reasons, we conclude that Interior's recommendation for installing new digital water level and flow recorders would not be worth the estimated levelized annual cost of approximately $17,360 for the Upper Red Lake Project and $17,375 for the Weed Project.

Weed Project Turbines

As discussed in section 3.3.2, *Aquatic Resources*, Gresham has had difficulties complying with its current run-of-river operation requirement under the existing license for the Weed Project due to downstream flow fluctuations because of the automation of power generation and the size differential of the two turbine units, which results in pulsing and subsequent downstream flow fluctuations when the project switches between turbines. On June 4, 2014, Interior filed a recommendation for Gresham to either modify or replace their current turbines or discontinue use of the larger of the two turbines under conditions that could produce rapid or frequent fluctuations in downstream flows. On October 5, 2015, Gresham filed the results of a trial run-of-river operation plan. In the

summary, Gresham noted that data from May through August of 2015 showed a marked reduction in the frequency of downstream fluctuations compared to the 2014 data, and Gresham attributed these reductions, in part, to a refurbishment of the larger turbine generating unit that now allows it to pass lower flows. According to the summary, Wisconsin DNR agreed with Gresham's assessment, concluding that the 2015 data demonstrates a substantial improvement in run-of-river operation.

The measures taken by Gresham, including modification of the large generating unit, seem to have adequately alleviated the rapid or frequent downstream flow fluctuations resulting from switching between the different turbine units and appear to meet the intent of Interior's recommendation. Therefore, we do not recommend modifying or replacing Gresham's current turbines or discontinuing the use of the larger of the two turbines.

Trashrack Design

Continued operation of the projects has the potential to result in some fish losses from impingement on the projects' trashracks or entrainment through the projects' turbines. To minimize fish mortality related to operating the projects, Interior recommends that Gresham install trashracks at both projects that have a maximum of 1 inch clear horizontal spacing between the bars and maintain "average normal intake approach velocities" no greater than 2.0 fps. Gresham does not propose any changes to its current trashrack configurations for the Upper Red Lake Project (2.2-inch bar spacing) or Weed Project (2.6-inch bar spacing). Interior states that trashracks with its recommended 1-inch spacing would protect more small fish from entrainment-related mortality, such as mortality resulting from turbine strike, at the projects than Gresham's current trashrack configurations.

As further discussed in section 3.3.2, *Aquatic Resources*, with the existing trashracks, the intake approach velocities for the Upper Red Lake Project and the Weed Project would continue to be at or below 2.0 fps during both mean and median flow conditions, and therefore meet Interior's recommended "average normal intake approach velocities" of no more than 2.0 fps.

Various species of sunfish, carps/minnows, and suckers would be most susceptible to entrainment through project facilities, particularly those individuals that are less than 6 inches in length and have burst speeds of less than 2.0 fps. However, survival rates would be upwards of 90 percent for resident fish passing through the projects' turbines. Additionally, the fish species most likely to become entrained at the projects have rapid growth rates and reproductive characteristics that increase their dispersal abilities by increasing their reproductive potential. Therefore, with Gresham's current trash rack configurations in place, continued operation of the projects would likely have little to no adverse effect on the overall fish community in the projects' reservoirs.

For these reasons, we conclude that installing Interior's recommended trashracks with 1-inch clear bar spacing would provide limited additional benefits to fish

populations within the projects' reservoirs compared to Gresham's existing trashracks and would not be worth the estimated levelized annual cost of approximately $525 for the Upper Red Lake Project and $875 for the Weed Project.

Gaging Station Installation

Interior recommends the installation of a stream gaging station at the Weed Project. Interior states that the stream gaging station is needed because the current peaking operation provided predictable boating flows for boaters; whereas, the proposed run-of-river operation would make the flows less predictable. However, the Weed Project was never licensed to operate in a peaking mode. As discussed in section 3.3.2, *Aquatic Resources*, Gresham had difficulty complying with its run-of-river operation requirement under its current license, although it has implemented measures to operate as run-of-river. As discussed in section 3.3.6, *Recreation and Land Use Resources*, and section 3.3.2, *Aquatic Resources*, Gresham currently uses the existing pressure transducer to measure water levels downstream of the Weed Project, which is an adequate tool for detecting the magnitude and duration of any downstream flow fluctuations that may occur as a result of project operation. As such, it would be practical and cost-effective for Gresham to use the existing pressure transducer, rather than install a stream gaging station as proposed by Interior. Further, Interior's recommendation to post downstream water levels to a public website could be achieved more economically by posting downstream water levels based on readings taken from the existing pressure transducer, versus a stream gaging station, and would similarly serve as a simple and effective tool to inform boaters of on-site river conditions.

Therefore, we do not recommend installing a stream gaging station. The measure would not be worth the estimated levelized annual cost of approximately $8,690.

Posting Upper Red Lake Flow Data to a Website

Interior recommend posting downstream flow information at the Upper Red Lake Project. However, there is a USGS gage located in close proximity to, and upstream of, the Upper Red Lake Project, which posts real-time discharge and stage information. Therefore, as further discussed in section 3.3.2, *Aquatic Resources,* posting flow data online for the Upper Red Lake Project reservoir would unnecessary, and would not serve any additional benefit to boaters that is not already provided by the USGS.

National Bald Eagle Management Guidelines and Conservation Measures

The Wisconsin DNR recommends compliance with the FWS's National Bald Eagle Management Guidelines and Conservation Measures. As discussed in section 3.3.4 *Terrestrial Resources*, bald eagles have been documented foraging in the nearby Wolf River, but no bald eagle sightings or nesting sites have occurred at the projects. Vegetation removal within the tree berm located in the southeast corner of the Red River walk-in site at the Weed Project would be limited to a small area and only dead or dying

trees would be removed. Project maintenance activities at the Weed Project would not affect bald eagles because tree removal would not include live trees, which are used for nesting. There is no tree removal proposed at the Upper Red Lake Project. Therefor neither the Weed Project nor the Upper Red Lake Project would affect bald eagles and compliance with the FWS's National Bald Eagle Management Guidelines and Conservation measures would not be required.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Continued operation of the projects would result in some unavoidable fish impingement- or entrainment-related mortality as fish are either impinged on the trashracks or pass through the turbines. However, Gresham's proposal to maintain its current trashrack configurations for the Upper Red Lake and Weed Projects with 2.2-inch and 2.6-inch clear-bar spacing, respectively, and maintain average normal intake approach velocities of no more than 2.0 fps, would continue to help limit any entrainment- and impingement-related fish mortality that may occur. Considering the size, speed, and proposed operation of the turbines, as well as the high fecundities of the fish species that would likely be subject to impingement and entrainment at the projects, the overall effects of impingement and entrainment at the projects on resident fish populations are expected to be minimal.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. On June 3, 2014, in response to the Notice of Application Ready for Environmental Analysis, the Interior filed recommendations pursuant to section 10(j). No other state or federal fish and wildlife agency submitted recommendations.

Table 17 and table 18 lists the federal recommendations filed subject to section 10(j) for the Upper Red Lake Project and Weed Project, respectively, and whether the recommendations are included under the staff alternative, and indicates the basis for our preliminary determinations concerning measures that we consider inconsistent with section 10(j). Of the seven recommendations that we consider to be within the scope of section 10(j) for the Upper Red Lake Project, we wholly include one and two in part. Of the eight recommendations that we consider to be within the scope of section 10(j) for the Weed Project, we wholly include one and two in part. We discuss the reasons for not

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including the remaining recommendations for each project in section 5.1, *Comprehensive Development and Recommended Alternative*. Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA and are addressed in the specific resource sections of this document.

Table 17. Interior's 10(j) recommendations for the Upper Red Lake Project (Source: staff).

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
1.	Operate the project in a run-of-river mode.	Interior	Yes	$0[e]	Adopted. Staff recommends that the project operate in a run-of-river mode, whereby outflow from the project approximately equals inflow to the project reservoir.
2.	Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate beyond ±0.30 foot.	Interior	Yes	$0[e]	Not adopted. However, staff recommends that the project operate in a manner more restrictive (headwater elevation does not fluctuate beyond ±0.25 foot) than Interior's recommendation.
3.	Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate the full range of ±0.30 foot within a 24-hour period	Interior	Yes	$0[e]	Not adopted. The recommendation is not specific enough to assess the associated benefits.[h]
4.	Return any deviations outside of ±0.30 foot range to the reservoir target elevation (±0.30 foot) as soon as possible.	Interior	Yes	$0[e]	Not adopted. However, staff recommends that Gresham return any deviations outside of ±0.25 foot range to the reservoir target elevation (±0.25 foot).

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
5.	Report any deviations outside the ±0.30 foot range to the FWS via email within 2 hours.	Interior	No[f]	$0[e]	Not adopted. Instead, staff recommends that Gresham report deviations as soon as possible, but no later than 10 days after each such incident.[g]
6.	Consult with the resource agencies prior to any planned reservoir deviation outside of ±0.30 foot.	Interior	No[f]	$0[e]	Adopted.
7(a).	Prepare an operation compliance monitoring plan.	Interior	Yes	$100	Adopted.
7(b).	As a provision of the operational compliance monitoring plan, install physical staff gages both upstream and downstream of the project.	Interior	Yes	$150[a,b]	Adopted.

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
7(c).	As a provision of the operational compliance monitoring plan, install automatic digital water level and flow recorders both upstream and downstream of the project.	Interior	Yes	$17,360[a,b,i]	Not adopted.[d] Instead, as provisions of staff's recommended operation compliance monitoring plan, we recommend that Gresham: (1) record headwater elevations using its existing ultrasonic water surface elevation sensor; (2) calculate flows through the project; and (3) record tailwater elevations using a new automatic water level recording device.
7(d).	As a provision of the operational compliance monitoring plan, provide upstream and downstream flow information publicly available on a website.	Interior	No[f]	$750[b]	Not adopted. Instead, as a provision of staff's recommended recreation plan, we recommend that Gresham provide tailwater elevation data and correlated discharge information at the Weed Project publicly available on a website.
7(e).	As a provision of the operational compliance monitoring plan, make upstream and downstream flow information available upon request in an electronic format.	Interior	No[f]	$0[e]	Not adopted. Instead, as provisions of staff's recommended operation compliance monitoring plan, we recommend that Gresham make: (1) headwater elevations, (2) tailwater elevations, and (3) calculated flows through the project available upon request in an electronic format.
8(a).	Install trashracks with 1-inch clear horizontal spacing between the trashrack bars.	Interior	Yes	$525[a]	Not adopted.[d] Instead, staff recommends that Gresham continue to use its existing trashrack configuration.

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
8(b).	Install trashracks with average normal intake approach velocities no greater than 2 fps.	Interior	Yes	$0[c]	Not adopted.[d] Instead, staff recommends that Gresham continue to use its existing trashrack configuration, which has approach velocities consistent with Interior's recommendation.
9(a).	Develop measures to identify and control the spread of invasive species.	Interior	Yes	$0[k]	Adopted. Staff recommends that Gresham prepare an invasive species management plan that would be consistent with Interior's recommendation.
9(b).	Develop measures to identify and control the spread of invasive species only when deemed appropriate by the resource agencies.	Interior	No[j]	$0[k]	Not adopted. Staff's recommended invasive species management plan would provide for the identification and control of invasive species throughout the term of any license issued for the project and its implementation would not be contingent upon a specific request to Gresham by the resource agencies.

[a] Cost estimated by staff.

[b] This cost only includes Interior's recommended provision, not the cost to prepare the plan.

[c] This measure is considered to be included in the cost of Interior's recommended 1-inch spacing between trashrack bars.

[d] Preliminary findings that recommendations found to be within the scope of section 10(j) are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are based on staff's determination that the cost of the measures outweigh the expected benefits.

[e] Staff estimates this cost would be negligible.

[f] Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.

[g] Commission issued licenses typically require a licensee to report deviations from operation license requirements as

soon as possible, but not later than 10 days of the deviation.

[h] The recommendation is inconsistent with the substantial evidence standard of section 313(b) of the FPA based on a lack of evidence to support the reasonableness of the recommendation or a lack of justification for the measure.

[i] This cost is based on an estimated cost to install stream gaging stations both upstream and downstream of the project.

[j] Reservation of authority to require additional licensee action or measures that cannot be defined until the occurrence of future events do not fall within the scope of section 10(j).

[k] We are unable to estimate the cost for this item because no measures were specified by Interior.

Table 18. Interior's 10(j) recommendations for the Weed Project (Source: staff).

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
1.	Operate the project in a run-of-river mode.	Interior	Yes	$0[e]	Adopted. Staff recommends that the project operate in a run-of-river mode, whereby outflow from the project approximately equals inflow to the project reservoir.
2.	Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate beyond ±0.30 foot.	Interior	Yes	$0[e]	Not adopted. However, staff recommends that the project operate in a manner more restrictive (headwater elevation does not fluctuate beyond ±0.25 foot) than Interior's recommendation.
3.	Maintain the reservoir at a target elevation such that the headwater elevation does not fluctuate the full range of ±0.30 foot within a 24-hour period	Interior	Yes	$0[e]	Not adopted. The recommendation is not specific enough to assess the associated benefits.[i]
4.	Return any deviations outside of ±0.30 foot range to the reservoir target elevation (±0.30 foot) as soon as possible.	Interior	Yes	$0[e]	Not adopted. However, staff recommends that Gresham return any deviations outside of ±0.25 foot range to the reservoir target elevation (±0.25 foot).

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
5.	Report any deviations outside the ±0.30 foot range to the FWS via email within 2 hours upon discovery.	Interior	No[f]	$0[e]	Not adopted. Instead, staff recommends that Gresham report deviations as soon as possible, but no later than 10 days after each such incident.[g]
6.	Consult with the resource agencies prior to any planned reservoir deviation outside of ±0.30 foot.	Interior	No[f]	$0[e]	Adopted.
7(a).	Prepare an operation compliance monitoring plan.	Interior	Yes	$350[a]	Adopted.
7(b).	As a provision of the operational compliance monitoring plan, install physical staff gages both upstream and downstream of the project.	Interior	Yes	$150[a,b]	Adopted.

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
7(c).	As a provision of the operational compliance monitoring plan, install automatic digital water level and flow recorders both upstream and downstream of the project.	Interior	Yes	$17,375[a,b]	Not adopted.[d] Instead, as provisions of staff's recommended operation compliance monitoring plan, we recommend that Gresham: (1) record headwater elevations using its existing ultrasonic water surface elevation sensor; (2) calculate flows through the project; and (3) record tailwater elevations using its existing pressure transducer.
7(d).	As a provision of the operational compliance monitoring plan, provide upstream and downstream flow information publicly available on a website.	Interior	No[f]	$0[b,j]	Not adopted. Instead, as a provision of staff's recommended recreation plan, we recommend that Gresham provide tailwater elevation information, as recorded by the existing pressure transducer, and corresponding discharge information, publicly available on a website.
7(e).	As a provision of the operational compliance monitoring plan, make upstream and downstream flow information available upon request in an electronic format.	Interior	No[f]	$0[e]	Not adopted. Instead, as provisions of staff's recommended operation compliance monitoring plan, we recommend that Gresham make: (1) headwater elevations, (2) tailwater elevations, and (3) calculated flows through the project available upon request in an electronic format.

Recommendation		Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
8.	Modify or replace the current turbines or discontinue use of the larger of the two turbines under conditions that could produce rapid or frequent fluctuations in flow downstream.	Interior	Yes	$0[h]	Not adopted.[i] Gresham's modification of the large generating unit that allows it to pass lower flows have adequately reduced the downstream flow fluctuations and appears to meet the intent of Interior's recommendation.
9(a).	Install trashracks with1-inch clear horizontal spacing between the trashrack bars.	Interior	Yes	$875[a]	Not adopted.[d] Staff recommends that Gresham continue to use its existing trashrack configuration.
9(b).	Install trashracks with average normal intake approach velocities no greater than 2 fps.	Interior	Yes	$0[c]	Not adopted.[d] Staff recommends that Gresham continue to use its existing trashrack configuration, which has approach velocities consistent with Interior's recommendation.
10.	Continue compliance with the current minimum flow through the bypassed spillway channel.	Interior	No[l]	$0[e]	Adopted.
11(a).	Develop measures to identify and control the spread of invasive species.	Interior	Yes	$0[m]	Adopted. Staff recommends that Gresham prepare an invasive species management plan that would be consistent with Interior's recommendation.

Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adoption? And Basis for Preliminary Determination of Inconsistency
11(b). Develop measures to identify and control the spread of invasive species only when deemed appropriate by the resource agencies.	Interior	No[k]	$0[m]	Not adopted. Staff's recommended invasive species management plan would provide for the identification and control of invasive species throughout the term of any license issued for the project and its implementation would not be contingent upon a specific request to Gresham by the resource agencies.

[a] Cost estimated by staff.

[b] This cost only includes Interior's recommended provision, not the cost to prepare the plan.

[c] This measure is considered to be included in the cost of Interior's recommended 1-inch spacing between trashrack bars.

[d] Preliminary findings that recommendations found to be within the scope of section 10(j) are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are based on staff's determination that the cost of the measures outweigh the expected benefits.

[e] Staff estimates this cost would be negligible.

[f] Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.

[g] Commission issued licenses typically require a licensee to report deviations from operation license requirements as soon as possible, but not later than 10 days of the deviation.

[h] We are unable to estimate a cost for this measure because the costs associated with modifying or replacing turbines vary greatly.

[i] The recommendation is inconsistent with the substantial evidence standard of section 313(b) of the FPA based on a lack of evidence to support the reasonableness of the recommendation or a lack of justification for the measure.

[j] The cost of this measure is included in the cost for Interior's recommendation to install automatic digital water level and flow recorders upstream and downstream of the project.

[k] Reservation of authority to require additional licensee action or measures that cannot be defined until the occurrence of future events do not fall within the scope of section 10(j).

[l] The recommendation does not fall within the scope of section 10(j) because Interior did not provide a specific rationale with regard to how the minimum flow would protect, mitigate, or enhance fish and wildlife resources.

[m] We are unable to estimate the cost for this item because no measures were specified by Interior.

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5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.

We reviewed seven comprehensive plans that are applicable to the projects, located in Wisconsin.[70] No inconsistencies were found.

[70] (1) National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993; (2) U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986; (3) U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.; (4) Wisconsin Department of Natural Resources. 1980. Wolf River Basin area wide quality management plan. Madison, Wisconsin. January 1980; (5) Wisconsin Department of Natural Resources. Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP): 1991-96. Madison, Wisconsin. October 1991; (6) Wisconsin Department of Natural Resources. 1992. Wisconsin water quality assessment report to Congress. Madison, Wisconsin. April 1992; and (7) Wisconsin Department of Natural Resources. 1995. Wisconsin's biodiversity as a management issue. Madison, Wisconsin. May 1995.

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6.0 FINDING OF NO SIGNIFICANT IMPACT

On the basis of our independent analysis, we find that the issuance of licenses for the Upper Red Lake and Weed Projects, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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