ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSES

Tomahawk Hydroelectric Project

FERC Project No. 1940-029

Grandfather Falls Hydroelectric Project

FERC Project No. 1966-054

Wisconsin

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

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
Aquatic Resource Fund	Aquatic Resource Fund Management Plan
ATV	all-terrain vehicle
BLM	Bureau of Land Management
°C	degrees Celsius
certification	water quality certification
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
º F	degrees Fahrenheit
DO	dissolved oxygen
EA	environmental assessment
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FERC Form-80	Licensed Hydropower Development Recreation Report
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
Grandfather Falls historic district	Grandfather Falls Hydroelectric Project/Upper Grandfather Falls Dam and Power Plant
HPMP	Historic Properties Management Plan
Ice Age Trail	Ice Age National Scenic Trail
Interior	U.S. Department of Interior
IPaC	Information for Planning and Consultation
kV	kilovolts
kW	kilowatt
kWh	kilowatt-hours
MGD	million gallons per day
mg/L	milligrams per liter
MISO	Midwest Independent System Operator, Inc.
MRO	Midwest Reliability Organization
MW	megawatts
MWh	megawatt-hour
NGVD 29	National Geodetic Vertical Datum 1929
National Register	National Register of Historic Places
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act

NWI	National Wetland Inventory
PA	programmatic agreement
Park Service	National Park Service
Reservoir Drawdown Plan	Reservoir Drawdown Management Plan
River Alliance	River Alliance of Wisconsin
ROR	run-of-river
RM	river mile
Settlement Policy Statement	Policy Statement on Hydropower Licensing Settlements
TMDL	Total Daily Maximum Load
USGS	United States Geological Survey
Wildlife Management Plan	Comprehensive Land and Wildlife Management Plan
Wisconsin DNR	Wisconsin Department of Natural Resources
Wisconsin SCORP	Wisconsin Statewide Comprehensive Outdoor Recreation Plan
Wisconsin SHPO	Wisconsin State Historic Preservation Officer
Wisconsin Public Service	Wisconsin Public Service Corporation
Woody Debris Plan	Woody Debris Management Plan

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1.0 INTRODUCTION

1.1 APPLICATION

1.1.1 Tomahawk Project

On March 28, 2016, Wisconsin Public Service Corporation (Wisconsin Public Service) filed an application with the Federal Energy Regulatory Commission (Commission) for a new license to continue to operate and maintain the existing Tomahawk Hydroelectric Project No. 1940 (Tomahawk Project). The 2.6-megawatt (MW) project is located on the Wisconsin River in Lincoln County, Wisconsin (figure 1). The project does not occupy federal land.

1.1.2 Grandfather Falls Project

On March 28, 2016, Wisconsin Public Service filed an application with the Commission for a new license to continue to operate and maintain the existing Grandfather Falls Hydroelectric Project No. 1966 (Grandfather Falls Project). The 17.24-MW project is located on the Wisconsin River in Lincoln County, Wisconsin (figure 2). The project occupies 0.1 acres of land owned by the Bureau of Land Management (BLM) that is located about 1,000 feet downstream of the project's tailrace access.

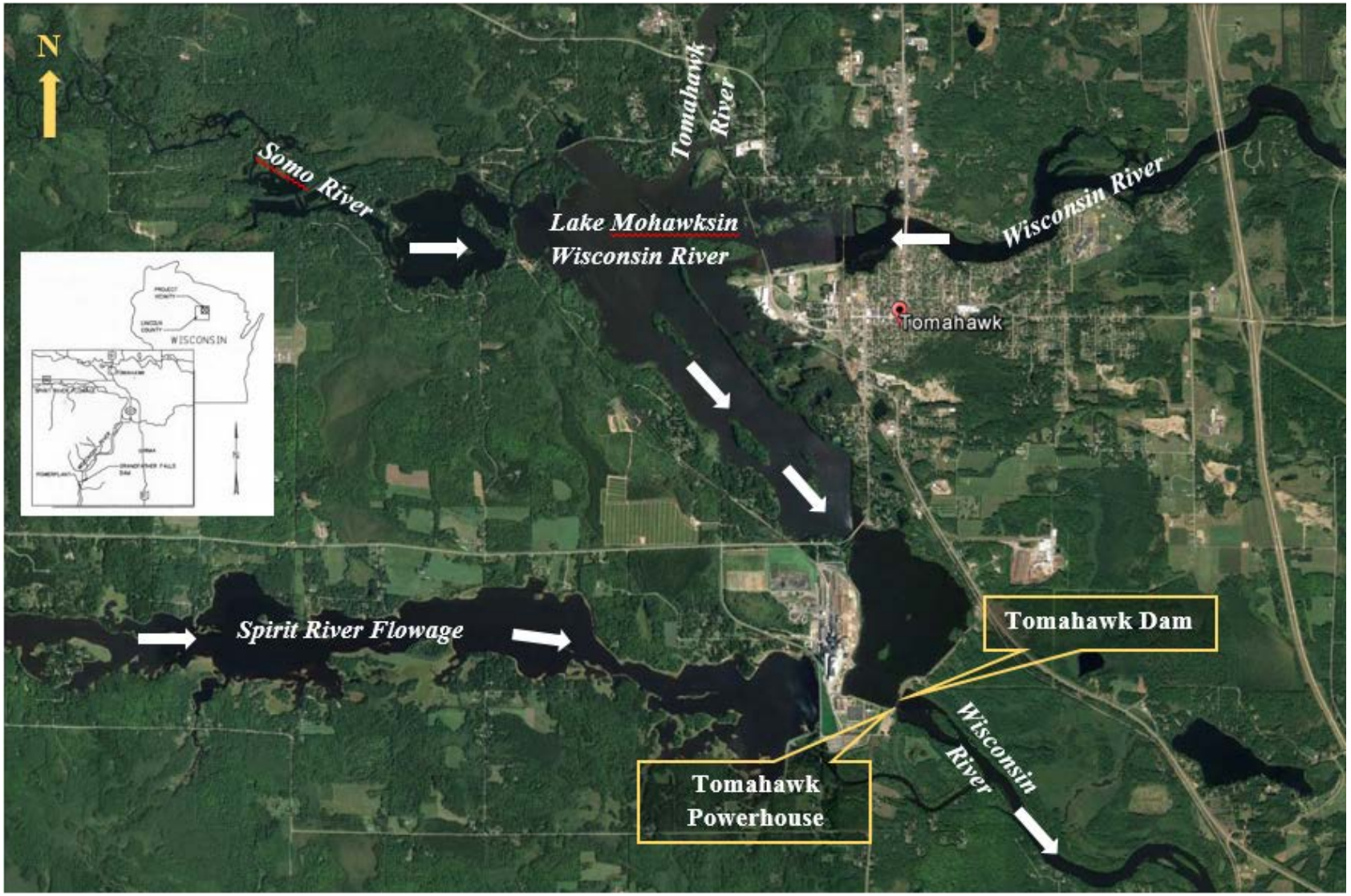

Figure 1. Location of project and facilities for the Tomahawk Project (Source: Google Earth, 2016; as modified by staff).

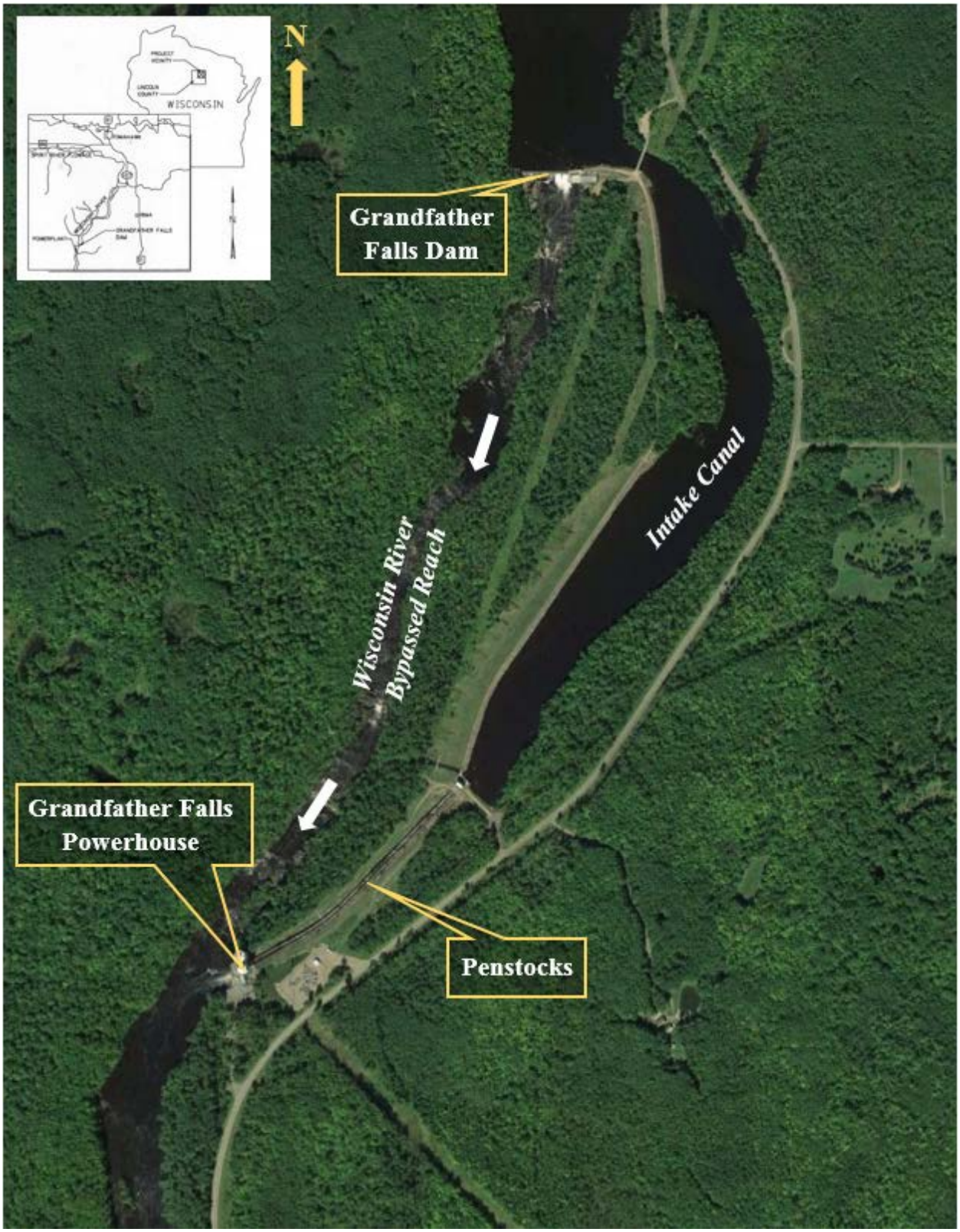

Figure 2. Location of project and facilities for the Grandfather Falls Project (Source: Google Earth, 2013; as modified by staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Tomahawk and Grandfather Falls Projects is to provide a source of hydroelectric power to meet the region's power needs. Under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue new licenses to Wisconsin Public Service for the projects and what conditions should be placed on any new licenses issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project would 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, and water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection, 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.

Issuing new licenses for the Tomahawk and Grandfather Falls Projects would allow Wisconsin Public Service to generate electricity at the projects for the term of the license, making electric power from a renewable resource available to its customers.

This environmental assessment (EA) analyzes the effects associated with operation of the projects, alternatives to the projects, and makes recommendations regarding terms and conditions to become part of any new licenses that may be issued.

The EA assesses the environmental and economic effects of: (1) operating and maintaining the projects as proposed by Wisconsin Public Service; (2) operating and maintaining the projects as proposed by Wisconsin Public Service, with additional staff recommended measures (staff alternative); and (3) no-action.

The important issues associated with relicensing the projects are whitewater boating flows in the Grandfather Falls Project bypassed reach and the effects of these flows on aquatic resources.

1.2.2 Need for Power

To assess the need for power, we looked at the needs in the operating region in which the two projects are located. The power generated by both projects is used to meet the power needs of Wisconsin Public Service's commercial and residential customers. The Tomahawk and Grandfather Falls Projects produce an average annual generation of 9,975 and 72,301 megawatt-hours (MWh), respectively.

The North American Electric Reliability Council (NERC) annually forecasts electricity supply and demand nationally and regionally for a 10-year period. The Tomahawk and Grandfather Falls Projects are located within the jurisdiction of the Midcontinent Independent System Operator, Inc. (MISO) which is a sub-regional entity

of the Midwest Reliability Organization (MRO), a region of the NERC. The MISO is a summer-peaking sub-region, and the winter peaks are normally less than those experienced in the summer. According to NERC's 2016 10-year forecast (NERC, 2016), MISO is projected to fall below their target of a 15.2 percent Anticipated Reserve Margin (i.e., the primary metric used to evaluate the adequacy of projected generation resources to serve forecasted peak load) to an Anticipated Reserve Margin of 13.89 percent in 2022 and continue to decrease to 9.07 percent by the year 2026. MISO would require approximately 8 gigawatts of additional generation resources by the end of the 10-year forecast in order to maintain its planning reserve margin of 15.2 percent (NERC, 2016).

If issued new licenses, the power from the Tomahawk and Grandfather Falls Projects would help meet a need for power in the MRO region in both the short- and long-term. The projects provide low-cost power that displaces generation from non-renewable sources.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Any new licenses for the projects would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements for the Tomahawk and Grandfather Falls Projects 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 Secretaries of Commerce or the Department of the Interior (Interior). Neither agency filed a fishway prescription, or a reservation of authority to prescribe fishways, under section 18 of the FPA for either project.

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 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.

No section 10(j) recommendations were filed in response to the ready for environmental analysis notice issued on March 1, 2017, for the Tomahawk Project. Three 10(j) recommendations were timely filed by Interior in response to the ready for

environmental analysis notice issued on March 1, 2017, for the Grandfather Falls Project. These recommendations are summarized in table 19, and discussed in section 5.3, *Summary of Section 10(j) Recommendations*.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain water quality certification (certification) from the appropriate state pollution control agency verifying compliance with the CWA. If the state agency fails or refuses to act on a request for certification, within a reasonable period of time (which shall not exceed one year) after receipt of such request, the certification requirements are deemed waived.

On March 17, 2017, Wisconsin Public Service applied to the Wisconsin Department of Natural Resources (Wisconsin DNR) for certifications for the Tomahawk and Grandfather Falls Projects. Wisconsin DNR received the requests for certifications for both projects on March 20, 2017. Wisconsin DNR has not acted on the applications.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure 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. Review of the U.S. Fish and Wildlife Service's (FWS) Information for Planning and Consultation (IPaC) system in August 2017 indicated that the federally-threatened northern long-eared bat *(Myotis septentrionalis)* and federally endangered gray wolf *(Canis lupus)* have the potential to occur within Lincoln County. Our analysis of project effects on threatened and endangered species is presented in section 3.3.4.2, *Threatened and Endangered Species*, and our recommendations are included in section 5.1, *Comprehensive Development and Recommended Alternative.*

We conclude that relicensing the projects, as proposed with the staff-recommended measures, would have no effect on the gray wolf.

The northern long-eared bat could be affected by the proposed maintenance of the portages at both projects, which would require periodic clearing of vegetation and may include removal of trees. In addition, the proposed extension of the path at the Ice Age trail at the Grandfather Falls Project would require the removal of up to 25 trees. The removal of trees has the potential to disturb roosting northern long-eared bats. However, tree removal would not occur within 0.25 mile of hibernacula, or within 150 feet of a known maternity roost tree. Therefore, we conclude that relicensing the projects may affect the northern long-eared bat, but any incidental take that may result is not prohibited by the final 4(d) rule.

1.3.4 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972, as amended, requires review of the two project's consistency with a state's Coastal Management Program for projects within or that would affect the coastal zone. Under section 307(c)(3)(A) of the CZMA, 16 U.S.C. §1456(c)(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state's 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.

On February 10, 2016, Wisconsin Public Service requested concurrence from the Wisconsin Coastal Resources Management Program to confirm that a consistency review for the two projects is unnecessary because the projects are not located in Wisconsin's designated coastal area. In email correspondence between Wisconsin Public Service and the Wisconsin Coastal Resources Management Program,[1] the Wisconsin Coastal Resources Management Program stated that the Grandfather Falls and Tomahawk Projects are outside of Wisconsin's coastal zone and unlikely to affect coastal resources. Therefore, a consistency certification is not required for either project.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to "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).

On November 26, 2012, Commission staff designated Wisconsin Public Service as its non-federal representative for the purposes of conducting section 106 consultation with the Wisconsin State Historic Preservation Officer (Wisconsin SHPO), under section 106 of the NHPA. As the Commission's designated non-federal representative, Wisconsin Public Service consulted with the Wisconsin SHPO to identify historic properties, determine the National Register-eligibility of the projects, and assess potential adverse effects on historic properties within the projects' area of potential effects (APE).

These consultations and other investigations concluded that the Grandfather Falls Hydroelectric Project/Upper Grandfather Falls Dam and Power Plant (Grandfather Falls historic district) is eligible for listing on the National Register as a historic district and may be adversely affected by project operation and maintenance. The Tomahawk Project

[1] Appendix E-11 of the license applications contains the email correspondence dated February 22, 2016 from the Wisconsin Coastal Management Program.

is not eligible for the National Register. However, within the APE for the Tomahawk Project, archaeological site (site 47LI0105) is eligible for listing on the National Register and may be adversely affected by ground-disturbing activities associated with maintaining the project.

To meet the requirements of section 106 of the NHPA, Commission staff executed a Programmatic Agreement (PA) with the Wisconsin SHPO and Michigan State Historic Preservation Officer on December 16, 1993. 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 Wisconsin Public Service address and treat all historic properties identified within each project's APE through implementation of a Historic Properties Management Plan (HPMP) for each project.[2]

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 CFR, section 5.1-5.16) require applicants to 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, Endangered Species Act (ESA), NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. A single scoping document that included both projects was distributed to interested agencies and other stakeholders on November 26, 2012. The scoping document was noticed in the Federal Register on October 1, 2012. Two scoping meetings were held on December 13, 2012, in Tomahawk, Wisconsin, to request comments on the projects. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the projects. An environmental site review for the Tomahawk Project was held on October 16, 2012, and for the Grandfather Falls Project on October 17, 2012. In addition to comments provided at the scoping meetings, the following entities provided written comments:

[2] Wisconsin Public Service prepared two HPMPs, one for each project. Wisconsin SHPO approved the Grandfather Falls and Tomahawk HPMPs, in emails dated February 9, 2016 and August 26, 2016, respectively. The Grandfather Falls and Tomahawk HPMPs and Wisconsin SHPO's concurrence letters were filed with the license applications.

Commenting Entity	Date Filed
Brian Tungate	December 10, 2012
Charles Johnson	December 11, 2012
FWS	January 10, 2013
River Alliance of Wisconsin (River Alliance)	January 22, 2013
Wisconsin DNR	January 24, 2013
National Park Service (Park Service)	January 28, 2013[a]
U.S. Environmental Protection Agency	January 30, 2013[a]
John McConville	January 30, 2013[a]
Ken Braband	January 31, 2013[a]

[a] The deadline for filing comments on the scoping document for both projects was January 25, 2013.

No comments warranting the issuance of a revised scoping document were filed.

1.4.2 Interventions

On March 1, 2017, the Commission issued separate notices accepting Wisconsin Public Service's applications for new licenses for the Tomahawk and Grandfather Falls Projects. The notices set April 30, 2017, as the deadline for filing protests and motions to intervene. In response to the notices, the following entities filed motions to intervene:

Intervenor	Date Filed and Project No.
Wisconsin DNR	March 8, 2017 for P-1966
River Alliance	April 24, 2017 for P-1966
Wisconsin DNR	March 8, 2017 for P-1940

1.4.3 Comments on the Application

Separate notices requesting comments, recommendations, and preliminary terms and conditions were issued on March 1, 2017, for the Tomahawk and Grandfather Falls Projects. No comments were filed on the Tomahawk Project. The following entities commented on the Grandfather Falls Project:

Commenting Entity	**Date Filed**
Interior	April 28, 2017
River Alliance	April 24, 2017
Park Service	April 21, 2017

Wisconsin Public Service filed reply comments on June 13, 2017.

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 Existing Project Facilities

The Tomahawk Project is located at river mile (RM) 315 between the Kings Dam Project (FERC Project No. 2239) at RM 321 and the Grandmother Falls Project (FERC Project No. 2180) at RM 307. The Grandfather Falls Project is located at RM 303 and situated between the Grandmother Falls Project and the Alexander Hydroelectric Project (Alexander Project) (FERC Project No. 1979) at RM 291. Both projects are among 23 other hydropower projects located on the Wisconsin River (figure 3 and table 1). Below are the descriptions of the facilities for each of the projects.

2.1.1.1 Tomahawk Project

The Tomahawk Project consists of the following existing facilities: (1) Lake Mohawksin, the project reservoir, with a surface area of 2,773 acres and 1,367 acre-feet of usable storage at the maximum full pool elevation of 1,435.5 feet National Geodetic Vertical Datum 1929 (NGVD 29); (2) a 27-foot-high and 2,968-foot-long reinforced concrete and embankment dam that includes: (a) 400-foot-long saddle dike, (b) 1,400-foot-long detached embankment, (c) 400-foot-long earthen embankment, (d) 125-foot-long concrete non-overflow slab and buttress section, (e) 267-foot-long concrete gated spillway section, 9-foot-long concrete sluice gate section, (f) 300-foot-long right embankment, and (g) 67-foot-long powerhouse housing two generating units with a total installed capacity of 2.6 MW; (3) a 67.5-foot-wide,18-foot-high intake and ten 6-foot-wide sections of steel trashracks with clear bar spacing of 2.5 inches that is integral with the powerhouse; (4) two 27.25-foot-long, 31.75-foot-wide, 9.25-foot-high draft tubes that discharges into a 34-foot-long, 60-foot-wide tailrace; (5) a 100-foot-long, 24.9-kilovolt (kV) overhead transmission power line; and (6) appurtenant facilities. The project is estimated to generate an average of 9,836 MWh.

2.1.1.2 Grandfather Falls Project

The Grandfather Falls Project consists of the following existing facilities: (1) the 340-acre Grandfather Falls reservoir at elevation 1,397.1 NGVD 29 and a usable storage capacity of 340 acre-feet; (2) a 36-foot-high and 762-foot-long reinforced concrete dam consisting of a 52-foot-long masonry retaining wall, a 263-foot-long concrete spillway section, a 147-foot-long non-overflow masonry dam, and a 300-foot-long rockfill embankment; (3) a 108-foot-long, 12-foot-wide timber (concrete pier supported) canal

bridge that crosses the upstream end of the canal, three intake canal embankments totaling 3,400 feet in length, a 4,000-foot-long, 300-foot-wide intake canal, and a 55.5-foot-wide intake structure; (4) a 4,500-foot-long bypassed reach; (5) two 55.5-foot-wide, 30.5-foot-high trashracks with clear bar spacing of 2.5 inches; (6) 11-foot-diameter, 1,313-foot-long steel penstock that transitions into a 30-foot-long steel penstock and a 13-foot-diameter 1,307-foot-long steel penstock that transitions into a 30-foot-long steel penstock; (7) a 51-foot-diameter surge tank with a 37.87-foot-high internal riser and a 39-foot-diameter surge tank with a 33.43-foot-high internal riser that are connected to the steel penstocks; (8) a 67-foot-wide, 53-foot-long, 46-foot-high powerhouse containing two generating units with a total installed capacity of 17.24 MW; (9) a 50-foot-long, 60-foot-wide bedrock excavated tailrace; (10) a 300-foot-long, 46-kV overhead transmission power line; and (11) appurtenant facilities. The intake canal and penstocks bypass about 4,800 feet of the Wisconsin River. The project is estimated to generate an average of 72,031.72 MWh.

2.1.2 Existing Project Boundary

2.1.2.1 Tomahawk Project

The Tomahawk Project's existing project boundary generally corresponds to the 100-year flood elevation surrounding Lake Mohawksin and encloses lands necessary for project operation, including the dam, powerhouse, impoundment, tailrace, appurtenant facilities, and Commission-approved recreational facilities. The project boundary does not include any federal lands.

2.1.2.2 Grandfather Falls Project

The Grandfather Falls Project's existing project boundary encloses lands necessary for project operation, including the dam, powerhouse, penstocks, reservoir, power canal, bypassed reach, tailrace, appurtenant facilities, and the eight project recreation facilities. The existing project boundary includes one BLM-owned island (0.1 acres) located about 1,000 feet downstream of the Grandfather Falls Project's powerhouse.[3]

2.1.3 Project Safety

The projects have been operating for over 29 years under their 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 licenses, and proper

[3] The existing project boundary encloses the Wisconsin River to about 1 mile downstream of the powerhouse.

maintenance. In addition, the projects have been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, we would evaluate the continued adequacy of the proposed project facilities under the new licenses. Special articles would be included in any license issued, as appropriate. We would continue to inspect the projects during the new 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.

2.1.4 Existing Project Operation

2.1.4.1 Tomahawk Project

In accordance with Article 38 of the existing license, Wisconsin Public Service operates the Tomahawk Project in a limited peaking mode, with maximum allowed daily reservoir fluctuations of 0.8 foot NGVD 29 (1,435.5 feet NGVD 29 to 1,434.7 feet NGVD 29), and maintains a continuous minimum flow of 162 cubic feet per second (cfs) or inflow, whichever is less, in the Wisconsin River downstream of the project. The project is automated and remotely operated from Wisconsin Public Service's Energy Supply and Control center. Remote operation includes starting and stopping the hydroelectric generators, monitoring kilowatt output, monitoring headwater and tailwater elevations, and maintaining headwater elevations. Under normal peaking operation, the reservoir is drawn down from the maximum pond elevation during the day and refilled at night, providing one peaking cycle per day. The amount of fluctuation is determined primarily by the volume of water that can be restored to the Tomahawk reservoir during off-peak hours. The capacity of the Grandmother Falls Project (located about 5 miles downstream) also affects the duration of water released from the Tomahawk Project. To make the most effective use of the available water resource, the operation of the Tomahawk Project is coordinated with Wisconsin Public Service's two other projects located downstream, the Grandfather Falls Project located about 12.4 miles downstream and the Alexander Project located about 13 miles downstream.

2.1.4.2 Grandfather Falls Project

In accordance with Article 405 of the existing license, Wisconsin Public Service operates the Grandfather Falls Project in a limited peaking mode, which includes a maximum 1-foot daily fluctuation between elevations 1395.1 and 1396.1 feet NGVD 29. The project is automated and remotely operated from Wisconsin Public Service's Energy Supply and Control center, which is staffed 24 hours per day, 365 days per year. Remote operation includes starting and stopping the hydroelectric generators, monitoring kilowatt output, monitoring headwater and tailwater elevations, and maintaining headwater elevations. During normal peaking operation, the impoundment is drawn down from the maximum pond elevation during the day and refilled at night, providing one peaking cycle per day. The operating regime has both a seasonal and a daily variation depending on precipitation and controlled releases made at upstream storage reservoirs that are

regulated by the Wisconsin Valley Improvement Company. Water releases from the Tomahawk and the Grandmother Falls Projects and the non-power dam at Spirit Lake,[4] which are all located upstream from the Grandfather Falls Project, are coordinated with water releases from the Grandfather Falls Project to ensure that adequate water is available in the Wisconsin River during the seasonal low-flow periods.

In accordance with Article 401 of the existing license, Wisconsin Public Service maintains a minimum flow of 400 cfs or inflow, whichever is less, in the Wisconsin River downstream of the project tailrace. In accordance with Article 402 of the existing license, Wisconsin Public Service maintains a minimum bypassed reach flow of 50 cfs.

The pondage provided by the 1-foot maximum drawdown between elevation 1,396.1 feet NGVD 29 and elevation 1397.1 feet NGVD 29 for the Grandfather Falls reservoir is used to augment and adjust the timing of the peaking operation at the project. Recharge of the Grandfather Falls reservoir occurs in the late evening and early morning hours. Peaking discharges from the Grandfather Falls Project are attenuated by the downstream Bill Cross Rapids, which is part of a free-flowing stretch of the Wisconsin River, with no visible evidence of the project's peaking effects further downstream at Wisconsin Public Service's Alexander Project.

2.1.5 Existing Environmental Measures

Provided below are the existing environmental measures required by the existing licenses for the Tomahawk and Grandfather Falls Projects.

2.1.5.1 Tomahawk Project

- Provide a minimum flow of 162 cfs in the project tailrace.
- Monitor headwater and tailwater elevations and flow releases from the powerhouse and release gates.
- Consult with Wisconsin DNR prior to any reservoir drawdowns or modifications of reservoir elevations or minimum flows.
- Maintain the trashracks to minimize the potential for fish entrainment and impingement.
- Remove woody debris from the trashracks and pass it downstream.
- Maintain existing Commission-approved recreation facilities.
- Implement an historic resources management plan.

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[4] The Spirit dam is located on the Spirit River about 1 mile upstream of the confluence of the Spirit and Wisconsin Rivers. The Spirit River joins the Wisconsin River about 1 mile downstream of Tomahawk Dam. Spirit dam and reservoir are project facilities of the Wisconsin River Headwaters Project No. 2113, and does not produce any power.

2.1.5.2 Grandfather Falls Project

- Provide a minimum flow of 50 cfs in the Grandfather Falls bypassed reach.
- Monitor the Grandfather Falls bypassed reach to ensure 50 cfs is provided into the bypassed reach.
- Provide a minimum flow of 400 cfs in the project tailrace (the 400 cfs can include the 50 cfs released in the bypassed reach).
- Maintain the trashracks to minimize the potential for fish entrainment and impingement.
- Remove woody debris from the trashracks and pass it downstream.
- Monitor headwater and tailwater elevations and flow releases from the powerhouse and release gates.
- Consult with Wisconsin DNR prior to any reservoir drawdowns or modifications of reservoir elevations or minimum flows.
- Implement a comprehensive wildlife management plan to protect and enhance wildlife habitat, including waterfowl habitat.
- Implement a recreation plan that contains provisions to operate and maintain Commission-approved recreation facilities.
- Implement an historic resources management plan.

2.2 WISCONSIN PUBLIC SERVICE'S PROPOSAL

2.2.1 Proposed Project Facilities

Wisconsin Public Service proposes no changes to existing project facilities for the Tomahawk or Grandfather Falls Projects, other than proposing improvements to the existing recreation facilities.

Wisconsin Public Service proposes to remove 2,053 acres of lands from the existing project boundary at the Grandfather Falls Project on the basis that these lands are no longer necessary for project operation. These lands are located along the length of the east and west sides of the reservoir and the river downstream of the powerhouse, and are used for timbering practices and hunting.

2.2.2 Proposed Project Operation

At the Tomahawk Project, Wisconsin Public Service proposes to continue to operate in a peaking mode, with daily impoundment fluctuations of 0.8 foot or less from the normal pool elevation of 1,435.5 feet NGVD 29 during normal operation.

At the Grandfather Falls Project, Wisconsin Public Service proposes to continue to operate in a peaking mode, with daily impoundment fluctuations of 1 foot or less from the normal pool elevation of 1,397.1 feet NGVD 29 during normal operation.

2.2.3 Proposed Environmental Measures

Wisconsin Public Service proposes the following measures to protect or enhance environmental resources and improve recreational opportunities at the projects.

2.2.3.1 Tomahawk Project

- Continue to maintain a minimum flow of 162 cfs, or inflow to the project reservoir, whichever is less, from the project tailrace to protect and enhance water quality and fishery resources downstream of Tomahawk Dam.
- Implement the proposed Reservoir Drawdown Management Plan (Reservoir Drawdown Plan), filed on October 28, 2016, to protect fishery resources in the reservoir during drawdowns.
- Implement the proposed Operation Monitoring Plan, filed on October 28, 2016, to ensure that project operations are in compliance with operating requirements intended to protect, mitigate, and enhance aquatic resources.
- Implement the proposed Aquatic Resource Fund Management Plan (Aquatic Resource Fund), filed on October 28, 2016, to guide the distribution and use of funds for aquatic resource protection and enhancement measures that would be identified at a later date.
- Implement the proposed Woody Debris Management Plan (Woody Debris Plan), filed on October 28, 2016, to establish procedures for removal of woody debris that accumulates on project trashracks and pass it downstream to benefit aquatic resources in the Wisconsin River.
- Implement the proposed Invasive Species Management Plan, filed on October 28, 2016, which includes provisions for: (1) terrestrial invasive plant monitoring; (2) training staff on terrestrial invasive plant identification; (3) the use of non-invasive seed materials for revegetation; and (4) educational signage to prevent the spread of invasive species.
- Implement the proposed Comprehensive Land and Wildlife Management Plan (Wildlife Management Plan), filed on October 28, 2016, which contains provisions for: (1) operating and maintaining existing recreation facilities at the project; (2) managing wildlife, including bald eagles; (3) protecting the federally listed northern long-eared bat and gray wolf; (4) shoreline management; (5) fire control measures; (6) forest insect and disease control programs; and (7) wetland management.
- Implement the proposed Recreation Plan, filed on October 28, 2016, which contains provisions to: (1) continue to operate and maintain the existing recreation facilities at the project; (2) repair the concrete planks at the tailwater boat landing

site;[5] (3) repair the reservoir boat landing site's fishing/courtesy pier;[6] (4) install and maintain one portable toilet at the reservoir boat landing and tailwater boat landing from Memorial Day to Labor Day; and (5) monitor recreation facility use every 6 years for the Commission's Licensed Hydropower Development Recreation Report (FERC Form-80).[7]

- Implement the statewide PA for Wisconsin, executed in 1993,[8] and the Historic Properties Management Plan (HPMP)[9] to protect historic properties.

2.2.3.2 Grandfather Falls Project

- Continue to maintain a minimum flow of 400 cfs, or inflow to the project reservoir, whichever is less, from the project tailrace to protect water quality and fishery resources downstream of the Grandfather Falls Dam.
- Continue to maintain a minimum flow of 50 cfs in the Grandfather Falls bypassed reach[10] to protect fishery resources in the Grandfather Falls bypassed reach.
- Continue to monitor the minimum flow released at the Grandfather Falls Dam into the Grandfather Falls bypassed reach to ensure the 50 cfs minimum flow is met to protect fishery resources in the bypassed reach.
- Implement the proposed Reservoir Drawdown Plan, filed on October 28, 2016, to protect fishery resources in the reservoir during drawdowns.

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[5] Wisconsin Public Service repaired this facility under the existing license; therefore, the proposed measure is considered baseline and not analyzed in section 3.3.5, *Recreation and Land Use*, or in section 4.3, *Cost of Environmental Measures.*

[6] *I.d.*

[7] To evaluate recreation resources at the project, the Commission requires the licensee to prepare and submit a FERC Form-80 every 6 years (see 18 C.F.R. § 8.11). Each FERC Form-80 must identify the project's recreation facilities and the level of public use of these facilities.

[8] The full name of the PA is Programmatic Agreement Among the Federal Energy 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.

[9] The HPMP was filed on October 28, 2016. Wisconsin SHPO approved the HPMP in a letter filed on February 9, 2016.

[10] The proposed 50 cfs flow release would also continue to contribute to the proposed 400 cfs minimum flow released into the project tailrace.

- Implement the proposed Operation Monitoring Plan, filed on October 28, 2016, to ensure that project operation is in compliance with operating requirements intended to protect, mitigate, and enhance aquatic resources.
- Implement the proposed Aquatic Resource Fund, filed on October 28, 2016, to guide the distribution and use of funds for aquatic resource protection and enhancement measures that would be identified at a later date.
- Implement the proposed Woody Debris Plan, filed on October 28, 2016, to establish procedures for removal of woody debris that accumulates on project trashracks and pass it downstream to benefit aquatic resources in the Wisconsin River.
- Implement the proposed Invasive Species Management Plan, filed on October 28, 2016, which includes provisions for: (1) terrestrial invasive plant monitoring; (2) training staff on terrestrial invasive plant identification; (3) the use non-invasive seed materials for revegetation; and (4) educational signage to prevent the spread of invasive species.
- Implement the proposed Wildlife Management Plan, filed on October 28, 2016, which contains provisions for: (1) operating and maintaining existing recreation facilities at the project; (2) managing wildlife, including bald eagles; (3) protecting the federally listed northern long-eared bat and gray wolf; (4) shoreline management; (5) fire control measures; (6) forest insect and disease control programs; and (7) wetland management.
- Implement the proposed Recreation Plan, filed on October 28, 2016, which contains provisions to: (1) continue to operate and maintain the existing and proposed recreation facilities at the project; (2) remove rocks upstream of the Grandfather Falls flowage boat landing; (3) add one portable toilet at the Grandfather Falls flowage boat landing, Grandfather Falls Dam access, Grandfather Falls intake access, and the Grandfather Falls tailrace access from Memorial Day to Labor Day; (4) provide up to three 4-hour scheduled whitewater flow releases of 1,500 cfs into the bypassed reach each year; (5) monitor the use of each scheduled recreation flow release; (6) construct a path from the Ice Age National Scenic Trail (Ice Age Trail) to an alternative put-in location downstream of the dam; (7) install directional signage for boaters along the bypassed reach; (8) install a kiosk at the Grandfather Falls Dam access site; (9) develop a webpage to post whitewater flow information; and (10) monitor recreation facility use every 6 years for the FERC Form-80.
- Implement the statewide PA for Wisconsin and the proposed HPMP[11] to protect historic properties.

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[11] The HPMP was filed on October 28, 2016. Wisconsin SHPO approved the HPMP in a letter filed on February 9, 2016.

2.3 STAFF ALTERNATIVE

The staff alternative includes most of Wisconsin Public Service's proposed measures for the projects with the modifications and additions noted below. The staff alternative does not include Wisconsin Public Service's proposed: (1) Aquatic Resource Fund; and (2) Wildlife Management Plan, with the exception of the following components of the plan: (a) the northern long-eared bat avoidance and protection measures, and (b) using the FWS's May 2007 *National Bald Eagle Management Guidelines* to protect bald eagles known to nest within the project boundaries for both projects.

- Modify the proposed Operation Monitoring Plan for the Grandfather Falls Project to include methods and procedures for verifying whitewater boating flows in the Grandfather Falls bypassed reach.
- Modify the proposed Invasive Species Management Plan for each project to include: (1) a description of the proposed monitoring methods for invasive aquatic plants within the reservoir, (2) the proposed frequency of monitoring; and (3) the proposed criteria to be used to determine when control measures would be implemented.
- Modify the proposed northern long-eared bat protection measures for each project to include implementing seasonal clearing restrictions on removing trees with a diameter equal to or greater than 3 inches at breast height from April 1 to October 1 to protect roosting northern long-eared bats.
- Modify the proposed Recreation Plan for the Grandfather Falls Project to include provisions for: (1) providing up to one 4-hour scheduled whitewater flow release of 1,800 cfs, between May 1 and May 31 in the bypassed reach, and up to two 4-hour scheduled releases of 1,500 cfs, between May 1 and June 21, each year; (2) modify the proposed kiosk at the Grandfather Falls Dam access site to remove the provision for the Park Service to provide information on hazards along the bypassed reach; (3) modify the proposed whitewater boating webpage to remove the provision to include the results of the 2014 recreation flow study, and include a description of the characteristics of the bypassed reach and general safety guidelines; and (4) prepare an annual report on recreation use for the first 3 years of scheduled recreation flow releases and, subsequently, in conjunction with the FERC Form-80.
- Remove from the proposed project boundary for the Grandfather Falls Project: (1) 886 acres of hardwood forest located on the west and east side of the reservoir and downstream of the powerhouse, with the exception of the land needed for the Ice Age Trail; and (2) the BLM-owned island downstream of the Grandfather Falls Project and the bypassed reach, all waters downstream of the project tailrace which are not needed for project operation and maintenance.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Several alternatives to Wisconsin Public Service's relicensing proposals for the projects were considered but have been eliminated from detailed analysis because they are not reasonable in the circumstances of this case. These include: (1) issuing non-power licenses; (2) Federal Government takeover; and (3) project retirement.

2.4.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency would 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, and we have no basis for concluding that the two projects should no longer be used to produce power. Thus, we do not consider issuing non-power licenses as a realistic alternative to relicensing the projects in this circumstance.

2.4.2 Federal Government Takeover of the Project

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the two projects would require Congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be recommended to Congress for both projects. 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 Project

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the relicense applications and surrender or termination of the existing licenses for both projects with appropriate conditions.

No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. The power generated by the Tomahawk and Grandfather Falls Projects provides clean, renewable energy. This source of power would be lost if the projects were retired, and replacement power would need to be found. In addition, boating and fishing opportunities at the Tomahawk and Grandfather Falls Projects would be lost if the projects' dams were removed. There also would likely be costs associated with removing the dams, powerhouses and appurtenant facilities. Thus, dam removal is not a reasonable alternative to relicensing both projects with appropriate protection, mitigation, and enhancement measures.

The second project retirement alternative for both projects would involve retaining the two dams and disabling or removing equipment used to generate power at both

projects. Project works would remain in place at both projects 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 both projects is needed, a source of replacement power would have to be identified. In these circumstances, we don't consider removal or disconnection of the electric generating equipment to be a reasonable alternative.

3.0. ENVIRONMENTAL ANALYSIS

This section includes: (1) a general description of the project 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 (aquatic, recreation, etc.). 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. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[12]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Wisconsin River Basin is located in central Wisconsin and drains an area of about 12,280 square miles, just over one-fifth of the total area of the state. The Wisconsin River Basin includes portions of 25 counties and encompasses 75 watersheds. The Wisconsin River is a tributary of the Mississippi River and originates in Lac View Desert, a 6.7 square-mile spring-fed lake bordering Wisconsin and the Upper Peninsula of Michigan. The Wisconsin River extends 430 miles from its origin to the Mississippi River. The Wisconsin River has nine major tributaries: Tomahawk, Rib, Eau Claire, Big Eau Claire, Yellow, Lemonweir, Baraboo, Pine, and Kickapoo Rivers and about 390 smaller tributaries. The Grandfather Falls and Tomahawk Projects are both located in the Upper Wisconsin Basin, one of three Wisconsin geographic management units. The Upper Wisconsin Basin originates at Lac View Desert and terminates about 4 miles south of Merrill, Wisconsin.

The Wisconsin River drops a total of 1,067 feet in elevation between its source at Lac View Desert and its confluence within the Mississippi River, located just south of Prairie du Chien, Wisconsin. About 60 percent of the drop in elevation occurs in the 150 miles between Rhinelander and Nekoosa, Wisconsin, in the upper half of the basin. The steepest descent in the Wisconsin River is at the Grandfather Falls Project where the

[12] Unless otherwise indicated, information in this EA is taken from the applications for licenses filed by Wisconsin Public Service on March 28, 2016, revisions to the applications filed on October 28, 2016, and additional information filed by Wisconsin Public Service on March 29, 2017, July 21, 2017, August 16, 2017, October 27, 2017, October 14, 2016, and reply comments filed on June 13, 2017.

river descends about 90 feet over 1.5 miles. The Northern Highland Group, where the two projects are located, has a strong southward slope and is a moderately hilly region as a result of historical glaciation of the area.

The basin and much of the state of Wisconsin has a geologic structure and history reflecting the results of glaciation. The topography of the land reflects Pleistocene glaciations which deposited glacial till and carved the landscapes. The landscapes are very diverse and include glacial features of moraines, eskers, kames, glacial lakes, drift-mantled ridges,[13] hills of bedrock and depressions filled with bogs.

The Wisconsin River Basin is largely undeveloped with over half of the land covered with forests (54 percent). Agricultural lands consist of 27 percent of the basin, open water and wetlands are about 16 percent, and the remaining lands are a mix of other classifications, including commercially developed lands and cities. The Wisconsin watershed in the vicinity of the projects is rural with little local residential or commercial development. Both projects are in Lincoln County where about 62 percent of the county is forested, 20 percent is classified as wetlands and open water, 10 percent is agricultural land, and the remaining lands involve mixed commercial, city, and other land classifications. The area around the projects has traditionally been and continues to be a resource-based economy focused on forestry and agricultural usage.

The Wisconsin River has been heavily developed for water power generation. There are 25 hydropower projects on the Wisconsin River (figure 3 and table 1). The 25 hydropower projects include the Grandfather Falls and Tomahawk Projects; Wisconsin Dells Project, a non-jurisdictional project;[14] and Wisconsin River Headwaters Project (P-2113), a non-power project.[15] There is also one non-Wisconsin River project listed in the table, the Jersey Project (P-2476), which is licensed by the Commission and located on the Tomahawk River. The hydropower projects are scattered on the Wisconsin River from its origin in Lac Vieux Desert, to its confluence with the Mississippi River. These 25 hydropower projects have altered the natural flow of the river by the construction of dams that are used for power generation.

The climate of the basin has moderately warm and short summers and very cold winters, with average monthly temperatures in the basin ranging from a maximum of 74º F in the southern part of the basin to a minimum of 9º F in the north. Annual precipitation in the basin averages 33.5 inches overall, and is heaviest from April through

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[13] Ridges that are covered with materials that are deposited from glacial actions like melting or movement of glaciers across a landscape.

[14] Not licensed by the Commission.

[15] The Wisconsin River Headwaters Project consists of 21 reservoirs, including 16 natural lake reservoirs and 5 man-made reservoirs, ranging in size from 330 to 7,626 acres that are used to store and release water needed to provide more uniform flows in the Wisconsin River for use in downstream hydropower generation (FERC, 1995).

September, with snowfall considerably greater in the northern sections of the basin (100 inches in the headwaters and just over 3 feet in the southern end of the basin). The average snowfall in the project area is 39.6 inches with average precipitation of 31.8 inches. In the project area, average temperatures in July are 67º F and 10º F in January. The growing season is approximately 135 days between May and September.

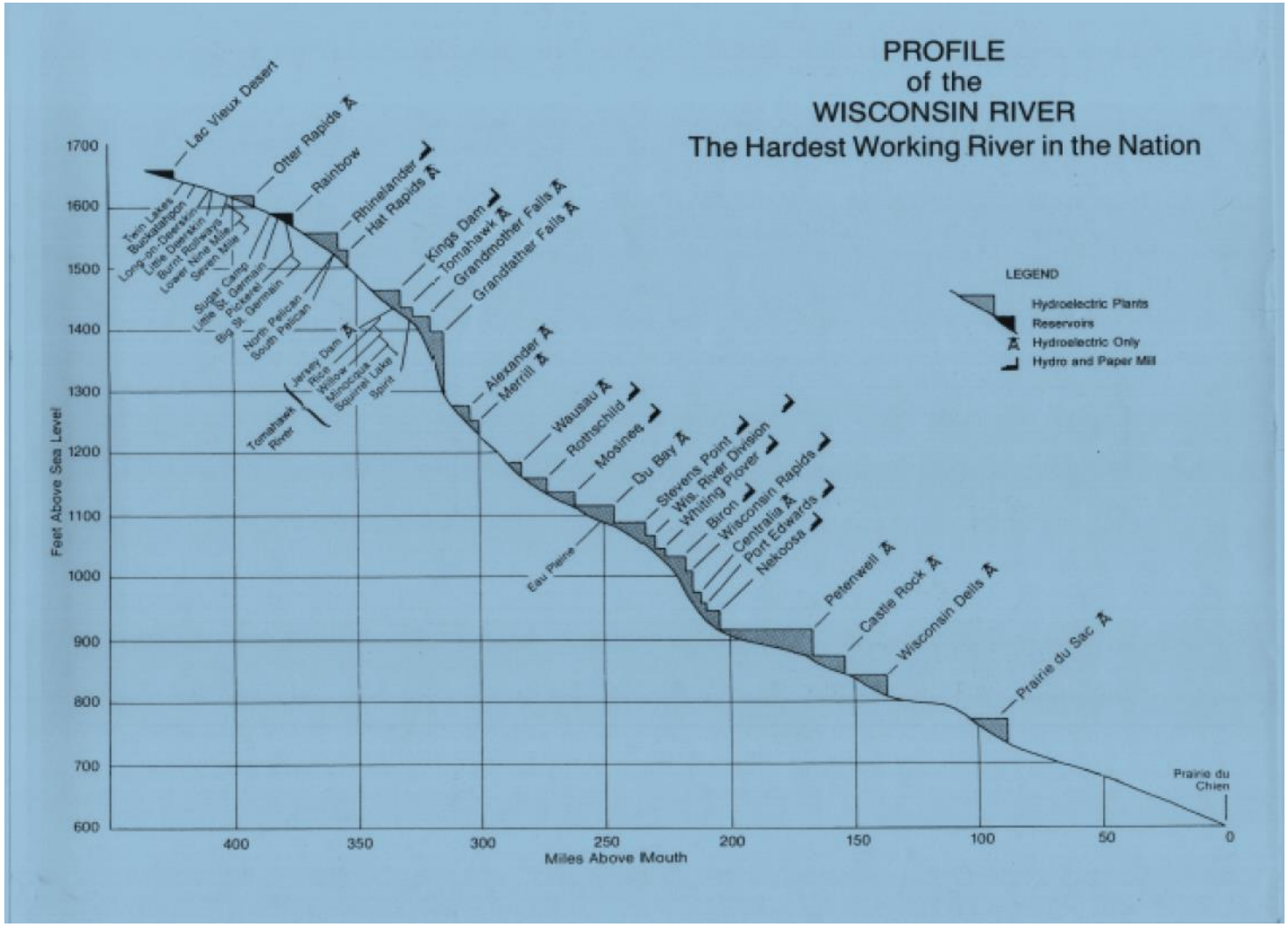

Figure 3. Location of Commission-licensed projects on the Wisconsin River. The figure does not show the Wisconsin River Headwaters Project (P-2113), located between Lac View Desert and the Otter Rapids Project (P-1957). (Source: Wisconsin Valley Improvement Company, 1991).

Table 1. Commission-regulated hydroelectric projects on the Wisconsin River (Wisconsin Public Service, 2016a, as modified by staff).

Project Name and River Mile (RM)	FERC No.	Owner	Reservoir Area(s) in Acres	Height of Dam (feet.)	Generation Capacity (kilowatt [kW])
Wisconsin River Headwaters	P-2113	Wisconsin Valley Improvement Company	66,602	----	0
Otter Rapids	P-1957	Wisconsin Public Service	3,916	12.5	700
Rhinelander	P-2161	Expera Specialty Solutions	3,576	31.8	2,120
Hat Rapids	P-1968	Wisconsin Public Service	650	20.0	1,950
Kings Dam RM321	P-2239	Tomahawk Power & Pulp	1,420	23.4	2,582
Jersey[1]	P-2476	Wisconsin Public Service	709	14.5	512
Tomahawk RM314	P-1940	Wisconsin Public Service	2,773	16.0	2,600
Grandmother Falls RM307	P-2180	PCA Hydro, Inc.	758	18.6	3,000
Grandfather Falls RM302	P-1966	Wisconsin Public Service	200	92.0	17,240
Alexander RM291	P-1979	Wisconsin Public Service	803	23.0	4,200
Merrill RM 287	P-1989	Wisconsin Public Service	373	14.0	2,340
Wausau	P-1999	Wisconsin Public Service	284	27.5	5,400
Rothschild	P-2212	Domtar Wisconsin Corp.	1,604	20.5	3,640
Mosinee	P-2207	Expera Specialty Solutions	1,380	21.7	3,050
Dubay	P-1953	Consolidated Water Power	7,800	25.3	7,200
Stevens Point	P-2110	Consolidated Water Power	3,915	16.6	3,840
WI River Div.	P-2590	Consolidated Water Power	240	22.0	6,340
Biron	P-2192	Consolidated Water Power	2,078	23.6	6,600
Wis. Rapids	P-2256	Consolidated Water Power	455	30.2	10,050
Centralia	P-2255	Domtar Wisconsin Corp.	250	15.0	3,500
Port Edwards	P-2291	Domtar Wisconsin Corp.	150	16.5	2,400
Nekoosa	P-2292	Domtar Wisconsin Corp.	400	21.4	3,800
Petenwell	P-1984	Wisconsin River Power Co.	23,040	41.5	20,000
Castle Rock	P-1984	Wisconsin River Power Co.	16,64	34.0	15,00

Wisconsin Dells	Non-FERC jurisdictional	Alliant Energy	2,150	26.6	9,600
Prairie Du Sac	P-11162	Alliant Energy	9,500	38.0	29,500
Total	-		85,424	646.2	167,164

[1] The Jersey Project is located on the Tomahawk River, a tributary to the Wisconsin River.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations that implement the National Environmental Policy Act (40 C.F.R., §1508.7), an action may cause cumulative effects on the environment if its impacts overlap in time and/or space with the impacts of other past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant action taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the information provided in the license application and agency and public comments, we have identified water quality and fishery resources as resources that may be cumulatively affected by the proposed operation of the two projects.

3.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the proposed action's effects on the resource. The geographic scope for the cumulative effects analysis on water quality and fishery resources includes the area between the tailrace of the Kings Project downstream to Bill Cross Rapids, which is located about 4.6 miles downstream from the Grandfather Falls powerhouse.[16] We identified this scope because these resources were most likely to be cumulatively affected from project operation in association with the other hydropower projects on the Wisconsin River.

3.2.2 Temporal Scope

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

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[16] The scoping document had set the downstream geographic boundary for cumulative effects to be the tailrace of the Grandfather Falls powerhouse. However, the Director's Study Plan Determination Letter, issued on August 7, 2013, required the proposed study plan for the fish and mussels to include a field collection of fish and mussels downstream to the Bill Cross Rapids to determine the effects of project peaking operation on these aquatic resources. Therefore, we have expanded the downstream geographic scope for cumulative effects on fishery resources downstream to the Bill Cross Rapids.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the project-specific effects 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 aquatic, terrestrial, threatened and endangered species, recreation, land use, and cultural resources may be affected by the proposed action and alternatives. We have not identified any substantive issues related to geology and soils, aesthetics, or socioeconomics associated with the proposed action and, therefore, these resources are not addressed in this EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative.*

3.3.1 Aquatic Resources

3.3.1.1 Affected Environment

Water Quantity

Tomahawk Project

The Tomahawk Project receives water from the Wisconsin River, Tomahawk River, and Somo River, with the largest contribution coming from the Wisconsin River. The project reservoir, Lake Mohawksin, has a surface area of 2,773 acres and a maximum depth of 25 feet. However, the reservoir is generally shallow with an average depth of 9 feet and 20 percent of the reservoir being less than 3 feet deep. Deep-water habitats are scarce, with less than 1 percent of the reservoir containing depths in excess of 20 feet. The usable storage capacity of the reservoir is 1,367 acre-feet at a maximum high water elevation of 1,435.5 feet NGVD 29 and a gross storage capacity of 15,200 acre-feet. The maximum allowed daily reservoir fluctuation is about 0.8 foot (from 1,435.5 feet to 1,434.7 feet NGVD 29). The reservoir extends about 6.7 miles upstream to the Kings Dam Project on the Wisconsin River, about 1 mile upstream to the Jersey Dam Project on the Tomahawk River, and about 4 miles upstream on the Somo River.

The USGS gage no. 0539500, located in the Wisconsin River at Merrill, Wisconsin, 27 miles downstream of the Tomahawk Dam, was used to determine the daily average inflows by month for the project for the period from January 1904 to December 2011. The mean annual daily flow for the project is 1,162 cfs. The highest flow recorded for the project was 16,234 cfs on September 1, 1941, and the lowest flow was 40 cfs on September 26, 1908.

Because of the limited storage capacity of the project, the outflows from the project are often relatively similar to the project inflows. The existing license for the project requires that a minimum flow of 162 cfs, or inflow, be released from the project.

Existing project operation meets the required minimum flow of 162 cfs, and about 85 percent of the time, flows from the project exceed 500 cfs.

Grandfather Falls Project

The Grandfather Falls Project's reservoir has a surface area of 340 acres and a gross storage capacity of 2,200 acre-feet. Wisconsin Public Service operates the reservoir between elevations 1,396.1 feet and 1,397.1 feet NGVD 29. The mean depth of the reservoir is 5.7 feet, with a maximum depth of 26.1 feet at a point located about 150 feet upstream of the Grandfather Falls Dam.

The USGS gage no. 0539500, located in the Wisconsin River at Merrill, Wisconsin, 14 miles downstream of the Grandfather Falls Project, was used to determine the daily average inflows by month for the project for the period from January 1904 to December 2011. The mean annual daily flow for the project is 2,078 cfs. The highest flow recorded for the project was 29,042 cfs on September 9, 1941, and the lowest flow was 375 cfs on October 22, 1933.

The supply of water to the project is coordinated with: (1) water releases from the Spirit reservoir which is one of several reservoirs that are part of the Commission-licensed Wisconsin River Headwaters Project (P-2113), a nonpower project located at the headwaters of the Wisconsin River; (2) releases from the Grandmother Falls Project located at RM 308, about 6 miles upstream from the Grandfather Falls Project; and (3) releases from the Tomahawk Project, about 12.4 miles upstream from the Grandfather Falls Project. The hourly water supply to the Grandfather Falls Project generally follows the releases of water from the Grandmother Falls Project, which reflects the pattern of limited peaking operation from the Tomahawk Project.

Inflows of water from the Wisconsin River to the Grandfather Falls Project are distributed between the project bypassed reach and the powerhouse canal and reconvene downstream of the powerhouse. The limited storage in the project reservoir and operational requirements cause outflows from the project to often be similar to the inflow to the project, but the project is considered to be a limited peaking facility.

Water Quality

Many of the streams and several of the lakes in the Upper Wisconsin River Basin are classified by the state as either Exceptional Resource Waters or Outstanding Resource Waters, and have excellent water quality and high quality fisheries (Wisconsin DNR, 2017). While the waters in the Upper Wisconsin River Basin are generally very good, there are some instances in which water quality has been adversely affected, especially where waters of the Wisconsin River are used for waste water assimilation. However, among the many lakes and streams in the Upper Wisconsin River Basin (Wisconsin

DNR, 2017),[17] only 40 lakes and flowages are listed as impaired waters under the 303(d) list,[18] including Lake Mohawksin, the project reservoir for the Tomahawk Project (Seibel, 2014).

Lake Mohawksin is classified as a eutrophic[19] lake and was first listed on the state's 303(d) list in 1998 because of high biological oxygen demand and sediment oxygen demand. The lake has remained listed as impaired for these two criteria, but has been identified as low priority by the state in terms of being a candidate for developing a Total Maximum Daily Load (TMDL)[20] program for the lake.

Wisconsin DNR establishes numeric and qualitative water quality standards for the Wisconsin River basin, consistent with section 303(c) of the Federal Clean Water Act. Under the Administrative Code, Chapter NR102, the state identifies surface water quality for the following water uses (State of Wisconsin, 2010): (1) fish and other aquatic life; (2) recreational use; (3) public health and welfare use; and (4) wildlife use.

Under the Wisconsin Administrative Code (Chapter 04.08), intrastate waters in north-central district counties, including Lincoln County where both projects are located, must meet the water quality criteria for fish and aquatic life and recreational use. Wisconsin DNR identifies the Grandfather Falls flowage as having a use designation of fish and aquatic life. The Wisconsin River downstream of the Grandfather Falls Project is identified as having a use designation of fish and aquatic life, recreation, public health and welfare, and fish consumption, with an attainable use classification of warmwater sport fish. As such, water quality criteria applicable to the Grandfather Falls flowage, the river reach downstream of the Grandfather Falls Dam, and the waters of the Tomahawk Project must meet the following criteria:

- dissolved oxygen (DO) content in surface waters may not be lowered to less than 5 milligrams per liter (mg/L) at any time; and
- the potential pH should be within the range of 6.0 to 9.0.

The state water quality criteria specifies that water temperature should not generally exceed 89º F (32 degrees Celsius [º C]) while maintaining natural daily and

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[17] Wisconsin DNR identified 5,098 lakes in the Upper Wisconsin River Basin and around 3,895 miles of streams and rivers.

[18] Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized Indian tribes are required to develop lists of impaired waters that do not meet the water quality standards that states, territories, and Indian tribes have set for them.

[19] A eutrophic lake has an abundant accumulation of nutrients that support a dense growth of algae and other organisms, the decay of which depletes the deep waters of oxygen in the summer.

[20] A TMDL is the amount of pollution a water body can receive and still meet water quality standards.

seasonal temperature fluctuations, and the discharges should not exceed 120º F (49º C). The state water quality criteria further specifies seasonal water quality standards for the Wisconsin River, with temperature parameters for ambient, sub-lethal, and acute criteria. For example, acute criteria for the Grandfather Falls Project requires water temperatures not exceed 85º, 86º, 85º, and 84º F, respectively, for the months of June, July, August, and September. The water temperature criteria for Lake Mohawksin are slightly different from those required for the Grandfather Falls Project and require water temperatures not exceed 85º, 86º, 86º, and 84º F for the months of June, July, August, and September, respectively. The state water quality criteria for DO and pH for the Tomahawk Project are the same as those listed above for the Grandfather Falls Project.

Water Use

The Wisconsin River is used as a source of power to operate hydropower projects and by local municipalities and industries for wastewater assimilation and for other uses, including for agricultural purposes, such as for irrigation, and as a cooling water source for power plants.

Tomahawk Project

The Packaging Corporation of America has a state issued permit to withdraw water from Lake Mohawksin for use in its paper packaging manufacturing process, including for use of waters from the lake for non-contact cooling purposes. The company withdraws up to 35.4 million gallons per day (MGD). The company has treatment facilities located on site, and treated effluent is returned to Lake Mohawksin just upstream from the Tomahawk Dam near the turbine intakes at the powerhouse. The company is authorized by the state to discharge a variable amount of treated effluent into Lake Mohawksin. The monthly effluent discharges for the months of June through September in 2011 and 2012 varied from 5.4 to 5.7 MGD, while cooling water discharges for the same timeframe ranged from 8.5 to 14.7 MGD.

During the growing season, a marsh adjacent to the west side of Lake Mohawksin is used to grow cranberries. A canal connected to Lake Mohawksin is used to withdraw small amounts of water, averaging around 1 cfs during the growing season, from the lake for use in growing and harvesting cranberries.

Wisconsin DNR allows riparian landowners to use Lake Mohawksin and the Wisconsin River for irrigation without the need to acquire a permit from the state, provided there is no commercial affiliation with the withdrawals, and the withdrawal is a nominal amount.

Grandfather Falls Project

There are no existing permitted water withdrawals or discharges at the Grandfather Falls Project besides what is used for power production at the project.

Fishery Resources

The Wisconsin River is classified as a warm, lowland river and is the longest and largest river in the state of Wisconsin (Lyons, 2005). Over 100 native fish species have been documented in the river, which meanders about 400 miles south from its outlet at Lac Vieux Desert on the Wisconsin-Michigan border to its confluence with the Mississippi River (Lyons, 2005).

Lake Mohawksin

The fish community in Lake Mohawksin has warm and coolwater fish assemblages.[21] Natural recruitment self-sustains the fish populations in Lake Mohawksin. The lake is primarily managed for walleye, northern pike, smallmouth bass, muskellunge, and panfish.[22] Walleye are abundant in the lake and are the most sought-after recreational fish pursued by anglers in the lake. Both the lake and the Wisconsin River downstream from the project are also known as "trophy waters" for their ability to consistently produce a number of large muskellunge.

Non-game fish species include bluegill, pumpkinseed, black and white crappie, black and yellow bullheads, bowfin, burbot, rock pass, white suckers, and various redhorse and shiner species. Fish surveys conducted in the lake report an abundance of yellow perch and bluegills with moderate numbers of black crappie and pumpkinseed. The reservoir has a healthy and diverse fish population that is fully supported through natural reproduction.

The shallow lake provides little summertime refuge for cool or coldwater fish species and has limited cool and coldwater habitat, because the deeper portions of the lake generally have low DO levels during the summer months, with anoxic conditions

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[21] The classification of the fishery in the lake is sometimes referred to as warmwater/transitional fishery because, although the lake is mostly composed of warmwater fish species like panfish, there are some fish species that occur in cool or cold water habitats (these habitats can occur seasonally in the lake), like northern pike and walleye.

[22] The term panfish is a loose catch-all term that applies to fish that are sought by hook and line anglers for food rather than buying fish in a market. Many fish that are called "panfish" are members of the sunfish, perch, bass, catfish, and sucker families. In some parts of the country, "panfish" refers to sunfish, such as bluegill, pumpkinseed, red ear sunfish, long ear sunfish, and green sunfish.

occurring. However, the nutrient rich and relatively productive waters of the lake create excellent conditions for forage species like golden shiners and additionally provide habitat that supports the production of abundant numbers of young-of-the-year fish from the fecund[23] species present, like bluegills and pumpkinseed. The abundance of small forage fish provide an excellent food base for piscivorous fish,[24] like walleye, northern pike, and muskellunge.

Wisconsin River, Downstream from the Tomahawk Project

The water exiting the Tomahawk Project enter a reservoir created by the Grandmother Falls Project that nearly backs up to the Tomahawk Dam. Fish species in the Grandmother Falls reservoir are similar to those occurring in Lake Mohawksin. A fish survey conducted at the Grandmother Falls Project in 2000 collected 25 fish species. The species comprise the same mix reported for Lake Mohawksin, with the exception of the following six species: common shiner, emerald shiner, fantail darter, Johnny darter, logperch and mottled sculpin.

Grandfather Falls Project

The Grandfather Falls reservoir is a riverine-like reservoir that is relatively shallow with a surface area of 340 acres. The reservoir extends around 5 miles upstream to the Grandmother Falls Dam. The reservoir is a 4,000-foot-long by 300-foot-wide body of water that leads to the intake canal for the project. About one-third of the reservoir has a depth of around 7.5 feet. The central portion of the reservoir has a mean depth of 2.1 feet and the uppermost one-third of the reservoir has an average depth of 1.5 feet. The stream gradient in the reservoir is relatively flat.

The Upper Wisconsin River near the Grandfather Falls Project supports an active sports fishery for smallmouth bass, walleye, and northern pike. Other species found in the project area include muskellunge, black crappie, bluegill, pumpkinseed, rock bass, redhorse, white sucker, yellow perch, logperch, yellow bullhead, channel catfish, longnose dace, and common shiner. The reach of the Upper Wisconsin River upstream of the project is actively fished throughout the open-water season.

The Grandfather Falls reservoir and a portion of the Wisconsin River upstream to Merrill, Wisconsin, which includes the reach of the Wisconsin River downstream to the Tomahawk Dam are identified by Wisconsin DNR as Class A1, Reproductive Category 1 Priority Navigable Waterways Musky Areas.

The reservoir has a healthy and diverse fish population that is fully supported through natural reproduction. The reservoir is currently managed by Wisconsin DNR for game fish (walleye, northern pike, smallmouth bass, and muskellunge) and managed for panfish. Panfish abundance (in decreasing order), includes such species as yellow

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[23] The ability to produce an abundance of offspring.

[24] Fish that eat other fish.

bullhead, black bullhead, pumpkinseed, black crappie, yellow perch, bluegill, hybrid bluegill (a cross between pumpkinseed and bluegill), and white crappie. Nongame forage species include white sucker, shorthead redhorse, golden redhorse, stonecat, burbot, golden shiner, northern hogsucker, and trout-perch. No fish stocking currently occurs or is proposed for the reservoir.

Grandfather Falls Bypassed Reach

The Grandfather Falls bypassed reach is about 4,500 feet long and extends from the Grandfather Falls Dam downstream to the confluence of the project tailwater. The bypassed reach drops 90 feet in elevation from the dam downstream to the tailrace. This drop in elevation in the bypassed reach creates moderate and high-gradient river habitats that provide high-velocity riverine habitat, and deep pools with narrow, shallow river margins. Substrate in the bypassed reach primarily consists of bedrock and large boulders, with pockets of smaller substrates composed of cobble and gravel. The fish habitats in the bypassed reach are subject to change due to changing water velocities from flows released from the dam, creating conditions that limit or affect fish diversity.

Between 1989 and 1993, Wisconsin Public Service conducted multiple baseline fish surveys in the Grandfather Falls bypassed reach as part of a study to evaluate the adequacy of the 50-cfs instream minimum flow for the bypassed reach. A total of 1,450 fish representing more than 15 fish species were collected over the course of the study. The dominant species in those surveys were smallmouth bass and longnose dace which composed 88.6 percent of the catch. The fish survey in 1989 found smallmouth bass to be the predominant game fish in the bypassed reach, and the collections of this species comprised mainly young-of-the-year and fish over one year or more in age. The pool habitats in the bypassed reach were also noted as good nursery habitats for smallmouth bass and thus a source of smallmouth bass recruitment for smallmouth bass fisheries in the Wisconsin River downstream of the project.

Wisconsin River Downstream of the Grandfather Falls Project Powerhouse to Bill Cross Rapids

Bill Cross Rapids, located about 4.6 miles downstream from the Grandfather Falls powerhouse, is a 1,000-foot-long shoal and rapids area that contains Class I and Class II rapids. The substrate at the Bill Cross Rapids area is primarily composed of boulders and cobble (73 percent) and sand (22 percent) with a shoreline that is well-vegetated and stable. The Bill Cross Rapids contains four different types of mesohabitats: run, riffle, rapids, and glide, with pockets of side pools and eddies found along the river's edge in the 1,000-foot-long rapids area.

There is an active sport fishery in the river reach downstream from the project powerhouse during the open-water fishing season. The most sought-after species include smallmouth bass, walleye, northern pike, muskellunge, bluegill, channel catfish, and yellow perch. The fish sampling in the Bill Cross Rapids in 2014 captured 10 species which were dominated by shorthead redhorse and various darter species (i.e., fantail,

rainbow, and Johnny darters, and logperch). The Bill Cross Rapids are relatively shallow and have swift currents, which is the type of habitat preferred by the darters, stonecats, and logperch.

Freshwater Mussels

Tomahawk Project

The mussel species were surveyed in 2014 downstream of the Tomahawk Project, and a total of 237 live mussels were captured.[25] Species captured included 9 plain pocketbook, 22 fatmuckets, 6 giant floaters, and 200 paper pondshells. Nearly half of the paper pondshells and one giant floater were less than 3 years old, which is indicative of recent recruitment. Host fish for the two most abundant mussels collected at the Tomahawk Project (i.e., paper pondshells and plain pocketbook), include white crappie, bluegill, and yellow perch, and largemouth bass, common shiner, and bluegill.

Grandfather Falls Project and Bill Cross Rapids

For the Grandfather Falls Project waters, 652 live mussels (and two relict species) were captured during the 2014 survey. Five mussel species were captured in the Grandfather Falls reservoir, including the spike, plain pocketbook, fatmucket, fluted shell, and black sandshell species; ten in the Grandfather Falls bypassed reach, including the five species captured in the Grandfather Falls reservoir and additionally the Elktoe, Wabash pigtoe, white heelsplitter, giant floater, and paper pondshell, which was not a live mussel, rather only the shell of the species.

A total of 668 mussels were collected at Bill Cross Rapids, representing nine species, including two mussels, the mucket and a relict purple wartyback that had not been captured in the Grandfather Falls reservoir or bypassed reach. The 1,000-foot-long Bill Cross Rapids, with its consistent flows and cobbled and sandy substrates, has ideal mesohabitats of runs, riffles, rapids, and glides that are preferred by mussels. The most dominant mussel species collected in the project vicinity were the spike and flutedshell. Suitable fish hosts for glochidia[26] of the two most abundant mussels collected from all sites include the abundant white crappie, yellow perch, northern pike, bluegill, and walleye.

Most of the species captured were greater than 3 years old. No rare, threatened, or endangered mussels were found during the mussel sampling study for either project.

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[25] Mussel sampling did not occur in Lake Mohawksin, which historically has not reported the presence of any mussels.

[26] Glochidia is the larva of a freshwater mussel of the family *Unionidae* that lives as a temporary parasite in the gills or on other external parts of a fish until it transforms into a microscopic juvenile and drops off the fish and settles to the bottom of the water body.

3.3.1.2 Environmental Effects

Water Quality

Tomahawk Project

Water quality data collected from the reservoir in 2006 indicated that water quality for temperature and DO were consistent with those specified by state standards most of the time, with occasional variances during the summer (Wisconsin DNR, 2015). During summer months, water temperatures were occasionally higher in the surface waters. In addition, typically DO concentrations in the reservoir were consistent with the 5.0 mg/L requirements of the state, with the exception of a few deepwater sections of the lake with depths greater than 9 or 15 feet, which often became anoxic during the summer months.

Wisconsin DNR also collected water quality data about 2.3 miles downstream from the project in the Wisconsin River, near Herb Mitchell Landing once a month between April 2010 and November 2013. DO levels collected at the site were consistent with or well above the state standards of 5.0 mg/L for DO. The data collected also indicated that pH levels downstream of the project were consistent with state standards for pH, with the exception of eight instances (five in 2011 and three in 2012) when the readings were slightly higher than the state standard of 9.0. The pH readings during these eight instances ranged from 9.28 to 10.23 and were mostly slightly over the 9.0 state requirement.

Water temperature and DO data collected by the Packaging Corporation of America near the turbines for the Grandmother Falls Project (about 5 miles downstream from the Tomahawk Project) between 2007 and 2014 showed there were some seasonal variations in temperature and DO levels, but temperature levels were always consistent with state standards. Similarly, DO levels were typically well above the minimum state criterion of 5.0 mg/L, but occasionally dropped below 5.0 mg/L during short periods in the summertime.

Wisconsin Public Service proposes to continue operating the Tomahawk Project in a peaking mode of operation. Changes in water elevations, which occur in a peaking mode of operation, have the potential to affect water quality, depending on the depths of the water released and the way the water is released. Also, the release of effluent from the Packaging Corporation of America into the project reservoir at the intakes to the project turbines at the Tomahawk powerhouse, and cooling water discharges to the reservoir could affect water quality by reducing DO and increasing temperatures, respectively.

Our Analysis

Project Operation

Water level fluctuations caused by operating the project in a peaking mode generally range from 1.1 to 1.2 inches with the daily fluctuation only exceeding 2 inches

about 10 percent of the time. The results of the Impoundment Fluctuation Assessment Study conducted in 2014 indicated that there was very little shoreline erosion in the reservoir and downstream. Continuing to operate the project in a peaking mode would not affect shorelines.

Water Quality

Existing water quality data collected for Lake Mohawksin and other project-affected reaches of the Wisconsin River show that project operation has little effect on water quality in the project vicinity, with no discernable correlation between project operation and water quality. Reduction of water quality in Lake Mohawksin is largely the result of natural, non-project factors, like its shallow depth, which provides excellent conditions for aquatic plant growth. The subsequent death and decomposition of plants leads to reduced DO levels in the water and causes an increase in biological oxygen demand and further reduction in water quality. Similarly, the large contributions of sediment entering the lake from its three tributaries causes sediment oxygen demand. The reduced DO levels and biological oxygen demand, in conjunction with the large amounts of sediment contributed to the lake from the three rivers that enter the lake, have led to the lake being classified as impaired and being listed on the state's 303(d) list. The project has no control over the sediments entering the project from the three rivers, and thus the DO, biological oxygen demand, and sediment caused reductions in water quality would not be caused by project operation.

During 2001 and 2012, the water quality sampling collected at Herb Mitchell Landing by Wisconsin DNR indicated that pH levels were slightly higher than the levels specified by the state standard. The pH data was collected as part of Wisconsin DNR's TMDL program for the Wisconsin River. The pH data was also collected on the same dates at Merrill, Wisconsin, located on the Wisconsin River about 27 miles downstream from the Tomahawk Project, and the pH values recorded there were the same as those measured downstream at Herb Mitchell Landing. Thus, the higher pH levels appear to be caused by natural causes and not from operation of the Tomahawk Project.

The discharge of cooling waters by the Packaging Corporation of America enters Lake Mohawksin via a six-orifice diffusion header that extends about 460 feet east-southeast from the company's shoreline and about 1,540 feet upstream from the Tomahawk Project's powerhouse. The non-contact cooling water discharges vary seasonally with the maximum discharges occurring in July and August and the minimum discharges in January and February. The volume of water withdrawn for cooling purposes is less than 3 percent of the annual mean daily flow of the Wisconsin River. Even though the discharges occur in the summer months when there are naturally occurring higher water temperatures and lower DO levels, the company's use of a multi-port diffuser facilitates the dissipation of heat from the process cooling water discharge. Wisconsin Public Service estimates, conservatively, that the company's cooling water discharge would contribute 0.3° F to 0.6° F increase in surface water temperatures during the summer months. The resulting temperature increase would potentially cause a

decrease of oxygen solubility of less than 0.1 mg/L. Thus, the cooling waters would not affect water quality in Lake Mohawksin.

The effluent discharge from the Packaging Corporation of America is directly discharged into the turbine intakes, so the treated effluent does not influence water quality in Lake Mohawksin. There have been no reports of water quality issues downstream of the Tomahawk Dam.

Natural stratification (formation of a thermocline) of the lake does occur in the deepwater sections of the lake during the summer and causes a reduction of DO levels in the affected-deepwater areas of the lake. This a natural phenomenon that occurs in many natural lakes and in reservoirs created by hydropower projects and is not caused by project operation.

Grandfather Falls Project

As part of the relicensing of the projects, water quality data was surveyed at various locations in project-affected waters of the Grandfather Falls Project. The following are the results of the survey:

(1) the pH in the Grandfather Falls reservoir ranged from 6.3 to 7.8 and was typically highest in the spring and lowest in the summer and fall;

(2) water temperatures collected in the reservoir and downstream of the project were consistent with those specified by the state standards, and DO levels ranged from 7.6 to 8.8 mg/L, well above the levels specified by the state standards;

(3) water temperatures collected in the Grandfather Falls bypassed reach during a fishery study were consistent with those specified by the state standards, and DO levels ranged from 7.3 to 8.3 mg/L during the first study in the bypassed reach. In a second year study season, water temperatures were consistent with those specified by the state standards and DO levels ranged from 7.9 to 8.3 mg/L, well above the state standard of 5.0 mg/L for DO; and

(4) the specific conductance of the water in the reservoir indicated that the water was within a soft water classification.

Wisconsin Public Service proposes to continue operating the Grandfather Falls Project in a peaking mode of operation and release a minimum flow of 50 cfs into the bypassed reach and 400 cfs into the project tailrace. Changes in water elevations, which occur in a peaking mode of operation, have the potential to affect water quality depending on the depths of the water released and the way the water is released. Also, the release of the proposed whitewater boating flows into the Grandfather Falls bypassed reach could potentially affect water quality in the bypassed reach.

Our Analysis

The water quality survey, as identified above in items (1) through (4), indicated that water quality parameters (i.e., pH, temperature, and DO), were consistent with state

standards. In many instances, DO levels were well above the minimum state standard for DO of 5.0 mg/L. The 50-cfs minimum flow in the bypassed reach under existing operation adequately protects water quality in the bypassed reach. The proposed release of whitewater boating flows in the bypassed reach, as discussed in section 3.3.4, *Recreation and Land Use*, would not likely adversely affect water quality, as one water quality survey conducted in the bypassed reach during the same month that whitewater boating flows were released showed that the water samples had DO levels that exceeded the state standard. Also, it is not likely that the proposed flows in the early spring (i.e., those occurring in May and June), would affect water quality because the cooler water temperatures in the project reservoir and affected Wisconsin River would have only started to warm up from the winter effects, thereby having little effect on DO and high water temperatures.

In summary, continued operation of the Grandfather Falls Project, as proposed, including whitewater flow releases, should not adversely affect water quality in project-affected water of the Grandfather Falls Project.

Reservoir Drawdown Management Plan (Reservoir Drawdown Plan) for Tomahawk and Grandfather Falls Projects

Reservoir drawdowns are often necessary at hydroelectric projects during emergencies or for scheduled maintenance activities. Reservoir drawdowns can strand aquatic organisms that inhabit nearshore areas of a reservoir and cause rapid increases in downstream flows, which have the potential to flush aquatic organisms from their downstream habitats. Subsequent refill of the reservoir after a drawdown could also limit downstream flows, as inflow to the project would need to be stored for refill purposes.

Reservoir drawdowns at both projects have historically been infrequent and are expected to remain relatively infrequent. However, as the structures age, Wisconsin Public Service states that the need for and frequency of drawdowns to perform inspections and maintenance may increase, and a drawdown frequency of once every 5 to 10 years is possible. Wisconsin Public Service proposes to implement a Drawdown Management Plan for each project.[27]

Wisconsin Public Service states the plan would: (1) detail expected periodicity and duration of maintenance drawdowns; (2) describe maintenance and emergency drawdown notification procedures; and (3) provide consultation with Wisconsin DNR prior to, during, and after drawdowns occur, as appropriate.

For planned drawdowns, the Reservoir Drawdown Plan for each project includes the following measures:

[27] Wisconsin Public Service filed with the Commission on October 28, 2016 a revised Reservoir Drawdown Plan for both projects.

- sending a proposed drawdown plan to Wisconsin DNR for a 30-day consultation period prior to the drawdown;
- submitting a drawdown plan to the Commission's Division of Dam Safety and Inspections for approval, along with evidence of consultation with Wisconsin DNR and responses to any comments received;
- describing the purpose of the drawdown(s) (e.g., including work to be accomplished, orders, reports, correspondence, or other documentation, as appropriate) for the intended drawdown(s);
- including a drawdown schedule and rate of drawdown (the typical goal for the drawdown rate is to not be greater than one foot per day);
- the anticipated final drawdown elevation;
- the anticipated project schedule for work required;
- a method for passing minimum flows during the drawdown;
- measures to minimize effects on aquatic organisms and resources;
- a refill plan and schedule, including refill rates;
- notifying the public, as appropriate; and
- posting appropriate signage at project recreation sites that may be closed as a result of the drawdown.

For emergency drawdowns, Wisconsin Public Service proposes to include the following provisions in the proposed reservoir drawdown plan:

- when an emergency drawdown is recognized as necessary and the drawdown has commenced, notify Wisconsin DNR as soon as practical, but no more than one business day following the initiation of the drawdown;
- within seven working days, provide Wisconsin DNR with: (1) date and time of commencement of a drawdown and anticipated duration of the drawdown, (2) if known, include the anticipated final drawdown elevation, (3) a description of the nature of the emergency requiring the drawdown, (4) notification(s) after the emergency is over and normal operation has resumed, (5) any effects to aquatic organisms and resources caused by the emergency drawdown, and (6) any other pertinent anticipated action;
- notify the public when an emergency drawdown is recognized as necessary and the drawdown has commenced; and
- to ensure public safety, post appropriate signage at project recreation sites that may be closed as soon as practical once it is determined that a an emergency drawdown is required.

Our Analysis

Project impoundments may need to be drawn down periodically for scheduled or unscheduled maintenance, as well as for emergencies beyond the control of the operator. If a drawdown occurs rapidly, saturated streambank soils could become more susceptible to sloughing as the resistance of the soils decrease upon dewatering. However, as part of the Impoundment Fluctuation Study conducted in 2014, the embankments along each reservoir's shorelines and on the banks downstream of each project's dams were examined for erosion and stability. Both projects' reservoir shorelines and banks downstream of the dams were determined to be stable. Therefore, drawdowns should not adversely affect these shorelines or reaches downstream.

In addition, rapid drawdowns of an impoundment or river reach can affect water quality by increasing water temperature and reducing DO. Rapid drawdowns can also lead to stranding of fish and other aquatic organisms, as well as dewatering of spawning, nursery, and foraging habitat. Wisconsin Public Service's proposed drawdown plan would use a drawdown rate of no more than one foot per day, which should protect aquatic resources in the reservoirs and provide time for downstream aquatic resources to move into deeper waters. This proposed slow drawdown rate should not create rapid exposure of shallow, nearshore areas or sandbars, allowing aquatic organisms to adapt to the changes in water elevations. Wisconsin's proposal to notify and work with Wisconsin DNR for any planned or unplanned drawdowns would help ensure that drawdowns and refills associated with scheduled or unscheduled maintenance activities or emergencies are minimized to the extent possible.

Operation Monitoring Plan for the Tomahawk and Grandfather Falls Projects

Wisconsin Public Service proposes to continue operating both projects as it does under the existing license (see section 2.2.1, *Proposed Project Facilities)*, including operating in a peaking mode and maintaining various reservoir elevations and minimum flows at both projects, which includes minimum flows in the Grandfather Falls bypassed reach. Wisconsin Public Service also proposes to release seasonal whitewater boating flows into the Grandfather Falls bypassed reach, as discussed in section 3.3.4, *Recreation and Land Use*.

In continuing to operate each project in a peaking mode, there would be one peaking cycle per day at each project. Operation of each project would continue to be remotely monitored, including headwater and tailwater elevations, and flows would continue to be released from the powerhouses and spillway gates. Daily reservoir fluctuations would continue to be no greater than 0.8 foot NGVD 29 at Lake Mohawksin and no greater than 1.0 foot NGVD 29 at the Grandfather Falls reservoir.

Wisconsin Public Service proposes to implement an Operation Monitoring Plan for each project to ensure its normal project operation monitoring systems and methods

of reporting results comply with its operating requirements that are intended to protect, mitigate, and enhance resources potentially affected by the projects.

The proposed Operation Monitoring Plan for each project would also contain the following items:

Monitoring

- The current electronic system would be used to monitor elevations in each project impoundment on a continuous basis and be recorded at least on an hourly basis in the electronic database.
- At least once per month the electronic readings collected for the reservoir elevations would be compared with the manual staff gage reading at each reservoir. If there is a difference between the two readings of 0.1 feet or greater, the electronic device would be recalibrated accordingly.
- In the event of an outage of the electronic monitoring system, Wisconsin Public Service would attempt to conduct elevation monitoring at least once daily by taking manual elevation readings from the staff gages. These collected manual staff gage readings would be recorded in writing.
- The permanent manual staff gages at each project would be recalibrated at least once every 5 years under the supervision of a registered land surveyor or whenever a staff gage is disturbed.

Minimum Flow Releases

- The minimum flow at the Tomahawk Project of 162 cfs is routinely passed through the generating units at the project. When the generating units would not be available, the minimum flow would be released through one of the project Tainter gates. Re-establishment of a minimum flow from the generating units to the Tainter gates would require up to 10 minutes.
- The minimum flow at the Grandfather Falls Project would be measured at the discharge gate and powerhouse.[28] When the generating units are not available, the minimum flow is released through one of the project's Tainter gates into the bypassed reach. Re-establishment of minimum flow from the generating units to the Tainter gates requires up to 10 minutes.

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[28] The minimum flow at the Grandfather Falls Project is 400 cfs, which includes the minimum flow of 50 cfs from the Grandfather Falls bypassed reach. Water released from the dam discharges into a large concrete weir that has a large circular cut-out through which the minimum flow passes. The flow measurements are correlated to an existing staff gauge that is mounted to the weir. The USGS performs a flow gauging survey in the Grandfather Falls reach of the Wisconsin River twice per year to verify that 50 cfs is provided.

Reporting/Deviations

- If flow releases or reservoir elevations would be modified outside of the license requirements, if issued, for each project, for a time period of less than 60 minutes and the modification did not result in the observation or reporting of any negative environmental effects, notifications/reports to the Commission and Wisconsin DNR and FWS would take place on an annual basis. The report would explain for each flow release and reservoir deviation any corrective measures implemented during the calendar year and would be provided to Wisconsin DNR and FWS by January 31st in the subsequent calendar year. The final annual flow release and reservoir elevation deviation report would be filed with the Commission by February 28, along with any resource agency comments and Wisconsin Public Service's response to the comment(s).
- If the flow releases or reservoir elevations would be modified outside of the license requirements, for each project, for a time period greater than 60 minutes and /or the modification result in negative environmental effects, a report for each project would be filed with the Commission, Wisconsin DNR, and FWS within 30 days of data availability. The report would, to the extent possible, identify the cause, severity, and duration of the incident and any observed or reported adverse environmental effects. The report would include the following items: (1) operational data necessary to determine compliance; (2) a description of any corrective measures implemented at the time of the occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence received from resource agencies regarding the incident.
- Wisconsin Public Service would discuss any operational compliance concerns[29] with Wisconsin DNR and FWS at the annual resource agency meeting, typically held each year in late winter or early spring.

FWS recommends Wisconsin Public Service develop a plan to monitor compliance with project operation that employs mechanisms to document inflow to and from the Grandfather Falls Project, including the Grandfather Falls bypassed reach and the tailrace of the Grandfather Falls Project.

Our Analysis

The proposed Operation Monitoring Plan would help Wisconsin Public Service ensure that both projects are operated in accordance with the operational requirements of

[29] Although it is not unusual for licensees to discuss license compliance concerns with federal and state resources agencies, the Commission retains the ultimate authority under the FPA to determine whether or not a licensee is in compliance with a Commission-issued license and to authorize actions necessary to ensure compliance.

any new licenses issued for the projects. Implementing the proposed plan for each project would also provide a mechanism for reporting the operational data to not only the Commission, but also to resource agencies that would be concerned about any abrupt changes in project operations that could affect fish and aquatic resources at each project. The plan for each project would also be beneficial in providing written guidance for all project employees that are involved in operating the project.

FWS's recommendation for documenting all inflows would result in no project-related benefit, because there are no proposed or recommended inflow restrictions for the project.[30] Likewise, FWS's recommendation for documenting tailrace flows would result in no project-related benefit, because there are no proposed or recommended powerhouse flow restrictions. In addition, minimum flow releases at both projects can be monitored by current equipment in place.

Because whitewater boating activities are proposed for the Grandfather Falls Project, it would be pertinent to modify the proposed Operation Monitoring Plan to include measures that would be used to specifically monitor whitewater boating flow releases into the Grandfather Falls bypassed reach and describe how the flows would be calibrated and modified to include contingencies for emergencies.

Consultation with FWS for the Grandfather Falls Project

FWS recommends Wisconsin Public Service consult with FWS on matters affecting fish and wildlife resources at the Grandfather Falls Project throughout the term of any new license issued for the project.

Our Analysis

The Operation Monitoring Plan proposed for the project would be sufficiently address FWS's recommendation to consult with it. One component of the plan includes a provision for annual meetings among Wisconsin Public Service, Wisconsin DNR, and FWS in the late winter or early spring. These annual meetings would provide an opportunity for FWS to be kept informed of project operational matters and provide an opportunity for FWS to discuss its concerns regarding project effects on fish and wildlife resources.

Fishery Resources

Operation of the Tomahawk and Grandfather Projects has the potential to result in some incidental fish losses caused by entrainment through the project turbines. To

[30] FWS's recommendation for measuring bypassed reach flow releases is a provision of Wisconsin Public Service's Operation Monitoring Plan, which is discussed above.

identify fish mortality related to project operation, Wisconsin Public Service conducted a desktop Fish Entrainment Study for both projects.

Our Analysis

The majority of fish likely to be entrained at the projects are less than 6 inches long and includes young life stages of all species present at the project that are incapable of avoiding the intakes and are not excluded from the trashrack, such as bluegill and yellow perch. Entrainment is likely to increase from spring to fall, which is related to increased activity and the presence and dispersal of juvenile fish.

Based on the desktop study, the average number of fish expected to become entrained at the Tomahawk Project annually would be around 22,600 fish, but based on the water year,[31] the number could range from 11,000 to 31,700 fish. The average annual number of fish to experience immediate turbine-related mortality at the project would be around 400 fish,[32] resulting in a 98-percent survival rate. Including latent mortality, overall turbine survival for those species and size classes estimated to become entrained at the Tomahawk Project would be around 93 percent. These estimates are fairly high because of the high survival rate of fish less than 6 inches long, which represented the majority of fish entrained at the project.

Based on the desktop study, the average number of fish expected to become entrained at the Grandfather Falls Project annually was around 12,200 fish, but based on the water year, the numbers of fish could range from 5,400 to 18,300 fish. The estimated average annual number of fish that may experience immediate turbine-related mortality at the project is estimated at around 900, which equates to an average annual survival rate of 93 percent. Based on the water year, this number could range from 400 to 1,300 fish. The survival rates are fairly high because of the high survival rates of fish less than 6 inches in length, which represented the majority of fish entrained at the project.

The numbers of fish estimated to be killed by operating the two projects is low. Also, the fish species present in both reservoirs that are most susceptible to becoming entrained are warmwater fish species with high fecundity, like bluegills, pumpkinseed, crappie, and shiners; therefore, these estimated losses would continue to not affect overall fish populations in the project waters.

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[31] A water year is defined by the 12-month period beginning October 1st and ending September 30th of the following year. The year is designated by the end of the water year (e.g., Oct 1, 2016 thru Sept 30, 2017 would be water year 2017). Water years were adopted to capture the hydrologic cycle which accounts for precipitation that may fall as snow and ice in the autumn and winter but may not melt/drain until the spring or summers snowmelt.

[32] The range would be 200 to 600 fish, depending on the water year.

Minimum Flows in the Grandfather Falls Bypassed Reach

Wisconsin Public Service proposes to continue providing a 50-cfs minimum flow in the Grandfather Falls bypassed reach to protect fish and aquatic resources in the bypassed reach.

The Wisconsin River in the Grandfather Falls bypassed reach is generally a moderate to high-gradient stream reach that drops 90 feet in elevation over the 4,500-foot-long reach between the Grandfather Falls Dam and the powerhouse tailrace. The moderate- and high-gradient stream section in the bypassed reach provide high-velocity riverine habitat, and deep pools and river margins provide feeding, rearing, and spawning opportunities for fish species that are less tolerant of rapid flows. Small boulders, large boulders, and bedrock are the dominate substrates (figure 5) with small cobbles, large cobbles, and gravels interspersed in pockets along the river margins. The stream bed is considerably wetted under the existing minimum flow of 50 cfs (figure 4).

Figure 4. A view looking downstream in the Grandfather Falls bypassed reach under a 50-cfs minimum flow release from the Grandfather Falls Dam (Source: Wisconsin Public Service, 2014).

Figure 5. A view of a portion of the Grandfather Falls bypassed section of the Wisconsin River looking upstream during a minimum flow of 50 cfs in June 2014 (Source: Wisconsin Public Service, 2014).

Our Analysis

Fishery Resources

The Instream Flow Study conducted in the Grandfather Falls bypassed reach examined flows of 50, 75, and 126 cfs to determine if increased flows in the bypassed reach would provide greater benefits to fishery resources in the bypassed reach. The results supported the conclusions reached in a 1996 study conducted by Wisconsin Public Service, which indicated that the release of a 50-cfs minimum flow in the bypassed reach protected and enhanced fishery resources.

The continuation of a 50-cfs minimum flow in the Grandfather Falls bypassed reach would support diverse aquatic habitats (e.g., riffles, runs, and pools) that provide rearing, spawning, and nursery habitat for game and non-game fish species. The minimum flow would provide 80 to 90 percent of suitable habitat available at the high flow for all species and life stages evaluated. In addition, smallmouth bass spawning habitat would be most suitable at flows of 50 cfs. Although the release of more water

above the 50 cfs minimum flow would increase the suitability of habitat for the three target fish species,[33] other than the smallmouth bass, the incremental increase in habitat would be minor.

The existing 50-cfs minimum flow would enhance and protect fishery resources by providing spawning, nursing, and rearing habitats. The 50-cfs minimum flow also would protect fishing opportunities in the bypassed reach, as well as potentially enhancing areas of the Wisconsin River downstream of the project from the recruitment of smallmouth bass from the bypassed reach.

Whitewater Flows

The Fishery Study conducted in 2014 by Wisconsin Public Service occurred shortly after the completion of the Whitewater Recreation Flow Study in the bypassed reach, with released whitewater boating flows reaching 4,000 cfs which rarely occur under normal operation.[34] The Whitewater Recreation Flow Study greatly affected the fishery resources in the bypassed reach, with only 40 fish collected, representing 4 families and 5 species of fish, with shorthead redhorse and smallmouth bass dominating the sparse catch.

A second Fishery Study was conducted in 2015 in the bypassed reach. During the study, the number and species of fish closely resembled the amount and type captured the previous year. The 2015 Fishery Study resulted in the capture of 48 fish from 4 families with smallmouth bass and shorthead redhorse dominating the catch. The results of 2015 Fishery Study indicated that fish populations in the bypassed reach had not recovered from the high whitewater boating flow released in 2014.

Based on all the fish studies that have been conducted in the Grandfather Falls bypassed reach over the years, fish populations in the bypassed reach have adapted to the occasional, naturally occurring high flows that seasonally occur in the bypassed reach (typically in April and May). As discussed in section 3.3.4, *Recreation and Land Use*, whitewater boating flow releases are proposed to be released in the bypassed reach. None of the proposed or staff-recommended whitewater boating flows would consist of

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[33] The target fish species evaluated in the Instream Flow Study were the greater redhorse, longnose dace, smallmouth bass, and walleye. Various life stages for each of the four target fish species were evaluated, including adult, juvenile, and spawning.

[34] Four whitewater boating flows were released during one day in May 2014 into the Grandfather Falls bypassed reach: 500 cfs, 1,000 cfs, 2,000 cfs, and 4,000 cfs.

flows near or at the 4,000 cfs flows, as what were released during the Whitewater Recreation Flow Study. Instead, the proposed or staff-recommended whitewater boating flows would have flows of 1,800 cfs and 1,500 cfs, which should have a minimal effect on fishery resources as these flows coincide with normal springtime flows in the bypassed reach. Also, the proposed or staff-recommended flows would be released between May 1 and June 21, to coincide with high flows occurring in the Wisconsin River. Also, these flows would occur at a time that would not encroach upon the spawning season for smallmouth bass,[35] which create a valuable fishing opportunity in the bypassed reach.

Ending whitewater boating flows in the bypassed reach after June 21st of each year would protect adult smallmouth bass that would be spawning in the bypassed reach in late June and it is unlikely that the three whitewater boating flows proposed for the bypassed reach would adversely affect the fish community in the bypassed reach.

Ramping Rates for Whitewater Boating Flows in the Grandfather Falls Bypassed Reach

Ramping is procedure used to either increase or decrease downstream flow from one value to another. Ramping is achieved by the release of flow through a water control structure, such as spillway gates at a dam. The rate at which ramping occurs is dependent on the starting flow, ending flow, and duration of the release. The ramping rate is determined so as to reduce stranding of fish, removal of habitat, and other adverse effects for fish and aquatic organisms, which can occur if water control structures rapidly open or close.

Wisconsin Public Service proposes an up-ramping duration and a down-ramping duration of 2 hours. The ramping duration proposed by Wisconsin Public Service was determined based on consultation with Wisconsin DNR personnel. Park Service and Interior recommend a "ramping rate of 10 percent" for the whitewater boating flow releases for the Grandfather Falls bypassed reach, which we interpret to mean 10 percent of the recreation release flow per hour. Park Service and Interior support their recommendation by stating that the 10 percent ramping rate has been used successfully for whitewater boating flow releases at other hydropower projects in Wisconsin and nationwide, but did not identify specific projects. River Alliance also recommends ramping for the Grandfather Falls Project, but did not specify the ramping rates and instead stated that a slow ramp-up and ramp-down procedure be used between flow releases.

[35] Smallmouth bass spawn from mid-May through June when water temperatures reach between 62 and 64° F.

Wisconsin Public Service proposes whitewater boating flows in the Grandfather Falls Bypassed Reach of 1,500 cfs. Park Service, Interior, and River Alliance propose whitewater boating flows of 2,000 cfs.

Our Analysis

To evaluate the ramping durations proposed by Wisconsin Public Service, and recommended by the Park Service and Interior for the Grandfather Falls bypassed reach, we analyzed data on the response of the Wisconsin River to four high-flow events. These four high-flow events were selected to represent a range of peak flow rates and river conditions that fish would normally experience. The flow data used in the analysis were recorded at USGS gage no. 05395000, located 14 miles downstream from the Grandfather Falls Project on the Wisconsin River at Merrill, Wisconsin. To account for the smaller drainage area of the Wisconsin River at the project, the flows measured at Merrill were scaled to the project location using a ratio of the drainage areas. The scaled peak flow rates for the four flow events in the Wisconsin River were: (1) 8,723 cfs for the February 23, 2017 event; (2) 5,126 cfs for the March 7, 2017 event; (3) 15,702 cfs for the May 18, 2017 event; and (4) 4,835 cfs for the October 9, 2017 event.

To meet the needs and demands of recreationists, scheduled recreation flow releases are proposed that would provide a predictable and reliable whitewater boating experience on the bypassed reach, an opportunity that does not currently exist for boaters.[36] To evaluate the effect of these whitewater boating flows and the associated ramping rates on aquatic resources, three flow release rates are evaluated, 1,500 cfs, 1,800 cfs, and 2,000 cfs.

The ramping rates were calculated for the three whitewater boating flow releases of 1,500 cfs, 1,800 cfs and 2,000 cfs, assuming a starting flow of 50 cfs in the Grandfather Falls bypassed reach, which is the minimum flow requirement for the bypassed reach. We assumed that the ramping rate releases would be linear between the starting and ending flow rates. Because Interior and Park Service did not specify a ramping duration, we assumed that Interior's and Park Service's 10 percent recommendation means that a $1/10^{th}$ flow change would occur per hour such that the total ramping would occur over a 10-hour period.

[36] See section 3.3.4, *Recreation and Land Use* for further discussion of the whitewater boating flow releases.

In our analysis, we considered the effects of project generation on the flows in the Grandfather Falls bypassed reach by assuming that the project would operate at its maximum hydraulic capacity of 2,820 cfs when the inflows reached 2,870 cfs. The inflow value of 2,870 cfs includes the proposed minimum flow of 50 cfs in the Grandfather Falls bypassed reach.[37]

We calculated the rate of flow change for the four flow events in the Wisconsin River in increments of 15 minutes, 1 hour, and 2 hours, and selected the largest change in both the rising limb and falling limb of the hydrograph for each high-flow event. These flow changes represent stream conditions that fish currently experience in the Wisconsin River absent of the proposed recreational flow releases, and were compared with the changes in rising and falling stream levels associated with the recreational flow releases and ramping durations proposed by Wisconsin Public Service, and recommended by the Park Service and Interior for the Grandfather Falls bypassed reach. The results of this analysis are presented in table 2 and table 3, for the rising limb and falling limb of the hydrograph, respectively. Table 2 and table 3 include the minimum, mean, and maximum flow rate change for time increments of 15 minutes, 1 hour, and 2 hours for the four high-flow events. Table 2 and table 3 show that currently, when a flow event occurs, the rates at which the hydrograph rises and falls are not constant over the entire event, but rather vary greatly over the course of the event. The greatest rate of change occurs during the shortest time increment of 15 minutes, but then flattens out over the longer time increments of 1 hour or 2 hours. This reduction in the maximum flow rate change as the time interval increases results from an averaging of the short-duration flow pulses over a longer time interval. Because the 2-hour time increment provides the smallest maximum change in flow observed in the Wisconsin River for the three time increments that were analyzed, the 2-hour time increment results in the most conservative comparison to the three proposed and recommended ramping rates, which are constant regardless of the time interval.

Table 2 and table 3 provides a comparison for three flows, of the maximum change in the hourly flow rate recorded in the Wisconsin River and the ramping durations proposed by Wisconsin Public Service, and recommended by Interior and Park Service. Table 2 and table 3 show that for all three flows, the ramping durations associated with Interior's and Park Service's recommendations are less than the mean flow changes observed in the Wisconsin River over a 2-hour increment. Table 2 and table 3 show that, for all three flows, the ramping durations associated with Wisconsin Public Service's proposal are less than the maximum increase in the hourly flow rate recorded in the Wisconsin River for a 15-minute increment. Table 2 shows that the up-ramping

[37] When the inflows to the project exceed 2,870 cfs, any change in the flow rate in the Grandfather Falls bypassed reach is identical to that in the Wisconsin River immediately downstream of the project tailrace because the powerhouse discharge would remain constant.

durations associated with Wisconsin Public Service's proposal for a 1,500 cfs flow, equal the maximum increase in the hourly flow rate recorded in the Wisconsin River for the 2-hour increment. Table 2 also shows that the up-ramping durations associated with Wisconsin Public Service's proposal for 1,800 cfs and 2,000 cfs flows, exceed the maximum increase in the hourly flow rate recorded in the Wisconsin River for the 2-hour increment. Table 3 shows that the down-ramping durations associated with Wisconsin Public Service's proposal are less than the maximum increase in the hourly flow rate recorded in the Wisconsin River for the 1-hour increment for the 1,500 cfs and 1,800 cfs flows, but are greater than the 1-hour increment for the 2,000 cfs flow. Table 3 also shows that for all three flows, the down-ramping durations associated with Wisconsin Public Service's proposal are greater than the maximum increase in the hourly flow rate recorded in the Wisconsin River for the 2-hour increment.

Table 2. Maximum increase in hourly flow rate statistics for four runoff events in the Wisconsin River compared to the proposed up-ramping rates in the Grandfather Falls Project bypassed reach (Source: staff).

Hydrograph Time Increment	Maximum Increase in Flow Rate[1] (cfs/hour) for Four High-Flow Events in the Wisconsin River			Up-Ramping Rate (cfs/hour) in the Bypassed Reach[2]					
				1,500 cfs		1,800 cfs		2,000 cfs	
	Minimum	Mean	Maximum	2 Hours	10 Percent	2 Hours	10 Percent	2 Hours	10 Percent
15 min	1,994	2,476	3,091	725	145	875	175	975	195
1 hour	665	1,232	1,637	725	145	875	175	975	195
2 hours	345	724	997	725	145	875	175	975	195

[1] – Flow rates were measured in the Wisconsin River at the USGS stream gage at Merrill, Wisconsin (gage no. 05395000), and scaled to the project location using a ratio of the drainage areas.

[2] – The 2-hour ramping duration is proposed by Wisconsin Public Service. The 10 percent rate is proposed by Interior and Park Service.

Table 3. Maximum decrease in hourly flow rate statistics for four runoff events in the Wisconsin River compared to the proposed down-ramping rates in the Grandfather Falls Project bypassed reach (Source: staff).

Hydrograph Time Increment	Maximum Decrease in Flow Rate[1] (cfs/hour) for Four High-Flow Events in the Wisconsin River			Down-Ramping Rate (cfs/hour) in the Bypassed Reach[2]					
				1,500 cfs		1,800 cfs		2,000 cfs	
	Minimum	Mean	Maximum	2 Hours	10 Percent	2 Hours	10 Percent	2 Hours	10 Percent
15 min	1,662	2,135	2,459	725	145	875	175	975	195
1 hour	814	924	1,080	725	145	875	175	975	195
2 hours	366	482	540	725	145	875	175	975	195

[1] – Flow rates were measured in the Wisconsin River at the USGS stream gage at Merrill, Wisconsin (gage no. 05395000), and scaled to the project location using a ratio of the drainage areas.

[2] – The 2-hour ramping duration is proposed by Wisconsin Public Service. The 10 percent ramping rate is proposed by Interior and Park Service.

In table 2 and table 3, with the exception of the 2-hour up-ramping for a 1,500 cfs release, we observe that the 2-hour up-ramping and 2-hour down-ramping durations proposed by Wisconsin Public Service, when used with whitewater boating flow releases of 1,500 cfs, 1,800 cfs and 2,000 cfs in the Grandfather Falls bypassed reach, result in flow changes that are greater than what fish would experience during high-flow events recorded in the Wisconsin River for the 2-hour increment. In table 2, the up-ramping rate of 725 cfs is equal to 724 cfs, which is the mean rate for increasing flows on the Wisconsin River for the 2-hour increment. Likewise, the up-ramping rate of 875 cfs is 21 percent greater than 724 cfs and the up-ramping rate of 975 cfs is 35 percent greater than 724 cfs. In table 3, the down-ramping flow rate of 725 cfs is 51 percent greater than 482 cfs, which is the mean rate for decreasing flows on the Wisconsin River for the 2-hour increment. Likewise, the down-ramping rate of 875 cfs is 82 percent greater than 482 cfs and the down-ramping rate of 975 cfs is 102 percent greater than 482 cfs.

Based on our analysis above, we conclude that the effects of the 2-hour up-ramping rate and 2-hour down-ramping rate associated with Wisconsin Public Service's proposal are not substantially different than that which now occurs over a 2-hour period on the Wisconsin River in the absence of project recreational flow releases, and therefore, Wisconsin Public Service's proposed ramping rates would not adversely affect the overall fish community in the Grandfather Falls bypassed reach. The fish species in the bypassed reach have adapted to large flow changes occurring in the bypassed reach during the spring as reflected by 15-minute flow change rates that are currently as high as 3,000 cfs/hour (table 2). The fact that all whitewater boating flow-releases would cease prior to June 21 would offer protection and not encroach on the spawning season for smallmouth bass. Other factors that potentially reduce the potential for adverse effects on fishery resources in the bypassed reach from the proposed whitewater releases and ramping rates include: (1) fish are not subject to stranding, as the river channel in the bypassed reach is narrow and well defined, reducing the potential for fish to become stranded in side channels or shallow areas during down-ramping; (2) there is an abundance of large rocks in the river channel (see figure 4 and figure 5), which can provide pockets of cover and holding sites for fish to escape the up-ramping of whitewater flow releases; and (3) smallmouth bass have shown to be resilient as determined from previous fish sampling efforts and can be successful in spawning and rearing young smallmouth bass in the bypassed reach, a factor important to recruitment of the species to the Wisconsin River downstream of the project tailrace.

In table 2 and table 3 we observe that the 10 percent up-ramping and 10 percent down-ramping rates proposed by Interior and Park Service, when used with whitewater boating flow releases of 1,500 cfs, 1,800 cfs and 2,000 cfs in the Grandfather Falls bypassed reach, result in flow changes that are much less than what fish would experience during high-flow events on the Wisconsin River for the 2-hour increment. In table 2, the up-ramping rate of 145 cfs is 80 percent less than 724 cfs, which is the mean rate for increasing flows on the Wisconsin River for the 2-hour increment. Likewise, the up-ramping rate of 175 cfs is 76 percent less than 724 cfs and the up-ramping rate of

195 cfs is 73 percent less than 724 cfs. In table 3, the down-ramping flow rate of 145 cfs is 70 percent less than 482 cfs, which is the mean rate for decreasing flows on the Wisconsin River for the 2-hour increment. Likewise, the down-ramping rate of 175 cfs is 64 percent less than 482 cfs and the down-ramping rate of 195 cfs is 60 percent less than 482 cfs. Therefore, we find that overall, the 10-percent up-ramp and down-ramp rates greatly exceed that which is necessary to protect fish.

Aquatic Resource Fund

Wisconsin Public Service proposes to implement the Aquatic Resource Fund to establish a process for funds to be made available for programs and activities related to aquatic resource enhancement and protection measures that have a nexus to the Tomahawk and Grandfather Falls Projects. Programs and activities that would be selected for funding by the Aquatic Resource Fund would need approval by Wisconsin Public Service and Wisconsin DNR prior to implementation, and FWS would also be consulted in the selection of activities to be implemented under the fund. The selection of activities for funding would be based on the following parameters: (1) the value the activity would provide to aquatic resources and the nexus the proposed activity would have to the Tomahawk and Grandfather Falls Projects; (2) the value the selected activity would have on achieving Wisconsin DNR's resource management goals; (3) the ability the selected activity would have in achieving stated objectives; and (4) the cost effectiveness of the proposals.

As part of the Aquatic Resource Fund for the Tomahawk and Grandfather Falls Projects, Wisconsin Public Service proposes a schedule and reporting process that would include: (1) measures for consulting with Wisconsin DNR and for submitting reports to the Commission; and (2) completion of a report that includes, as a minimum: (a) documentation of yearly contributions made to the fund by Wisconsin Public Service, (b) a summary of the activities that have taken place during the previous year and the proposed programs or activities for the upcoming year, and (c) a record of consultation with Wisconsin DNR.

Interior recommends that Wisconsin Public Service consult with FWS or Park Service on decisions regarding protection and enhancement management activities in the Wisconsin River, including annual selection of activities for consideration of potential funding by the Aquatic Resource Fund. Wisconsin Public Service agreed to add FWS as an advisory member to the resource management personnel who are involved in implementing the Aquatic Resource Fund. However, Wisconsin Public Service stated in its letter filed on August 16, 2017, that it does not want to add Park Service as a member of the resource management team because the Aquatic Resource Fund does not address recreation resources.

Wisconsin Public Service proposes to provide $13,500[38] annually each for the Tomahawk and Grandfather Falls Projects from the Aquatic Resource Fund. Wisconsin Public Service states that the types of activities for each project funded under the Aquatic Resource Fund could include programs or activities such as: (1) aquatic invasive plant point intercept surveys; (2) nearshore terrestrial invasive plant control, including release of *Galerucella* beetles; (3) herbicide application for controlling species like Eurasian water milfoil; (4) fish surveys; and (5) water quality monitoring.

Our Analysis

The Fishery Study conducted by Wisconsin Public Service indicates that the fish populations are healthy and self-supporting at both projects. Also, successful recreational fishing occurring at both projects indicates that the projects have robust and healthy fish populations. Water data collected at both projects showed that water quality was consistent with state standards, and in several locations, like the Grandfather Falls bypassed reach and at Bill Cross Rapids, DO levels were higher than the state standards.

An invasive species management plan proposed by Wisconsin Public Service would address the issue of invasive species, as discussed in section 3.3.2.1, *Terrestrial Resources, Environmental Effects*, and thus using the Aquatic Resource Fund to also address of invasive aquatic plants appears to be a duplication of effort.

Continued operation, management, and maintenance of both projects as proposed should offer protection for the continued health of aquatic resources in project-affected waters, negating the need for this special funding mechanism of an Aquatic Resource Fund. In addition, the Commission in its Policy Statement on Hydropower Licensing Settlements[39] (Settlement Policy Statement) notes that it is the Commission's preference that there should be specific protection, mitigation, and enhancement measures that have a clear nexus to the project (i.e., a relationship between project effects or purposes and a proposed measure must be established) rather than broad funding measures. As stated

[38] Wisconsin Public Service indicated in its filing on August 16, 2017, that in addition to the $13,500 that would be put in the Aquatic Resources Fund annually for both projects, it would also give $4,000 to each project annually for use in the Invasive Species Management Plan proposed for both projects.

[39] *See* 116 FERC ¶ 61,207 (2006).

above, there is no evidence that the types of activities that could be funded by Aquatic Resource Fund are needed to address a project effect.

Woody Debris Plan

Large woody debris provides valuable habitat for fish, invertebrates, and other aquatic life.

Wisconsin Public Service's proposed plan for handling and removing woody debris that collects on the trashracks at both projects would include the following measures:

- remove woody debris that accumulates on the trashracks from the trashracks by mechanical means[40] and sluice it downstream to the Wisconsin River;
- remove litter and other man-made or manufactured debris from the trashracks and take it to a landfill;
- remove large woody debris, like a tree, that is determined by Wisconsin Public Service to create an unsafe condition if sluiced downstream by mechanical means and instead take large woody debris by truck to a woody debris disposal area at the Lincoln County Landfill; and
- clear woody debris from the trashracks as needed, typically 3 to 4 times a month.

Our Analysis

Large woody debris plays an important role in many stream and riverine ecosystems by providing cover, shelter, and feeding opportunities for aquatic organisms (University of California, 2006; Opperman et al., 2004). Wisconsin Public Service's Woody Debris Plan would provide valuable habitat for aquatic resources in the Wisconsin River downstream of each project by sluicing woody debris downstream when it is removed from the project trashracks. The addition of woody debris to the Grandfather Falls bypassed reach would be particularly beneficial to fish and aquatic resources in that stream reach because it is dominated by small and large boulders and a bedrock substrate, and therefore, lacking much woody debris.

Freshwater Mussels

Freshwater mussels are considered to be good indicators of the health of aquatic ecosystems because of their 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 adversely affects mussels, which as filter feeders, require clean, well-oxygenated

[40] Methods of removal can include a mechanical raking system, pike poles, hand rakes, or a mobile crane for removing larger items.

water (Brim-Box and Mossa, 1999). The disappearance of native freshwater mussels may indicate degraded water quality and habitat.

Freshwater mussels are also especially sensitive to changes in hydraulic conditions. In addition, 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 that can move rapidly in and out of microhabitats with changes in water levels, mussels move slowly and are unable to respond to sudden drawdowns in a river. Suspended sediments can also indirectly affect mussels by reducing light for photosynthesis, which reduces DO and productivity of its food items, such as algae (Waters, 1999; Natural Resource Conservation Service, 2007). Furthermore, elevated levels of suspended sediments have been shown to interfere with specialized reproductive adaptations, gas exchange, and the brooding of glochidia (Natural Resource Conservation Service, 2007).

Wisconsin Public Service collected 1,588 live mussels from project-affected waters of the Tomahawk and Grandfather Falls Projects, excluding Lake Mohawksin, where no sampling was conducted as the sediments in the lake are unsuitable for mussel species. From among all the mussel surveys that were conducted, eleven species were identified with around 43 percent of all mussel collected coming from the Bill Cross Rapids site, located downstream of the Grandfather Falls Project. While most of the mussels collected were adults, the qualitative surveys (i.e., timed searches in likely suitable habitats) could explain why no juvenile mussels were observed in many of the mussel surveys at all sites.[41]

Our Analysis

The results of the Bill Cross Mussels and Fishery Study, the Grandfather Falls Mussels Study, and the Tomahawk Mussels Study all showed diverse and healthy mussel communities. The various fishery surveys in the project areas also indicate there is an abundance of host fish to support mussel recruitment to the Grandfather Falls Project and Tomahawk Project waters.

Continued operation of both projects as proposed, including the release of flows for whitewater boating in the Grandfather Falls bypassed reach, are not expected to alter the quality of habitat for existing mussel species, as mussels like moving water and species that are established in the bypassed reach are accustomed to seasonal high water flows that occur in the spring and would be similar to the proposed whitewater boating flows. In addition, mussel host fish species would continue to have access to the bypassed reach.

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[41] Juvenile mussels are typically located below the surface substrate and are extremely difficult to find in numbers without conducting extensive quadrate sampling that includes substrate removal.

Cumulative Effects

The operation and maintenance of the Tomahawk and Grandfather Falls Projects, in combination with the 23 other hydropower projects currently operating on the Wisconsin River, could cumulatively affect aquatic resources and water quality in the Wisconsin River. The storage and release of water from peaking hydropower projects, including the Tomahawk and Grandfather Falls Projects, have the potential to affect DO and water temperatures on-site and in downstream waters.

Fishery resources can be cumulatively affected from the operation of each hydropower project on the Wisconsin River as a result of fish losses from mortality associated with impingement of fish on the trashracks and from fish passing through the turbines and being struck by the turbine blades.

Our Analysis

Water quality data collected from project waters of both projects indicate that DO and water temperature are generally consistent with levels stipulated by state water quality standards. In fact, in several instances, DO levels reported at both projects were higher than the levels stipulated by the state standards and should continue to exhibit these DO levels under the proposed operating scenario for both projects. Also, data collected from numerous studies conducted at both projects show current operation of both projects is not contributing to influential losses of fish or aquatic organisms, such as mussels. Incidental fish losses at both projects are very low, and most of the fish killed are warmwater fish species with high fecundity rates, like bluegills, pumpkinseed, crappie, and shiners. The fish communities at both projects are robust, healthy, and self-supporting, and the estimated losses caused by the projects are not expected to adversely affect overall fish populations in project waters.

We determine that the continued operation of both projects, as proposed, would not result in additional cumulative adverse effects on water quality or on fish and aquatic organisms in the Wisconsin River.

3.3.2 Terrestrial Resources

3.3.2.1 Affected Environment

Vegetation

Tomahawk Project

The Tomahawk Project is located in the Northern Highlands ecological landscape. The area is predominantly upland forests (48 percent of the Northern Highland land cover), composed largely of aspen with some species of pine, such as white, red, and jack in natural stands and plantations. Lowland conifers occupy peatlands scattered

throughout the landscape, while northern hardwood forests occur on the more mesic[42] soils. There are also numerous wetlands in the vicinity of the project.

The area surrounding Lake Mohawksin is largely upland and wetland forests. Mature stands in this forest community are dominated by sugar maple and by hemlock, which sometimes occur with white pine. Other tree species in the area include yellow birch, basswood, and white ash. The understory in these forest types can range from sparse to lush. Woodferns, bluebead lily, clubmosses, and Canada mayflower are widespread groundcover for these forests.

Grandfather Falls Project

The Grandfather Falls Project is located at the border of the North Central Forests and Northern Highlands ecological landscape. This area is predominantly composed of upland forests. Forest vegetation in the Northern Central Forest area is largely made up of sugar maple basswood and red maple with some stands containing scattered hemlock, yellow birch, and/or white pine.

The project is located within historic pine barrens which are large areas dominated by forests and woodlands of pitch pine and associated species. The area within the project boundary and surrounding project waters is primarily composed of upland and wetland forests.

Wetlands

Tomahawk Project

The lands downstream of Lake Mohawksin and the Wisconsin River are a largely undeveloped, intact riparian corridor. Many of the plant species inhabiting the forested, emergent, and shrub wetlands also occur in the riparian zone, as well as species more typical of the upland forest community.

Based on the results of the Reservoir Fluctuation Study and FWS National Wetland Inventory (NWI)[43] data, about 650 acres of wetlands occur within the project boundary. Palustrine[44] wetlands, including palustrine forested, palustrine scrub-shrub, and palustrine emergent wetland types, are common. These wetlands types include both areas that are seasonally flooded and those areas that are saturated for longer periods of

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[42] A mesic habitat is a type of habitat with a moderate or well-balanced supply of moisture, for example a mesic forest, a temperate hardwood forest, or dry-mesic prairie.

[43] Wetland boundaries are based on FWS's NWI using digital mapping, which provides information on wetland habitats using remote sensing and aerial photo interpretation techniques.

[44] The palustrine wetland system includes all freshwater wetlands, such as marshes, bogs, and swamps, which are dominated by trees, shrubs, emergent herbaceous plants, floating leaved and submergent plants, and mosses and lichens.

time, but where surface water is not present. In addition to these wetland types, pond wetlands are also present.

Grandfather Falls Project

The Wisconsin River upstream of the Grandfather Falls Project meanders through the landscape and has a low gradient shoreline and is dominated by scrub-shrub type wetlands with associated shoreline vegetation. About 375 acres of wetlands occur within the project boundary, and palustrine wetlands are relatively common.

There is a relatively large palustrine forested, broad-leaved deciduous/needle-leaved, evergreen wetland complex located along the northwestern shore of the Wisconsin River. Smaller areas of palustrine forested, needle-leaved deciduous, and palustrine needle-leaved evergreen wetlands that are also located on the southern shore of the river in this same area.

Invasive Species

Wisconsin Public Service completed surveys for terrestrial invasive plants in 2012 at Grandfather Falls and aquatic invasive plant surveys in 2006 and 2013 at the Tomahawk Project.

During the 2012 plant surveys at the Grandfather Falls Project, various populations of terrestrial invasive plants were found in the project boundary including autumn olive, Canada thistle, Dame's Rocket, multi-flora rose, spotted knapweed, reed canary grass, purple loosestrife, and tansy. Eurasian water milfoil was found at both projects during 2012 and 2013 surveys of aquatic plants. In addition, curly-leaf pondweed is also known to occur in Lake Mohawksin at the Tomahawk Project.

Wildlife Resources

Terrestrial wildlife associated with habitats in the vicinity of the projects includes a combination of large and small mammals, terrestrial reptiles, and bird species ranging from habitat generalists to those that have more specific habitat requirements. Migratory birds and waterfowl use the exposed banks along the impoundments when water levels are low, and also forage in nearby agricultural fields. Forest-dwelling raptors and numerous songbird species are also known to occupy the forested areas in the vicinity of the projects. These species include snow geese, common mallard, black duck, Virginia rail, Cooper's hawk, Red-tailed hawk, rose-breasted grosbeak, ovenbird, wood thrush, red-winged blackbird, and black-capped chickadee. A variety of mammal species are also known to occur at the projects, including but not limited to, black bear, white-tailed deer, moose, red fox, striped skunk, river otter, porcupine, shrews, and various rodent species.

Special Status Species

Wood Turtle

The wood turtle (*Clemmy insculpta*) was listed in a 2015 review of the Natural Heritage Inventory[45] as potentially occurring in the project vicinity. Wood turtles are listed as threatened by Wisconsin DNR as a result of: (1) habitat loss; (2) adult removal; and (3) low recruitment.

Wood turtles are habitat generalists but are often found in and around clear, moderate- to fast-moving rivers and streams with sand, gravel, or cobble substrates located near adjacent riparian wetlands and upland deciduous forests. The species often uses open, wet meadows and shrub-carr habitats[46] for foraging, while favoring sand banks, sand prairies, agricultural fields and other areas with disturbed sandy or gravelly substrates.

Bald Eagle

The bald eagle has a historic range from Alaska and Canada to northern Mexico and mainly lives near rivers, lakes, and marshes, which contain their food sources. The primary diet of bald eagles consists of fish, which is regularly supplemented with turtles, rabbits, snakes, waterfowl, carrion, and other small animals (FWS, 2007). Forests provide required breeding habitat for this species, which builds its nest on the tops of large trees. Bald eagles exhibit philopatry,[47] and the life-long breeding pairs typically return to their same nest, expanding and increasing it in size, year after year.

3.3.2.2 Environmental Effects

Wetlands

Wisconsin Public Service proposes to continue to operate the Tomahawk and Grandfather Falls Projects in a peaking mode, maintaining a maximum of 0.8-foot and 1-foot daily fluctuations in reservoir surface levels, respectively. Also, Wisconsin Public Service proposes to continue implementing reservoir drawdowns for each project.

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[45] Wisconsin's Natural Heritage Inventory program is part of an international network of inventory programs that maintain data on the locations and status of rare species, natural communities, and natural features throughout the state.

[46] This type occupies areas that are transitional between open wetlands, such as wet prairie, calcareous fen, or southern sedge meadow, and forested wetlands, such as floodplain forest or southern hardwood swamp, and often occurs in bands around lakes or ponds, on the margins of river floodplains, or more extensively, in glacial lakebeds.

[47] Philopatry is the tendency of an organism to stay in or habitually return to a particular area.

Our Analysis

Adverse effects to wetlands at hydropower projects would be primarily associated with extended drawdowns, such as maintenance drawdowns that may extend for weeks. The modification of the hydrologic regime that keeps the wetlands viable may result in the loss of obligate wetland plant species, and subsequently degrade habitat for spawning and nesting wildlife that use wetland habitat.

The Fluctuation Study, completed in 2014, indicates that the wetlands around the Tomahawk and the Grandfather Falls Projects are healthy and in a state of equilibrium with the existing operation and the associated frequency, duration, and magnitude of reservoir fluctuations. As discussed in section 3.3.1, *Aquatic Resources*, Wisconsin Public Service does not propose any extended drawdowns of the Lake Mohawksin or the Grandfather Falls reservoirs. The projects would continue to operate they currently do, and water stage levels within the project boundary would not depart from existing conditions. As such, continued operation would not affect wetlands in the project.

Invasive Species

Wisconsin Public Service proposes an Invasive Species Management Plan for each project with provisions for: (1) invasive terrestrial plant identification training for Wisconsin Public Service staff; (2) surveys and monitoring for terrestrial invasive plants; (3) prevention of transmission through the inspection and cleaning of equipment that could contain invasive plant matter; (4) revegetation after the construction and maintenance activities, using seed that is free of invasive species; and (5) installation of educational signage to promote the removal of aquatic vegetation or mussels from boats.

Our Analysis

Invasive plants are able to out-compete and displace native species, thereby reducing biodiversity and altering compositions of existing and/or native plant and animal communities. Plant surveys completed in 2012 indicated populations of terrestrial invasive species, including autumn olive, Canada thistle, Dame's Rocket, honeysuckle, multiflora rose, spotted knapweed, purple loosestrife, and tansy, within the project boundaries for the two projects. In addition, Eurasian water milfoil and curly-leaf pondweed, aquatic invasive plants, have been found at both Tomahawk and Grandfather Falls Projects.

Several project-related activities, including the removal of trees and ground and/or soil disturbance caused by the installation or maintenance of recreational facilities could facilitate the spread of invasive species within and adjacent to project lands and waters.

The Invasive Species Management Plan proposed for each project would help ensure the protection of terrestrial native vegetation and wildlife habitat by minimizing adverse effects associated with the existence of terrestrial invasive plants in the project boundary through its training of staff on invasive plant identification and implementing measures to monitor the amount of terrestrial invasive species. Also, signage would

educate visitors on the presence of aquatic invasive plant species and ways to reduce its spread to other water bodies.

While measures listed above would help prevent the spread of terrestrial invasive plants, there are currently also populations of aquatic invasive plants at both projects. Aquatic plant surveys conducted in 2012 indicated that there are populations of Eurasian water milfoil and purple loosestrife found at the Grandfather Falls Project reservoir. For the Tomahawk Project, aquatic plant surveys conducted in 2006 and 2013 indicated the existence of Eurasian water milfoil, purple loosestrife, and curly-leaf pondweed. Chemical control efforts have reduced the 258-acres area of Eurasian water milfoil identified during 2013 to 31 acres as of 2014. During the surveys, 29 colonies of purple loosestrife, ranging from small (1-5 plants) to large (>50 plants), were identified at the Tomahawk Project, with additional colonies found during a post-treatment survey. Finally, while curly-leaf pondweed was identified at the Tomahawk Project during the 2013 surveys, no control efforts for have been implemented due to its limited distribution.

As indicated by the information provided above, aquatic invasive plant monitoring efforts at these projects have historically provided necessary data to determine the extent of invasive plants and the efficacy of controls. Therefore, implementing a plan to monitor both terrestrial and aquatic invasive species, including Eurasian water milfoil within project-affected waters, would reduce the likelihood of adverse effects to native vegetation, recreation, and other resources by limiting their abundance and reducing the likelihood of their transmission.

Eurasian water milfoil, purple loosestrife, and curly-leaf pondweed can displace native plant species, adversely affect water quality, alter fish communities by providing excessive refugia to prey fish species, and interfere with recreational water activities such as boating and fishing.[48] The dense beds of Eurasian water-milfoil found at the Tomahawk Project can also become lodged among watercraft apparatus and be transmitted to uncontaminated bodies of water. Therefore, an invasive species management plan for each project should also include the monitoring of aquatic invasive species and contain: (1) a description of the proposed monitoring methods; (2) the proposed frequency of monitoring; (3) the proposed criteria to be used to determine what mechanical or chemical control measures should be implemented; and (4) a schedule for filing monitoring reports.

[48] Eurasian water-milfoil can increase boat repair and maintenance costs by clogging the intake of motors.

Special Status Species

Wood Turtle

The wood turtle is listed as threatened in Wisconsin and is known to inhabit Lincoln County, where the projects are located. Wood turtles prefer the edge of wooded riparian corridors near open water, wooded upland habitats adjacent to open meadows, and fens or forest openings. Although preferred habitats exist on both projects' lands, there have been no recent surveys indicating that wood turtles are present at the projects.

As part of the Wildlife Management Plan proposed for each project, Wisconsin Public Service includes a measure to consult with Wisconsin DNR prior to conducting ground-disturbing activities in the suitable habitat for the wood turtle.

Our Analysis

The proposed recreation measure to construct a path from the Ice Age Trail to an alternative put-in location downstream of the dam at the Grandfather Falls Project would result in the removal of vegetation preferred by the wood turtles. However, the species is not known to be within the project boundary; therefore, the removal of vegetation for the extension of the trail would have no effect on the wood turtle. For this reason, there is no need for Wisconsin Public Service to consult with Wisconsin DNR prior to conducting ground-disturbing activities associated with the trail extension.

Bald Eagle

At the Grandfather Falls Project, Wisconsin Public Services proposes to repair boat launches and construct an access trail to link the Ice Age Trail with a boat launch at the Grandfather Falls bypassed reach, which would require the removal of trees of 25 trees. The majority of this work would take place in the central and southern areas within the project boundary. At the Tomahawk Project, proposed activities include continuing to operate and maintain recreational facilities, including repairing boat launches/portages and maintain fishing piers. This work would take place in the southern portion of the project boundary.

To mitigate any disturbance of the identified bald eagle nests at the project, as part of its Wildlife Management Plan for each project, Wisconsin Public Service proposes to follow management practices established in the *National Bald Eagle Management Guidelines* (FWS, 2007). As part of the plan, Wisconsin Public Service also proposes to consult with FWS in the event that the species or its nests are encountered or disturbed during any proposed project maintenance activities.

Our Analysis

Wisconsin Public Service conducted a wildlife survey in August 2015. During the survey, Wisconsin Public Service identified two bald eagle nests at the Grandfather Falls Project, located in the northern and southern ends of the reservoir, and seven nests at the

Tomahawk Project, along the shoreline and island, primarily in the northern section of the reservoir.

Wisconsin Public Service's proposed activities have the potential to disturb resident eagles during foraging, nest building, incubation, and other phases in their reproductive life cycle by requiring tree and/or vegetation removal and, in the case of constructing the access path, heavy machinery.

FWS's 2007 *National Bald Eagle Management Guidelines* provides detailed guidance on how to minimize effects to bald eagles, particularly where they may be activities that constitute "disturbance." The guidelines in the *National Bald Eagle Management Guidelines* include the following measures to avoid disturbances to nesting eagles: (1) keeping a distance between the activity and the nest (distance buffers); (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season (FWS, 2007).

Developing a plan that includes Wisconsin Public Service's proposal to operate and maintain both projects using the avoidance techniques and conservation measures listed in FWS's *National Bald Eagle Management Guidelines* would ensure that the existing nests within the project boundaries would remain undisturbed, and would protect bald eagle nesting habitat at both projects.

Wildlife Management Plan

Wisconsin Public Service proposes to implement a Wildlife Management Plan for each project. The plans include guidance on how to address project effects, such as tree removal and construction and maintenance of recreation facilities on the federally listed northern long-eared bat and gray wolf, which is discussed in section 3.3.3, *Threatened and Endangered Species*. The plan also contains measures to address construction and maintenance of recreation facilities for the bald eagle and wood turtle, which is discussed above, and shoreline resources, which is discussed in section 3.3.4, *Recreation and Land Use*.

In addition, the Wildlife Management Plan includes proposals for forest management, forest insect and disease programs, and fire control. For its forest resources management practices, Wisconsin Public Service proposes the following: (1) implement forest management practices consistent with Wisconsin DNR's Public Forest Lands Handbook 2416.5; (2) report forest pest activities to Wisconsin DNR; (3) report usual tree damage or insect outbreak to Wisconsin DNR's Forest Health Specialist; and (4) consult with Wisconsin DNR and the local fire entity regarding fire prevention and detection if needed.

Our Analysis

Forest management, the forest insect and disease program, and fire control are not project-related activities. As stated in section 3.3.4, *Recreation and Land Use*, we

determined that the forested land within the proposed project boundary for the Grandfather Falls Project would not be needed for any project purpose, and therefore should be removed from the project boundary. In addition, the Tomahawk Project would not have forests that would need to be managed for project operation. Thus, the proposed Wildlife Management Plan would not be beneficial because the measures for forest management would not be necessary. Rather, implementing proposed individual measures within the plan for each project to address wildlife and threatened and endangered species issues, as discussed above would address any project effects on wildlife or shoreline resources.

3.3.3 Threatened and Endangered Species

FWS's IPaC system indicates two federally-listed threatened and endangered species are known to occur in Lincoln County, the northern long-eared bat and gray wolf (FWS, 2017b). No critical habitat designated for either species occurs on project-affected lands (FWS, 2017b).

3.3.3.1 Affected Environment

Northern Long-eared Bat

The northern long-eared bat occurs in Lincoln County, Wisconsin and was listed as threatened under the ESA in April 2015 (FWS, 2015). The northern long-eared bat uses upland forests and woods for roosting. The summer roosting habitat consists of cavities or crevices in live and dead trees, as well as barns and sheds, and rarely dams. Key characteristics of tree species suitable for roosting within both projects' boundaries include bark retention, prevalence of cavities or crevices, and trees with a diameter at breast height[49] of 3 inches or greater. Cooler places, such as caves and mines, are used by males and non-reproductive females during the summer. During winter months, northern long-eared bats hibernate in caves and mines that have very high humidity (FWS, 2015).

The historical range of the northern long-eared bat includes 37 states in the eastern and north central United Sates. Historically, some bat populations have been negatively affected by degradation or loss of habitat. More recently, white-nose syndrome has caused the dramatic decline of the long-eared bat population with numbers declining by 99 percent in some regions (FWS, 2015).

Gray Wolf

Gray wolves once ranged throughout most of the continental United States; however, by the early 20th century, government-sponsored predator control programs and

[49] Diameter at breast height refers to the tree diameter as measured about 4 to 4.5 feet above the ground.

declines in prey brought gray wolves to near extinction. The gray wolf has recovered since its listing as endangered in May 1974. According to FWS, as of 2015, there were 746 gray wolves in Wisconsin, some of which are present in Lincoln County, Wisconsin (FWS, 2017a).

3.3.3.2 Environmental Effects

Northern Long-eared Bat

As described in section 3.3.5, *Recreation and Land Use*, Wisconsin Public Service proposes to continue to operate and maintain the portages and trails at both projects, including removing any trees that could be a hazard and cause harm to a person or property. In addition, Wisconsin Public Service proposes to construct an access trail to link the Ice Age Trail with an alternative whitewater put-in site on the Grandfather Falls bypassed reach at the Grandfather Falls Project, which would require the removal of trees.

To protect the threatened northern long-eared bat for both projects, Wisconsin Public Service proposes to: (1) develop a protocol to ensure that there continues to be no adverse effects on the northern long-eared bat; (2) consult with resource agencies if the northern long-eared bat is found on project lands; (3) complete tree removal and brush cutting outside of the bat pup season (June 1 – July 31); and (4) follow FWS final 4(d) rule, which exempts forestry and tree removal activities from incidental take if certain guidelines are met.

Our Analysis

There is no known documentation of northern long-eared bats occurring within the project; however, FWS's IPaC system indicates that the federally listed northern long-eared bat has the potential to occur within Lincoln County. In addition, no documented roost trees or hibernacula have been found within Lincoln County; however, tree species with a diameter at breast height of ≥3 inches and other characteristics of northern long-eared bat habitat are found within project boundaries for both the Tomahawk and Grandfather Falls Projects. Wisconsin Public Service's proposal to maintain a portage and trails at both projects would require the periodic clearing of vegetation and may require the removal of dead trees or trees with a breast height of ≥3 inches, which are potential summer roosting habitat for northern long-eared bats. In addition, the proposal to construct a new access trail at the Grandfather Falls Project would require the removal of up to 25 trees that are greater than 3 inches in diameter at breast height. Because the tree removal would not be located within 0.25 mile of hibernacula or within 150 feet of a known maternity roost, the continued operation and maintenance of the projects and the construction of the access trail at Grandfather Falls Project may affect the northern long-eared bat, but any incidental take that may result is not prohibited by the final 4(d) rule.

Compliance with FWS's northern long-eared bat 4(d) rule and the other proposed avoidance measures, would reduce the likelihood of disturbing northern long-eared bats

during the summer and maternity roosting season when they would potentially be using these trees at both projects. However, modifying the proposed northern long-eared bat protection measures to include implementing seasonal clearing restrictions for removing trees with equal or greater than 3 inches in diameter at breast height from April 1 to October 31, rather than the proposed June 1 to July 31, would reduce the likelihood of disturbing northern long-eared bats and their newly born pups in undocumented maternity roosts within 150 feet of the portages and access trail. Tree removal or disturbance in the winter months, from November 1 through March 31, would occur at a period of time in which northern long-eared bats are likely utilizing caves or other hibernacula. Therefore, implementing these seasonal restrictions would minimize effects on northern long-eared bats resulting from vegetation removal or construction disturbances.

Gray Wolf

Wisconsin Public Service proposes to contact Wisconsin DNR if a wolf den or wolf pup rendezvous site is identified within both project boundaries and to consult with Wisconsin DNR on whether additional measures may be necessary to ensure any dens or rendezvous sites are protected. Wisconsin Public Service also states it would review Wisconsin's Natural Heritage Inventory database prior to any land-disturbing activities.

Our Analysis

The gray wolf is known to occur in Lincoln County, Wisconsin; however, there have been no documented populations at either project. For the Tomahawk Project, favorable habitat is not present within the project boundary. In addition, as discussed in section 3.3.5, *Recreation and Land Use*, land within the project boundary for the Grandfather Falls Project that is not needed for a project purpose should be removed. These lands would include over 800 acres of hardwood forest that could have served as potential gray wolf habitat. However, with the removal of these lands from the Grandfather Falls Project, there would be an insignificant amount of lands remaining in the project boundary that would provide suitable habitat for the gray wolf. The continued operation and maintenance of the projects would have no effect on the gray wolf.

3.3.4 Recreation and Land Use

3.3.4.1 Affected Environment

Regional Recreation Resources

Located in Wisconsin’s designated Northeast Tourism Region, regional recreation opportunities surrounding the projects includes hunting and fishing, snowmobiling, cross-country skiing, swimming, hiking, and camping. The Lincoln County Forestry Department manages more than 100,000 acres of forest for multiple recreation activities, including hunting, fishing, hiking, camping, wildlife observation, nature photography, snowmobiling, and riding all-terrain vehicles (ATVs). Lincoln County operates 11 parks

with amenities that consist of playground equipment; picnic facilities; fairgrounds and exhibition halls; horseback riding, bicycling, hiking, and cross-country skiing trails; hunting and fishing; and boating, fishing, and swimming. Lincoln County also maintains the Harrison Hills ATV system, consisting mainly of old logging roads, and snowmobile trails. The municipalities within Lincoln County also maintain over 25 parks and open space facilities outside of the project boundary.

The Ice Age Trail, which stretches over 1,000 miles within the state of Wisconsin, follows the edge of the last continental glacier in Wisconsin and is known for its unique glacial features. Several sections of the trail are in close proximity to the projects and 4.8 miles of the Ice Age Trail bisect the Grandfather Falls project boundary and offer opportunities for hiking, cross-country skiing, and snowshoeing. Also present within the region is the Hiawatha state trail.

Regional Whitewater Recreation

In the state of Wisconsin, there are over 200 areas identified for whitewater activities. Table 4 identifies the whitewater areas in the Wisconsin River watershed and their proximity to the Grandfather Falls Project. Thirteen are located within 50 miles of the Grandfather Falls Project, and range from 0.3 to 4.6 miles long and provide class I to IV rapids. Wausau Whitewater Park, an internationally recognized slalom and freestyle course, is also located on the Wisconsin River, approximately 32 miles downstream from the Grandfather Falls Project, and hosts several whitewater slalom and freestyle events. Wisconsin Public Service sponsors and coordinates flow events with Wausau Whitewater Park.

Existing Project Recreation Facilities at the Tomahawk Project

Recreational opportunities at the Tomahawk Project occur at Lake Mohawksin, which provides nearly 2,800 acres of flat water recreation. Within the project boundary, Wisconsin Public Service owns and maintains three recreation facilities that offer an array of recreational opportunities, including motorized and non-motorized boating, fishing, hiking, winter trail use, photography, and viewing wildlife, shown in figure 6.

Wisconsin Public Service Reservoir Boat Landing

Located on the southern end of Lake Mohawksin, upstream of the dam, the Wisconsin Public Service reservoir boat landing includes a single lane concrete boat ramp, shoreline access, and a skid pier that is used for launching boats and fishing. Wisconsin Public Service owns and maintains this recreation facility, which provides a parking area large enough to accommodate 15 vehicles with trailers in the gravel and lawn portions of the parking area. The parking area is shared between the reservoir and tailrace boat landings.

Wisconsin Public Service Tailwater Boat Landing

Wisconsin Public Service owns and manages the tailrace boat access and shoreline fishing area, located immediately downstream of the project's dam. This facility provides a single-lane concrete block boat ramp and a parking area shared with the reservoir boat landing project recreation facility. Recreationists also use this site to access the canoe portage put-in location. Anglers commonly fish adjacent to the boat launch and along the shoreline adjacent to the dam.

Portage Trail

The 500-foot-long portage trail, owned and maintained by Wisconsin Public Service, is primitive with a gravel portion and provides passage for boaters around the dam.

Hiawatha State Trail

Although not owned or maintained by Wisconsin Public Service, the Hiawatha State Trail is located within the project boundary.

Figure 6. Recreation at the Tomahawk Project (Source: Wisconsin Public Service, 2016a).

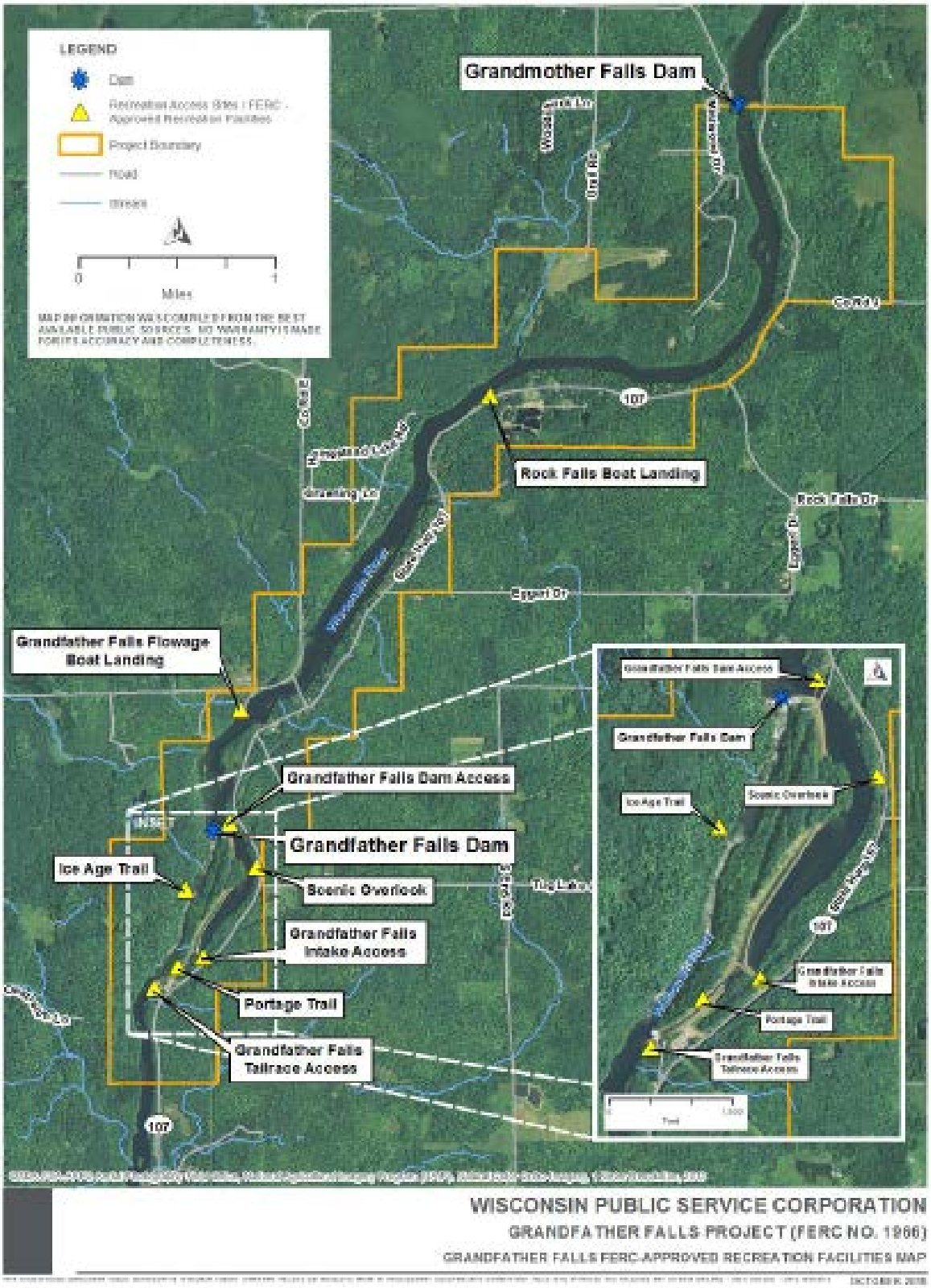

Figure 7. Recreation within the Grandfather Falls Project Boundary (Source: Wisconsin Public Service, 2016b).

Table 4. Whitewater areas in the Wisconsin River watershed identified in the American Whitewater National Inventory and approximate distance from the Grandfather Falls Project (Source: Wisconsin Public Service, 2016b).

Whitewater River/Section Name	Location	Class	Length of Whitewater Area (Miles)	Approximate Distance from Grandfather Falls (Miles)
Prairie	Merrill	II	3.9	12
Wisconsin (Grandfather Falls)	Rock Falls	II-III+(IV)	1	--
Pine (Lincoln Co.)	Merrill	I(II)	2.2	18
Wisconsin (Camp 10 to Menard Isle)	Rhinelander	I-II(III)	4	23
Copper	Merrill	I-II	2.25	20
Silver Creek	Merrill	II	2	25
Trappe	Wausau	I-II(III)	3.5	28
Wisconsin (Rhinelander)	Rhinelander	II-III	0.3	31
Wisconsin (Wausau Slalom/Freestyle Course)	Wausau	II-III	0.35	32
Big Rib	Athens	II	2.5	34
New Wood	Harding	I-II	4.1	28
Eau Claire (Spring Brook Bridge)	Aniwa	II-III(IV)	4.6	41
Black Creek	Athens	I-II	1.4	46
Eau Claire (Eau Claire Dells to Badger Road)	Aniwa	II	2.8	44
Plover	Stevens Point	III-IV	NA	66
Mill Creek	Stevens Point	I-II	4	67
Wisconsin (Whiting Dam/Al Tech County Park)	Stevens Point	I-II	NA	67
Little Eau Pleine	Marshfield	I-II(III)	9.3	70.3
Yellow (Wisconsin R. trib)	Pittsville	I	7	85
Rowley Creek	Baraboo	I-II	2.2	143
Lake Columbia	Dekorra	I	NA	143
Wisconsin (Wisconsin Dells - Narrows)	Wisconsin Dells	I(III)	NA	141
Baraboo	Baraboo	I(II)	4.5	151
Skillet Creek	Baraboo	III-IV	1.8	153
Roxbury Creek	Sauk City	I-II	2	165
Wisconsin (Prairie du Sac)	Prairie Du Sac	II	NA	158

Existing Project Recreation Facilities at the Grandfather Falls Project

Recreational opportunities at the Grandfather Falls Project include flat water recreation on the reservoir and shoreline and bank fishing along nearly 3,000 feet of reservoir shoreline at and near the boat landings, dam, and power canal and along 4,000 feet of the bypassed reach river bank. Within the project boundary, Wisconsin Public Service owns six recreation facilities and maintains eight, all of which are shown above in figure 7. These recreation facilities offer recreational opportunities, including motorized and non-motorized boating, fishing, hiking, winter trail use, photography, and viewing wildlife.

Grandfather Falls Flowage Boat Landing

Wisconsin Public Service owns and maintains the Grandfather Falls flowage boat landing, located on the western shore of the project reservoir, just south of the County Road E Bridge. The site features a single-lane, concrete boat launch that provides access to the project reservoir, but is closed during winter months. Specific amenities include a gravel parking area that accommodates around six vehicles with trailers. The adjacent shoreline is heavily vegetated and anglers are able to fish approximately 15 feet of shoreline there.

The 2014 recreation survey reported some deterioration of the gravel between the concrete blocks on the boat ramp and the presence of a recreationist-established campfire ring.

Rock Falls Boat Landing

Wisconsin Public Service leases the Rock Falls boat landing from the Rock Falls Rod and Gun Club and maintains the single-lane, concrete boat launch that provides access to the project reservoir. Located on the eastern shore, near the middle of the project reservoir, the site features a gravel parking area that can accommodate around six vehicles with trailers. Anglers fish from the boat launch and 6 feet of adjacent shoreline, but the recreation facility is closed during the winter months.

Grandfather Falls Intake Access

The Grandfather Falls intake access site, owned and maintained by Wisconsin Public Service, is located off of state highway 107 on the east side of the Wisconsin River. This site provides parking for visitors accessing the area downstream of the dam for shoreline fishing, in addition to providing access to the portage trail, Ice Age Trail, and the project's tailrace and bypassed reach. This recreation site also features a parking area that can accommodate around five vehicles without trailers, a gravel launch site for hand-carried boats, and water access for shoreline fishing and whitewater boating. The 2014 survey reported the need for a portable toilet.

Grandfather Falls Dam Access

The Grandfather Falls Dam access site, which Wisconsin Public Service owns and maintains, is located off state highway 107, about 12 miles north of Merrill, Wisconsin. This recreation site provides recreation access to the area around and downstream of the dam, as well as access for parking to use the Ice Age Trail; portage trail; informal fishing on the reservoir, a 100-foot-long bridge across the power canal; and scenic area on the project's bypassed reach. Specific amenities include a fishing pier with hard surface, gentle slopes, and limited cross-grades from the parking area to the fishing pier. There is also informal shoreline fishing, covering 200 feet, and an informal launch for hand-carried boats. A gravel parking area that accommodates around 15 vehicles without trailers is also located at this recreation site.

This recreation site offers an entry location for whitewater recreationists boating in the bypassed reach. American Whitewater rates the bypassed reach as a class II-III (and sometimes IV) run and describes it as "…a full mile of wide river with an amazing jumble of rocks and a few good ledges. With adequate water, this is a wild stretch of river which should allow many options of routes and plenty of play possibilities." Local paddlers boat the bypassed reach during high flows and spill events.

Grandfather Falls Tailrace Access

Visitors can access the project's tailrace and the terminus of the portage trail at the Grandfather Falls tailrace access, located off state highway 107 about 0.33-mile south of the intake and immediately downstream of the powerhouse, and is owned and maintained by Wisconsin Public Service. At this recreation site, there is a gravel hand-carry boat launch, fishing platform, and shoreline fishing, in addition to a parking area that can accommodate around five vehicles without trailers. A chain-link fence restricts public access to the powerhouse, while large boulders and signs restrict vehicle access beyond the parking area.

Portage Trail

The approximately 500-foot-long primitive portage trail with a gravel section provides an avenue for canoeists and kayakers to traverse around the project's dam.

Ice Age National Scenic Trail

While the Ice Age Trail is owned by Park Service and maintained by the Ice Age Trail Foundation, Wisconsin Public Service maintains the 4.8-mile-long segment located within the project boundary. There is a route on the Ice Age Trail that links the eastern and western portions of the trail, crossing the river on the County Highway E Bridge. A gravel path from the bridge over the power canal leads downstream of the dam to a canoe put-in and the Ice Age Trail.

Scenic Overlook

The scenic overlook features a gravel area with parking available for taking photographs.

Recreation Use

Wisconsin Public Service's 2014 recreation use study for each project provides baseline recreation information, including existing water- and land-based recreation uses at both projects' recreation facilities during the winter and summer recreation seasons, based on 16 days of data collection and analysis. Sampling occurred on two days during the winter season, from December 1 through February 28, and 14 days during the summer season, from Memorial Day weekend through Labor Day weekend. The study characterized public access, types of use, and capacity, and assessed future needs based on the information collected and population trends as discussed in the Lincoln County: Outdoor Recreation Plan, Wisconsin Statewide Comprehensive Outdoor Recreation Plan (Wisconsin SCORP), and Outdoor Recreation Trends and Futures: A Technical Document Supporting the Forest Service 2010 RPA Assessment.

With year-round outdoor recreation opportunities, the Wisconsin SCORP identified Wisconsin residents as participating in outdoor recreation at a comparatively higher rate than other regions of the country, with 87 percent enjoying some form of outdoor recreation. The Wisconsin SCORP also identified public parks, trails, and water-based recreation activities as being among the most essential components of outdoor recreation opportunities in Wisconsin, and a key goal of the Wisconsin SCORP is to provide and enhance access to state lands and waters for recreation.

The 2012 Wisconsin SCORP also reported an increase in outdoor recreation between 1994 and 2004, specifically in snow and ice activities, land resource activities and water resource recreation activities, of 43.1 percent, 27.3 percent, and 7.8 percent, respectively. Between 1994 and 2009, participation in kayaking grew 604 percent, and is expected to continue to show increased demand, along with paddleboarding. Land-based activities have increased just over 27 percent in 10 years. In addition, of the water-based recreation activities occurring at the project, the Wisconsin SCORP projects that the greatest change in demand over the next 50 years will occur with an increase in swimming (164 percent), motorized water sports (159 percent), and canoeing/kayaking (146 percent).

Tomahawk Project

Wisconsin Public Service's 2014 recreation use study included spot counts at all public access sites within the project boundary, including Wisconsin Public Service's reservoir and tailrace boat landings, and the two project recreation facilities at the project. Based on the 2014 spot counts and Wisconsin Public Service's FERC Form-80 conducted in 2015, there were 895 vehicles observed during the 16 survey days, with approximately 3 percent donning out-of-state license plates. Researchers estimated 11,000 recreation days during the summer season and 2,000 in the winter among all water access sites and parks located within the project boundary, with only about 40 percent recreating on the water. The Wisconsin Public Service reservoir and tailrace boat landing parking lot received an average of 1.3 vehicles during the peak summer season, which is

underutilized and has only met 8 to 13 percent of its total capacity. Overall, recreation use is moderate on weekends and weekdays and significant on holiday weekends.

Although winter recreation is noted to be popular in the area, there were no recreationists observed during the spot count efforts. During winter, recreationists can access the frozen lake directly from the ramps and parks.

Grandfather Falls Project

Wisconsin Public Service's 2014 recreation use study provides baseline recreation information, including existing water- and land-based recreation uses at the project's recreation facilities during the winter and summer recreation seasons, based on 16 days of data collection and analysis, with 2 sampling dates during the winter and 14 sampling dates during the summer. The study indicates that most recreationists live within 40 miles of the project. During summer spot counts, researchers estimated 1,000 recreation days during the season, and observed fishing on the shorelines at the dam, intake, and tailrace access areas. Although winter recreation is noted to be popular in the area and there was evidence of snowmobiling at the project, no recreationists were observed during the spot count efforts. Therefore, researchers estimated winter use to be 100 recreation days based on professional judgment.

Based on the 2014 recreation use study and the FERC Form-80 conducted for the project in 2014, all of the recreation facilities are currently underutilized, with the Grandfather Falls flowage boat landing having the highest average utilization of the public access sites at 28 percent during peak summer season. The Grandfather Falls intake access, Grandfather Falls Dam access, Rock Falls boat landing, and Grandfather Falls tailrace access were similar with an average utilization of 24, 14, 12, and 10 percent of the project's public access sites, respectively. However, the Grandfather Falls flowage boat landing was close to capacity during the July 4th weekend. The portage trail, Ice Age Trail, and scenic overlook were at 17, 15, and 15 percent capacity, respectively.

Land Use

In the vicinity of both projects, land use is primarily rural, with local residential, commercial, industrial, transportation, and utility uses accounting for 3.4 percent of the land cover. In Lincoln County, forests, wetlands, and agriculture comprise 62, 20, and 10 percent, respectfully, of the land cover; undeveloped, open lands account for 4.3 percent; and open water accounts for around 3 percent. The shoreline surrounding the project reservoir is classified as woodlands, interspersed with very limited residential development. One island, owned by BLM, is located about 1,000 feet downstream of the project's tailrace access area, within the existing project boundary.

3.3.4.2 Environmental Effects

Tomahawk Project Recreation Plan

To maintain and enhance recreation resources at the Tomahawk Project, Wisconsin Public Service proposes to implement its proposed Recreation Plan,[50] which includes measures for:

- continuing to operate and maintain the following FERC-licensed project recreation sites and facilities: (1) boat launch, dock, and boat landing at the reservoir boat landing, (2) the hardened boat launch and parking area at the tailwater boat landing, and (3) the portage trail;
- maintaining the vegetation at the project's shared parking area for the reservoir and tailwater boat landings; and
- installing and maintaining one portable toilet adjacent to the shared parking area for the reservoir and tailwater boat landings during the summer recreation season, from Memorial Day to Labor Day.

The proposed Recreation Plan also contains an implementation schedule for the proposed improvements, as well as a provision for monitoring recreation use via the FERC Form-80 scheduled every 6 years.

Our Analysis

Implementing the proposed Recreation Plan for the project would provide a framework by which Wisconsin Public Service would implement the proposed recreation enhancements, maintain project recreation facilities, and monitor recreational use and needs.[51] There is not currently a portable toilet at the project's recreation sites, and the lack of public restrooms was observed as a need for recreationists at the project during the 2014 Recreation Use Study. Adding proposed portable toilets would address the identified need. Further, the proposed enhancements of existing recreational facilities

[50] The proposed Recreation Plan for the Tomahawk Project was filed with the revised license application on October 28, 2016, and developed from the results of the 2014 Recreation Use Study and FERC Form-80.

[51] The FERC Form-80 describes a project's recreation facilities and the level of public use.

would improve recreationists' experiences at the Tomahawk Project reservoir boat landing, tailwater boat landing, and portage trail.

Grandfather Falls Project Recreation Plan

To maintain and enhance recreation resources at the Grandfather Falls Project, Wisconsin Public Service proposes to implement its proposed Recreation Plan,[52] including measures for:

- continuing to operate and maintain the following FERC-licensed project recreation sites and facilities: (1) flowage boat landing area, to include its boat launch and parking area; (2) Rock Falls boat landing,[53] to include its boat launch and parking area; (3) dam access area, to include its boat launch and gravel parking area; (4) portage trail; (5) portion of the Ice Age Trail in the project boundary; and (6) scenic overlook;
- removing rocks located upstream of the Grandfather Falls flowage boat landing that restrict access to the landing;
- continuing to maintain parking areas at all project recreation facilities by grading gravel parking areas, as needed, and maintaining vegetation, at least once per year and as needed;
- adding one portable toilet at the Grandfather Falls flowage boat landing, Grandfather Falls Dam access, Grandfather Falls intake access, and Grandfather Falls tailrace access, from Memorial Day to Labor Day; and
- providing up to three 4-hour scheduled whitewater flow releases of 1,500 cfs each year with whitewater recreation support, including: (a) clearing a put-in and portage on the east side of the bypassed reach, (b) clearing a small path from the Ice Age Trail to an alternative put-in location to avoid a strong eddy downstream of the dam, (c) installing directional signage identifying the put-in, take-out, and portage for boaters, (d) installing a kiosk at the Grandfather Falls Dam access site, (e) posting scheduled whitewater flow releases by April 1 of each year, (f) developing a webpage for posting preferred whitewater flows and current flows and reservoir levels, (g) trimming vegetation at the whitewater put-in, take-out and portage site, and (h) monitoring the number of participants, actual flows, and weather conditions, and posting this information within 1 week after each scheduled recreation flow release.

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[52] The proposed Recreation Plan for the Grandfather Falls Project was filed with the revised license application on October 28, 2016, and developed from the results of the 2014 Recreation Use Study, FERC Form-80, and Whitewater Recreation Flow Study.

[53] Wisconsin Public Service operates and maintains the Rock Falls boat landing, but leases the land from the Rock Falls Rod and Gun Club.

The proposed Recreation Plan also contains an implementation schedule for the proposed improvements and upgrades, as well as a provision for monitoring recreation use for the FERC Form-80 schedule every 6 years.

Our Analysis

Continuing to operate and maintain the flowage boat landing, tailwater boat landing, dam access site, intake access site, portage trail, and scenic overlook at the Grandfather Falls Project, in addition to continuing to maintain the Rock Falls boat landing and Ice Age Trail, would help ensure that any existing recreational facilities would be properly maintained. Further, Wisconsin Public Service's proposed enhancements of existing recreational facilities, included in its Recreation Plan for the Grandfather Falls Project, would improve recreationists' experiences at the project's recreation sites.

There are approximately 10 rocks at the flowage boat landing, with an average diameter ranging from 8 to 24 inches. Though Wisconsin Public Service originally placed the rocks there to mitigate the strong current and assist with launching and landing boats, these rocks impede boaters trying to land and launch at the boat landing and have been more hazardous than helpful. Removing the rocks would improve conditions and facilitate ease of use at the launch, as well as prevent any damage to boats attempting to use the recreation site.

Continuing to maintain the parking areas at all project recreation facilities by grading gravel lots and maintaining vegetation, as Wisconsin Public Service proposes in its Recreation Plan, would ensure that adequate parking would continue to be available to recreationists during the busiest period of the recreation season. However, vegetation removal could affect potential roosting habitat for the endangered northern long-eared bat, as previously discussed in section 3.3.3, *Threatened and Endangered Species*.

There is not currently a portable toilet at the project's recreation facilities and recreationists who participated in the site condition assessments, conducted in 2014, stated a need for restroom facilities at the recreation sites. Therefore, providing a portable toilet from Memorial Day to Labor Day at the flowage boat landing, dam access, intake access, and the tailrace access for the Grandfather Falls Project, as proposed by Wisconsin Public Service in its Recreation Plan, would address a noted demand.

Recreation Flows

As part of its proposed Recreation Plan for the Grandfather Falls Project, Wisconsin Public Service proposes to provide up to three scheduled recreation flow releases of 1,500 cfs for whitewater boating, between May 1 and June 21 each year in the bypassed reach, with whitewater recreation support, as described in table 5 below. Park Service and Interior recommend four recreation flow releases of 2,000 cfs, with a "ramping rate of 10 percent," which we interpret to mean 10 percent of the recreation release per hour, between May 1 and June 30 each year, as described in table 5 below. In

the event of low flows on the day of a schedule released, Park Service and Interior recommend shortening the peak flow release period to 3 hours, rather than 4 hours.

As stated in its reply comments filed on June 13, 2017, Wisconsin Public Service maintains its proposal to provide three scheduled releases to balance power generation, the recreational fishery, and whitewater recreation interests, and contends that its proposal is appropriate in an area that currently offers a variety of other nearby whitewater boating opportunities. Wisconsin Public Service also maintains its proposal to release a flow volume of 1,500 cfs during the proposed scheduled releases, rather than 2,000 cfs because the likelihood of being able to provide a 2,000-cfs release during May and June is naturally diminished with reduced seasonal inflows to the project. Wisconsin Public Service states that the Grandfather Falls Project can support 1,500 cfs whitewater recreation flow events for 4 hours for 90 percent of the time in May and June, whereas the 2,000 cfs flows would only be able to be scheduled under median and higher flows during June. Further, Wisconsin Public Service states that the participants in the whitewater recreation flow study identified 1,500 cfs as the most boatable release for novice through advanced boaters, accommodating the widest range of skill levels of the flows tested during the study.

Wisconsin Public Service agrees with Park Service's and Interior's recommendation to decrease the release to 3 hours, instead of 4 hours, during low-flow events and proposes to modify the Recreation Plan to include this option if the flow is sufficient to provide a 3-hour-long release. Wisconsin Public Service states in its reply comments that it does not anticipate any negative effects of reducing the duration of the flow release during low-flow events to the operation or generation occurring at upstream projects.

Wisconsin Public Service also notes that it selected an ending date of June 21 based on consultation with Wisconsin DNR to avoid adverse effects to spawning smallmouth bass and to coincide with naturally-occurring high flow periods between April and May. Therefore, Wisconsin Public Service does not agree to extend its proposed whitewater boating season for scheduled releases. Wisconsin Public Service and Wisconsin DNR also consulted on the most appropriate timing of scheduled recreation releases and ramping rate, and determined that ramping up for 2 hours to the full flow rate by 10:00 a.m., sustaining the recreation rate for 4 hours to 2:00 p.m., and then ramping down for 2 hours, would be suitable to protect the fishery, as long as no whitewater boating releases were made after June 21, as discussed in section 3.3.1, *Aquatic Resources*.

Park Service and Interior also recommend that Wisconsin Public Service monitor and report on recreational use of the whitewater flow releases on an annual basis and use the results every 6 years to evaluate the whitewater flow releases concurrent with the FERC Form-80. Wisconsin Public Service replied that it is willing to record the number of participants observed, actual flows, and weather conditions, all to be posted on its website within 1 week after each scheduled release. Wisconsin Public Service also states

it would observe and document use levels to assess site capacity and use of the whitewater releases, as proposed in its Recreation Plan and as required by the FERC Form-80 every 6 years; therefore, it states that filing an annual report is not necessary or warranted.

River Alliance recommends five, 4-hour recreation flow releases at 2,000 cfs per year, as described in in table 5 below. River Alliance further recommends that Wisconsin Public Service update its existing project brochure, if necessary, to show any changes in designated recreational sites and access roads.

Table 5. Wisconsin Public Service's proposal and recommendations for recreation flow release parameters (Source: Wisconsin Public Service, 2016b; Park Service and Interior, 2017; and River Alliance, 2017, as modified by staff).

Wisconsin Public Service	**Timing**	• Provide up to three 4-hour recreation flow releases between 10:00 a.m. and 2:00 p.m., with a 2-hour ramp-up and 2-hour damp-down period, on three Saturdays, between May 1 and June 21 each year.
	Flow Parameters	• Recreation releases should be provided at 1,500 cfs, as Wisconsin River flow conditions allow. • In the event of high flows on a scheduled release day, Wisconsin Public Service would post the flow information on its website as soon as it is available. • If river flows are low on a scheduled release day, such that available project storage would not be able to sustain the scheduled release with proposed ramping rates, Wisconsin Public Service would cancel the scheduled release and post flow information on its website as it is available. • Monitor flows and boater frequency to inform future scheduled flows.
Park Service and Interior	**Timing**	• Provide four 4-hour recreation flow releases, with a 10 percent ramping rate, between May 1 and June 30 each year.
	Flow Parameters	• Recreation releases should be provided at 2,000 cfs. • In the event that inflow is insufficient to sustain the proposed 4-hour release, Wisconsin Public Service could shorten the peak flow release period to 3 hours, with peak flows ending at 2:00 p.m. The modified flow regime and schedule should be posted on Wisconsin Public Service's website where boaters register. • Prepare an annual summary to describe the number of users at each release and pertinent notes explaining if some extenuating circumstances might affect the number of users. Wisconsin Public Service should send this report to Park Service's Midwest Great Lakes Hydropower Coordinator and American Whitewater.

		• Wisconsin Public Service should monitor and report on recreation use at the scheduled recreation flow releases annually, and every 6 years use the information as an evaluative tool concurrent with the FERC Form-80 review to determine if flow release changes are warranted.
River Alliance	**Timing**	• Provide five 4-hour recreation flow releases with ramping rates.
	Flow Parameters	• Recreation releases should be provided at 2,000 cfs and start at full flow by 10:00 a.m. for two runs during the day. • Implement a slow ramp-up and ramp-down procedure between flow releases.

Our Analysis

Scheduled Flow Releases

Currently, the Grandfather Falls Project provides access to whitewater boaters at the bypassed reach, but boaters are unable to adequately estimate flow ranges and are, therefore, unable to effectively prepare for their boating trips. Offering three scheduled recreation flow releases would provide a predictable and reliable whitewater boating experience on the bypassed reach, an opportunity that does not currently exist for boaters. The scheduled releases would also enhance recreation at the project and meet the needs and demands of a growing cohort of recreationists and their supporting agencies and organizations. However, Park Service, Interior, and River Alliance recommend additional flows and how the flows should be released.

Wisconsin Public Service's proposal to schedule recreation flow releases between May 1 and June 21 each year would provide reliable flows and would also reduce any adverse effects to spawning smallmouth bass in the bypassed reach by providing the flows outside of the smallmouth bass spawning season. Consultation with Wisconsin DNR determined June 21 to be the most appropriate date to cease scheduled whitewater flows, as the date coincides with the cessation of naturally-occurring high flows. Extending the whitewater boating season to June 30, as Park Service and Interior recommend, would encroach upon the spawning season for smallmouth bass, which offers another valuable recreation activity at the project. Offering recreation flow releases between May 1 and June 21 each year would benefit boaters, anglers, and fishery resources.

Whitewater Flows

The results from the whitewater recreation flow study indicated that for a standard trip, the lowest flow for quality boating ranged from 1,500 cfs to 1,800 cfs. The lowest flows for optimal boating ranged from 1,800 to 2,000 cfs, with 2,000 cfs to 8,000 cfs being an optimal flow for a challenging trip for expert boaters. A flow of 1,500 cfs would provide a class II to class III whitewater experience, appropriate for novice through advanced boaters. Additionally, 11 of 12 participants in the study rated a flow of 1,500 to be suitable for whitewater boating in the bypassed reach.

To understand what recreation flows could be feasible to enable the continuation of simulating close-to-natural flows to enhance recreation resources while protecting aquatic resources, we considered providing flows of 1,500 cfs, 1,800 cfs, and 2,000 cfs, as shown in table 6, table 7, and table 8, respectively. Given the history of flows in May and June between 2000 and 2014, the Grandfather Falls Project would be able to support 1,500 cfs recreation flow events for 4 hours 90 percent of the time in May and June, while flows of 2,000 cfs could only be sustained for 2.4 hours in May and 1.6 hours in June. A

recreation release of 1,800 cfs could be sustained for just 4.1 hours in May and 2.6 hours in June.

Table 6. 1,500 cfs recreation flow in the Grandfather Falls Project bypassed reach with all flow diverted from the powerhouse and a 2-hour ramp-up and ramp-down sequence (Source: Wisconsin Public Service, 2017c).

Month	Median flow (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	75% Exceedance (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	90% Exceedance (cfs)	Storage Draw (cfs)	Sustainable for (hrs)
May	1,865	-365	Continuous	1,260	240	11.7	1,002	498	4.6
June	1,494	6	546.5	1,086	414	5.9	950	550	4.0

Table 7. 1,800 cfs recreation flow in the Grandfather Falls Project bypassed reach with all flow diverted from the powerhouse and a 2-hour ramp-up and ramp-down sequence (Source: Wisconsin Public Service, 2017c).

Month	Median flow (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	75% Exceedance (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	90% Exceedance	Storage Draw (cfs)	Sustainable for (hrs)
May	1,865	-65	Continuous	1,260	540	4.1	1,002	798	2.1
June	1,494	306	8.8	1,086	714	2.6	950	850	1.9

Table 8. 2,000 cfs recreation flow in the Grandfather Falls Project bypassed reach with all flow diverted from the powerhouse and a 2-hour ramp-up and ramp-down sequence (Source: Wisconsin Public Service, 2017c).

Month	Median flow (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	75% Exceedance (cfs)	Storage Draw (cfs)	Sustainable for (hrs)	90% Exceedance	Storage Draw (cfs)	Sustainable for (hrs)
May	1,865	135	22.4	1,260	740	2.4	1,002	998	1.3
June	1,494	506	4.5	1,086	914	1.6	950	1,050	1.1

Recalling that the whitewater recreation flow study identified 2,000 cfs as being the uppermost volume released for optimal flows for a standard trip and the start of optimal flows for expert boaters, a recreation flow release of 2,000 cfs would accommodate expert boaters with an experience level that allows them to boat class III and IV rapids. While we recognize the benefit of providing a wider range of whitewater use, and the range of 2,000 cfs would provide more technical rapids for expert boaters, we do not see the need to expand opportunities for a narrow range of whitewater boaters because the surrounding area offers a variety of boating experiences that meet the needs of a range of skill levels. In addition, Wasau Whitewater Park and other nearby whitewater opportunities provide flows that meet the needs of an optimal experience for expert boaters.

For a standard trip, the results from the whitewater recreation flow study indicated that the lowest flow for quality boating ranged from 1,500 cfs to 1,800 cfs and the lowest flows for optimal boating ranged from 1,800 to 2,000 cfs. As available flows naturally diminish over the course of summer months, providing up to one 4-hour recreation flow release of 1,800 cfs between May 1 and May 31 would increase the likelihood that sufficient flows would be available. As such, providing a flow of 1,800 cfs between May 1 and May 31 and, in

subsequent scheduled weekends, offering up to two 4-hour, 1,500-cfs releases before June 21 would offer recreation benefits to the project and greater vicinity of the project by expanding opportunities for a range of whitewater boating skill levels. The cost to provide1,800- and 1,500-cfs flow releases is shown in table 18 in section 4.3, *Cost of Environmental Measures*.

In the event that inflow to the project is insufficient to sustain the proposed 4-hour release, Wisconsin Public Service agrees to Park Service's and Interior's recommendation to shorten the peak flow release period to 3 hours, rather than canceling the event as initially proposed, if the flows are available. This proposal would allow whitewater boaters to still experience paddling the bypassed reach during lower-flow conditions, while also meeting the needs of operating the project.

Ramping Rates

Park Service and Interior recommend a 10-percent ramping rate, but do not specify over how much time that ramping rate should be implemented. A 10-percent ramping rate would presumably mean that 145 cfs would be added to, or reduced from, a 1,500-cfs flow release each hour, or 175 cfs would be added to, or reduced from, a 1,800-cfs flow release each hour, as shown in table 2 and table 3, respectively. Park Service's and Interior's ramping recommendation would take 10 hours to reach the desired flow, totaling 20 hours of ramping. Such a ramping duration would not provide any practical benefit, given that the duration of a whitewater event would be for 4 hours, and, as discussed in section 3.3.1, *Aquatic Resources*, would provide no additional benefit to the fisheries in the bypassed reach. Further, Park Service and Interior do not discuss what benefit a 10-percent ramping rate would provide, other than stating that other unspecified projects in Wisconsin have put into effect a 10-percent ramping rate.

Providing a 2-hour ramping rate, as proposed by Wisconsin Public Service, would mean that a maximum of 725 cfs would be added to, or reduced from, a 1,500-cfs flow release each hour, or 875 cfs would be added, to or reduced from, an 1,800-cfs flow release each hour, as shown in table 2 and table 3, respectively. As boaters would be made aware of any scheduled flow releases on the Wisconsin Public Service website and kiosk, boaters would be able to plan ahead and have ample time to safely paddle through the water and exit the bypassed reach without the risk of stranding.

River Alliance is not specific about what the ramping rate should be. Therefore, a 2-hour ramping rate prior to and following a scheduled recreation release would be most appropriate to balance sustaining the fishery and whitewater recreation, by maximizing the benefit to recreationists while avoiding any negative effects to aquatic resources, as discussed in section 3.3.1, *Aquatic Resources*.

Monitoring

Because the project has never provided scheduled recreation flow releases, preparing an annual report that contains information on recreation use for the first 3 years of scheduled releases and the capacity of the whitewater recreation amenities, as recommended by Park Service and Interior, would help evaluate the effectiveness of the releases in terms of participation and quality of the boating experience, thereby informing ways to improve future scheduled releases. Subsequently, monitoring and reporting for distribution to Park Service's Midwest Great Lakes Hydropower Coordinator and American Whitewater, as well as filing with the Commission, in coordination with the FERC Form-80 every 6 years, would help address any unanticipated changes or needs for whitewater boaters, especially during the nascent stage of the recreation flow releases.

Recreation Flow Release Amenities

To enhance whitewater recreation at the Grandfather Falls Project, Wisconsin Public Service proposes, as part of its Recreation Plan, to include amenities related to the scheduled recreation flow releases, as shown in table 9. Table 9 also includes Park Service's, Interior's, and River Alliance's recommendations for amenities related to the proposed scheduled recreation flow releases.

Park Service and Interior "concur with… whitewater recreation related enhancement proposals made by [the] licensee in their Revised Recreation Management Plan", but also recommend two additional measures.[54] Park Service and Interior recommend that Wisconsin Public Service post the 2014 whitewater study, including the results of the preferred 2,000-cfs recreation flow release. Wisconsin Public Service asserts that it would post the 2014 whitewater study results to its website, including a link to the full report. Park Service and Interior also recommended that a sign-up sheet and related flow status information be included on the whitewater signage that Wisconsin Public Service proposes to install at the put-in site. Wisconsin Public Service states that on-site observations, proposed to occur during recreation flow releases, would account for boater usage, and that collecting names or other contact information of participants is unnecessary.

River Alliance recommends inspecting the bypassed channel for stranded fish and other aquatic life and to return any, if discovered, after scheduled flow release events. Wisconsin Public Service disagrees with River Alliance's request for inspecting the bypassed channel because Wisconsin Public Service consulted with Wisconsin DNR to develop the proposed recreation flow releases and

[54] Park Service's and Interior's comments on the ready for environmental analysis notice, filed on April 21 and April 28, 2017, respectively.

ramping procedures, which alleviated Wisconsin DNR's concerns for the recreation flow releases' potential adverse effects to fishery resources.

Table 9. Proposals and recommendations for recreation flow releases amenities (Source: Wisconsin Public Service, 2016b and staff).

Entity	Proposal or Recommendation
Wisconsin Public Service	• Clear and maintain a put-in and portage between reaches 2 and 3 of the bypassed reach. • Clear a small path from the current Ice Age Trail to an alternative put-in location downstream. • Install directional signage at the parking areas at the Grandfather Falls Dam, intake, and tailrace access sites that identifies the whitewater put-in, take-out, and portage locations. • Install a kiosk that includes: (1) a map panel of the bypassed reach, including put-in and take-out locations and portage route; (2) safety warnings; and (3) a contact person for boaters to obtain information on the specific location and nature of hazards on the bypassed reach. • Upgrade and maintain Wisconsin Public Service's website, and post: (1) results from the 2014 recreation flow study; (2) river flows, reservoir levels, and bypassed reach flows, to be updated regularly; and (3) any planned maintenance projects that would divert flow to the bypassed reach. • Trim vegetation at the whitewater put-in, take-out, and portage sites.
Park Service and Interior	• Prior to selecting flow release dates, Wisconsin Public Service should coordinate with American Whitewater to consider Wausau Whitewater's annual recreation flow release schedule. • Announce and post the scheduled recreation flow releases by April 1 of each year. • Email the recreation flow release schedule each spring to Park Service's Midwest Great Lakes Hydropower Coordinator and to American Whitewater. • Provide a sign and sign-in sheet at the put-in site downstream of the dam, providing: (1) instructions for paddlers signing in at each release; (2) a description of the characteristics of the bypassed reach; and (3) flow status information.

	• On Wisconsin Public Service's website, post: (1) river flows, reservoir levels, and bypassed reach flows and update regularly; (2) the preferred whitewater flow for a standard trip; (3) instructions for paddlers signing in at each release; and (4) any planned maintenance projects that would divert flow to the bypassed reach. • Trim the vegetation at the whitewater put-in, take-out, and portage areas. • Clear and maintain a small path from the current Ice Age Trail to an alternative put-in location downstream.
River Alliance	• Coordinate with other scheduled releases in the area to avoid multiple releases at different locations the same day. • Develop an alternative put-in downstream of the dam and clear a small path from the riverside trail to the new put-in. • Clear and maintain the vegetation along the canoe portage • Install signage marking the put-in and take-out, and a "Danger" sign at the rock ledge within the bypassed channel. • Install a kiosk, located at the put-in near the dam, which features: (1) a map panel indicating major rapids, the rock ledge, put-in, take-out, and canoe portage; and (2) a brief history of the dam. • Update the existing brochure to show changes in project recreation facilities.

Our Analysis

Boating Access

Wisconsin Public Service's proposal to clear and maintain a put-in and portage on the east side of the bypassed reach would provide an easier access point for whitewater boaters entering the bypassed reach via the intake canal access site. The portage would also allow boaters the option to exit the river to circumvent the rock ledge located on the river between reaches 2 and 3. Wisconsin Public Service's proposal to clear a small path from the current Ice Age Trail to an alternative put-in location further downstream from the current put-in site, located immediately downstream of the dam, would improve recreation accessibility and safety for boaters by helping them avoid the strong eddy that exists at the existing put-in site. Maintaining the vegetation at the put-in, take-out, and portage sites would ensure ease of access for boaters, thereby contributing to whitewater recreation enhancements and boater experience at the project.

Posting directional signage, sized appropriately for visibility, at the parking areas at the Grandfather Falls Dam, intake, and tailrace access would enable boaters to identify the whitewater put-in, take-out, and portage locations along the bypassed reach, and allow boaters to familiarize themselves with the river and the whitewater course and exit the river when desired.

Kiosk

Wisconsin Public Service's proposal to install a kiosk with a map panel of the bypassed reach, including put-in and take-out locations and portage routes, as well as a description of the characteristics of the bypassed reach would provide important safety warnings for boaters and help them familiarize themselves with the whitewater course before a entering the water. However, Wisconsin Public Service's proposal to also include on the kiosk a telephone contact, if provided by Park Service, for boaters to call to obtain more detailed information on the specific location and nature of hazards on the bypassed reach may not provide an accurate portrayal of the river reach. A visual depiction of the bypassed reach and brief description of any hazards on the bypassed reach, including the rock ledge located between reaches 2 and 3, displayed at the kiosk would ensure that boaters have accurate information, rather than be provided information via phone with no visual cues.

Park Service's and Interior's recommendation to install a sign that includes: (1) a sign-in sheet; (2) an explanation of the importance and rationale of paddlers signing in at each release; (3) a description of the characteristics of the bypassed reach; and (4) flow status information would be beneficial to boaters. Wisconsin Public Service states in its reply comments that a sign-in sheet would provide no additional information to the data collected during on-site observations; however, on-site observations would only occur when Wisconsin Public Service

staffs the scheduled release events, which would not include whitewater boaters recreating outside of the scheduled releases.

Directional signage and a kiosk with a map panel, description of the bypassed reach and its potential boating hazards, and flow status would assist boaters in preparing for their trip downriver by increasing their awareness of the river course and its inherent safety risks. However, installing a sign with a sign-in sheet, separate from the kiosk, would be unnecessary and redundant. Wisconsin Public Service's proposed kiosk could be modified to include the same information and sign-in sheet. Additionally, a sign-in sheet would be useful for documenting use of the bypassed reach for whitewater boating, especially during its first 3 years of implementing the scheduled releases.

River Alliance recommends installing a "Danger" sign at the rock ledge within the bypassed channel and marking the rock ledge on the proposed map panel of the kiosk. American Whitewater's website describes the ledge as being located about two-thirds of the way downstream from the dam put-in site and states that the rock ledge is what rates the river stretch as a class IV run at flows of 2,000 cfs and higher. The site further states: "At low-to-moderate flows, this reach may be more in the class II-III range, but the continuous nature of the rapids, and pushiness (as it heads to higher water levels) should not be taken lightly."

Wisconsin Public Service argues that providing a contact name and phone number to call for more detailed information on the hazards within the bypassed reach, if one is provided by Park Service, would be sufficient. Wisconsin Public Service's proposal to clear and maintain a put-in and portage on the east side of the bypassed reach, around the rock ledge between reaches 2 and 3, with the proposed signage for the portage would provide adequate warning to boaters, and an additional "Danger" sign would be unnecessary. Also, the Commission cannot require Park Service to provide any information to the applicant, such as a contact to reach for further information about hazards. Modifying the map panel at the kiosk modified to indicate any hazards to inform boaters who are unfamiliar with the reach and allow them to be better prepared and more aware of the risks associated with boating the bypassed reach.

River Alliance also recommends including a brief history of the dam on the kiosk, which would enhance the recreational experience for users and assist the public in understanding the project's effects on recreation. However, while providing a history of the dam would be informative, the primary focus of the kiosk is boating preparedness and collecting use data. Therefore, information on the history of the dam would not be necessary or appropriate to include on the kiosk.

Modifying Wisconsin Public Service's proposed kiosk to include: (1) a map panel of the bypassed reach that indicates the put-in and take-out locations and portage routes, as well as safety warnings for boating the bypassed reach; (2) a

picture and description of the rock ledge between reaches 2 and 3; (3) general whitewater boating safety guidelines, including the importance of wearing a personal floatation device; (4) a description of the characteristics of the bypassed reach; (5) a visible sign-in sheet and an explanation of the importance and rationale of paddlers signing in at each release; and (6) flow status information for scheduled events would be beneficial to boaters by identify hazards, and help document whitewater use during and outside of scheduled releases. Further, including the link for Wisconsin Public Service's whitewater boating webpage would make boaters aware that the whitewater recreation information is available to them online to enable them to prepare for future trips at the Grandfather Falls bypassed reach.

Scheduled Releases

Park Service, Interior, and River Alliance recommend that Wisconsin Public Service coordinate with other scheduled releases in the area to avoid multiple releases at different locations on the same day. Park Service and Interior more specifically recommend that: (1) Wisconsin Public Service coordinate with American Whitewater to consider Wausau Whitewater Park's annual recreation flow release schedule, (2) announce and post the scheduled recreation flow releases by April 1 of each year, and (3) email the recreation flow release schedule each spring to Park Service's Midwest Great Lakes Hydropower Coordinator and to American Whitewater. Wisconsin Public Service commented that posting the scheduled releases, as proposed, on its website by April 1 of each year would be sufficient and that coordinating scheduled releases with nearby opportunities would be unnecessary, as there are numerous local opportunities and overlapping scheduled releases would be inevitable in some years.

Given the abundance of whitewater boating opportunities in the region, as listed in table 4, overlapping scheduled releases would be inevitable, so coordinating with one entity would not eliminate scheduling conflict. However, posting scheduled release dates on Wisconsin Public Service's website and contacting Park Service's Midwest Great Lakes Hydropower Coordinator and American Whitewater by April 1 of each year would help inform boaters of whitewater boating opportunities.

Webpage and Brochure

Developing a webpage customized for boaters preparing a trip to the project would inform recreationists of current flow and elevation status, including changes in scheduled flows, high- and low-flow events, and curtailed or cancelled events, thereby enhancing boater preparedness. However, including the full report from the 2014 whitewater study, as recommended by Park Service and Interior, and specifying the preferred whitewater flow is unnecessary and does not serve the purpose of informing boaters of flow conditions or preparing them for a trip to the bypassed reach.

River Alliance recommends that Wisconsin Public Service update its existing brochure to show on a map any modifications in project recreation facilities. However, with the proposed webpage and kiosk, a brochure would be redundant, and therefore, unnecessary.

The proposed website could be modified to offer the same information as the proposed kiosk. Mapped features of the bypassed reach would allow boaters to consider how to navigate challenging stretches of the bypassed reach and what precautions could be necessary in advance of any whitewater boating trip. Further, providing an explanation on the website of the importance of signing in would encourage boaters to sign in by making them aware of the presence of a sign in sheet, thereby allowing Wisconsin Public Service to better monitor and gain an understanding of recreation use at the whitewater recreation facilities. Lastly, providing any information on the proposed website regarding cancellations or changes in scheduled flows prior to any whitewater boating trip would benefit paddlers by making them aware of existing flow conditions before embarking on a whitewater boating trip.

Bypassed Reach

The proposed ramping regimen was designed to ensure that fish would not become stranded during the flow releases. The proposed ramping rates would mitigate any potential effects of the scheduled recreation flow releases on aquatic resources. Also, as discussed in the section 3.3.1, *Aquatic Resources*, the configuration of the bypassed reach provides an abundance of refuge or pocket areas for fish to move to during whitewater boating flow releases. Therefore, inspections of the bypassed reach for stranded fish and other aquatic life, as recommended by River Alliance would not be necessary.

Ice Age National Scenic Trail

The 4.8-mile-long segment of the Ice Age Trail that passes through the Grandfather Falls Project includes an informal connecting route for approximately 3 miles on State Highway 107. Within its 1,200-mile-long-entirety, the Ice Age Trail consists of 550 miles of connecting routes, which consist of paved roads as connectors; however, Park Service's goal is for connector routes on paved roads to be temporary and eventually converted to off-road trails. In order to cross the Wisconsin River further downstream, thereby removing the need for the connector route to cross the Wisconsin River further upstream of the project, Park Service and Interior recommend two alternatives: (1) offer a pedestrian crossing over the Grandfather Falls Project's dam infrastructure; or (2) construct a pedestrian bridge over the bypassed channel of the Wisconsin River. Park Service and Interior state that a pedestrian bridge would allow wildlife and viewing of instream recreation on the bypassed reach and recommend reducing the costs of a bridge by coordinating its construction with the penstock replacement and exploring funding

sources to match dollars, including Stewardship Funds offered by Wisconsin DNR and Challenge Cost Share funds offered through Park Service.

In its reply comments, Wisconsin Public Service states that a pedestrian crossing on the project dam would be incompatible with the aesthetic intent of the trail, which features mainly natural and rural landscapes. Wisconsin Public Service states that greater than 45 percent of the trail is located on similar connecting routes and that the connecting route in the vicinity of the project is surrounded by wooded and rural areas and includes a river crossing on County Road E, which it states is consistent with Park Service's intent for the Ice Age Trail.

The reply comments also point out that the Commission considers the dam at the Grandfather Falls Project to be classified as a high-hazard dam. Wisconsin Public Service states that a pedestrian crossing over the bridge would pose risks to safety and security, and that the hoisting equipment located on the operator deck reduces the walkway to 30 inches in some places, making it impractical to provide necessary separation from the public and allow adequate space for operation.

Lastly, Wisconsin Public Service states that it would remain open to accommodating Park Service, the Ice Age Trail Alliance, or any other party that wishes to finance, build, and maintain a bridge; however, the penstock replacement has already occurred.

Our Analysis

Park Service and Interior provide no evidence that an alternative river-crossing is needed. The approximately 3-mile-long connecting route along State Highway 107 and County Road E bridge offers a wooded landscape that is a continuation of the natural viewshed experienced elsewhere along the trail. There is also a gravel shoulder that hikers use along County Road E, and there is a widened shoulder on one side of the bridge. Therefore, we see no benefit in eliminating the connecting route to provide an alternate river-crossing.

Grandfather Falls Project Boundary

Wisconsin Public Service proposes to modify the project boundary at the Grandfather Falls Project by removing 2,053 acres from the existing project boundary, located east of Highway 107, that it states are not necessary to operate or maintain the project.

Our Analysis

Commission regulations require that all lands necessary for the operation and maintenance of the project be included within a project boundary.[55] The lands proposed for removal were included in the original license because Wisconsin Public Service owned them at the time of licensing; however, the lands do not serve a project purpose. The lands have been used for non-project related forestry activities and hunting, and would not be needed for project operation and maintenance or for other project purposes, such as project-related recreation, protection of cultural resources, or protection of other environmental resources. Therefore, there is no need to include them within any proposed project boundary.

The proposed project boundary for the Grandfather Falls Project also includes 886 acres of hardwood forest used for non-project related forestry activities and hunting. The existing license does not require these activities. In addition, the proposed project boundary includes a portion of the Ice Age Trail, which Wisconsin Public Service proposes to maintain. Because most of the remaining 886 acres are not necessary for project operation and maintenance or for other project purposes, such as project-related recreation, protection of cultural resources, or protection of other environmental resources these lands should be removed from the proposed project boundary. However, the land necessary for project recreation, including the portion of the Ice Age Trail within the project boundary that Wisconsin Public Service proposes to continue maintaining as a condition of any new license, should be kept within the project boundary. Keeping that portion of the Ice Age Trail within the project boundary would ensure the continued maintenance of that portion of the trail.

Lastly, the proposed project boundary includes the bypassed reach and a 0.1-acre island owned by BLM that is around 1,000 feet downstream of the project tailrace access area. These bypassed reach and island serve no project purpose and do not include any cultural or wildlife resources that would be affected by the project and, as such, should be removed from the proposed project boundary.

Land Use

As part of the proposed Wildlife Management Plans, Wisconsin Public Service proposes to conduct visual inspections of the shoreline every 6 years, in conjunction with the FERC Form-80, and to remove or halt any non-conforming structures and/or uses that are identified on any Wisconsin Public Service lands.

Park Service and Interior support the visual inspection of the shoreline every 6 years, in conjunction with the FERC Form-80.

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[55] *See* 18 C.F.R. 4.41(h)(2) (2017).

River Alliance supports implementing the proposed Wildlife Management Plan and recommends that the plan include a provision for a 200-foot-wide, no-cut shoreline buffer zone in which only diseased wood would be removed to protect the shoreline/riparian zone.

Our Analysis

Paragraph (b) of the standard article, *Land Use and Occupancy*, requires the licensee to monitor project property for non-conforming structures to ensure that no unauthorized project and non-project uses or occupancies occur within the project boundary. In this article, the Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph and to require modification of those standards, guidelines, or procedures. As such, implementing the proposed Wildlife Management Plan, including the measure to conduct visual inspections every 6 years would be redundant and unnecessary.

The measure included in the proposed Wildlife Management Plan to provide a 200-foot-wide, no-cut buffer zone, supported by River Alliance, is arbitrary because Wisconsin Public Service and River Alliance do not provide any evidence of adverse effects of project operation and maintenance along the shoreline. As discussed in section 3.3.3, *Threatened and Endangered Species*, avoiding cutting trees during certain times of the year to protect the northern long-eared bat would protect trees needed for northern long-eared bat's maternity roosting season. Land for a 200-foot-wide, no-cut buffer zone, currently outside the proposed project boundary, would not serve a project purpose, thus providing such a buffer would be unnecessary.

Further, as stated in section 3.3.2, *Terrestrial Resources*, the Wildlife Management Plan would not be beneficial because it contains measures for the management of issues which are not project-related.

3.3.5 Cultural Resources

3.3.5.1 Affected Environment

Area of Potential Effects

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's for the Grandfather Falls and Tomahawk Projects include: (1) all lands enclosed by the project boundary, as delineated in the existing license;

(2) attached or associated buildings and structures extending beyond the project boundary; (3) lands which contribute to the National Register eligibility of the hydroelectric generating facility; and (4) lands or properties outside of the project boundary where the project may cause changes in the character of use of historic properties.

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). The Menominee, Chippewa (Ojibwa), and Potawatomi Tribes, extending from the Algonkian language family, have been the predominant indigenous groups living in the Great Lakes region for the last five centuries. Upon European contact, the project area was home to the Menominee and Ojibwe 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.

The first European explorer to the Wisconsin region was Jean Nicolet in 1634. In 1763, Great Britain seized dominion over the area during the French and Indian Wars and the United States government acquired it after the Revolutionary War. In the 1850s, after Wisconsin Territory had become a state, two-thirds of its immigrants came from the eastern United States, with the remaining immigrants coming mostly from Germany, Ireland, and Norway. Early settlers participated in either fur trading or logging in the early 1800s. In Lincoln County, the City of Merrill was first developed as a trading post in 1843 for S.S. Merrill, the general manager of the Chicago, Milwaukee, St. Paul Railroad. The community gained prominence in the lumber industry throughout the 1800s and remained prosperous into the next century.

The Grandfather Falls Project was originally constructed in 1906 by the Grandfather Falls Paper Company of Merrill, Wisconsin, to provide more power for the operation of its mill. Wisconsin Public Service purchased the project in 1936 to develop the site to provide energy for the growing population in the Wisconsin River Valley. In 1938, the existing dam was renovated and the current project structures, including the current powerhouse, were constructed.

In 1887, the Tomahawk Land and Boom Company sold lots in the City of Tomahawk, allowing for the expansion and routing of the Chicago, Milwaukee, and St. Paul Railroad system through Tomahawk. The sawmill industry dominated with the region's abundance of pine and hardwood forests, and farms soon took the place of those previously-forested lands. With the pulp and paper industry booming, the Tomahawk Dam was completed in 1888 and the City of

Tomahawk was incorporated in 1891. The Tomahawk Dam was partially rebuilt in 1904 under the ownership of the Tomahawk Pulp and Paper Company; however, in 1932, the dam began leaking and failed, resulting in the dam's collapse. In 1935, Wisconsin Public Service acquired the dam and constructed a new dam in 1938.

Archaeological and Historic Resources

Tomahawk Project

A Phase I archaeological survey was conducted in May of 2010 to identify any new archaeological sites at the Tomahawk Project that could be affected by project operation, as approved in an amendment to modify the project boundary on June 14, 2011. The survey did not identify any new archaeological sites within the project boundary. The Wisconsin SHPO concurred with the results of this survey.

In 2011, a Phase II archaeological survey was conducted to assess the eligibility of site 47LI0105 for listing on the National Register, which is located partially within the APE and project boundary. The survey report recommends this site as eligible for listing on the National Register under Criterion D: *Information Potential*, as a site that has yielded or may likely yield information important in prehistory or history. The report also noted the site had been vandalized and looted following the Phase II fieldwork.

In the spring of 2011, Wisconsin Public Service conducted a historic assessment of the Tomahawk Project to determine if it was eligible for listing on the National Register; however, the report determined the Tomahawk Project to be well-maintained, yet ineligible for listing on the National Register. The Wisconsin SHPO concurred with the conclusions of the architectural report.

Grandfather Falls Project

A Phase I archaeological survey of 10 miles of shoreline along the Grandfather Falls Project reservoir was conducted in 2011 to identify any areas of erosion with the potential to affect archaeological sites. The survey also included shovel tests on 720 acres of upland area owned by Wisconsin Public Service within the project boundary. The survey revealed no new archaeological sites within the project boundary. During the survey, attempts were made to relocate archaeological sites 47LI0067 and 47LI0068, which were reported within the APE for the project. Site 47LI0067 was found during the survey, and it was determined that the project does not affect the site. Site 47LI0012, which has not been evaluated for National Register-eligibility, was not relocated during the survey. The Wisconsin SHPO concurred with the report finding in writing on January 10, 2013. This site is located within land proposed for removal from the project boundary.

The architectural assessment of the Grandfather Falls Project, completed in November of 2011, determined the Grandfather Falls Project to be eligible for listing on the National Register under Criterion A: *Event*, due to its association with events that have made a significant contribution to the broad patterns of history for its role in engineering and social history of the local area. The Grandfather Falls Project is also eligible for listing on the National Register under Criterion C: *Design/Construction* for its embodiment of distinctive characteristics of a type, period, or method of construction, due to its design that preserved the original Grandfather Rapids in the bypassed reach while increasing power at the project five times greater than its original capacity. The report established the period of significance for the project to span from 1938 through 1961. On June 15, 2012, the Wisconsin SHPO determined that the Grandfather Falls historic district is eligible for listing on the National Register as a historic district with 11 contributing properties, including the 1906 powerhouse, 1938 powerhouse, canal, canal bridge, dam, dike, intake house, penstocks, sluice gate and spillway, surge tanks, and a former domestic site.

3.3.5.2 Environmental Effects

Effects on Historic Properties

The executed statewide PA requires that every 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, Wisconsin Public Service proposes to implement an HPMP for each project, each entitled *Historic Resource Management Plan* and filed on October 28, 2016. The Wisconsin SHPO concurred with the proposed HPMPs on February 9, 2016.[56]

Our Analysis

Historic District

Continued operation of the Grandfather Falls Project would ensure that the 11 properties that collectively contribute to the eligibility of the Grandfather Falls historic district would be used as they were originally designed and built, and would therefore, be beneficial. However, operating the project could result in adverse effects to the Grandfather Falls historic district, including repairs and modifications that, while necessary for the continued safe and efficient operation,

[56] Historic Resources Management Plan, Grandfather Falls Hydroelectric Project, FERC Project No. 1966, and Historic Resources Management Plan, Tomahawk Hydroelectric Project, FERC Project No. 1940 (Source: Wisconsin Public Service, 2016a and 2016b).

are not in keeping with the project's historic character. For example, future project maintenance or emergency situations may adversely affect the Grandfather Falls historic district. The HPMP contains procedures to mitigate for any adverse effects.

To ensure that any unanticipated discoveries are adequately addressed, the HPMP for each project, developed based on requirements of the executed statewide Wisconsin PA,[57] contains 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 Grandfather Falls Project contains measures to: (1) maintain and operate properties within the Grandfather Falls historic district in accordance with 36 C.F.R. Part 67, *Guidelines for Rehabilitating Historic Buildings* and applicable Park Service preservation briefs; and (2) and to file proposals for alterations to historic properties with the Wisconsin SHPO and allow a 30-day public comment period. These measures would help avoid, lessen, or mitigate for any adverse effects that project operation and maintenance would have on the Grandfather Falls historic district.

Archaeological Sites

Within the APE for the Tomahawk Project, archaeological site 47LI0105 was determined to be eligible for listing on the National Register. The site is stable and not eroding, but could be adversely affected by ground-disturbing activity. The HPMP for the Tomahawk Project includes a measure for monitoring the site and including the results of the monitoring in the annual report for three consecutive years, in addition to remedial action to take in the event of ongoing vandalism or disturbance of the site.

Within the APE for the Grandfather Falls Project, archaeological site 47LI0012 is located within land proposed for removal from the project boundary. However, the site has not been evaluated for National Register-eligibility and was not relocated during the survey. Therefore, removing the lands where the site is located from the project boundary would not have an adverse effect on the site.

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[57] The full name of the PA is "Programmatic Agreement Among the Federal Energy 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."

While Wisconsin Public Service does not propose to conduct ground-disturbing activities at or near the sites as part of its relicensing, future ground-disturbing activities at these sites may be necessary to ensure continued project operations. The HPMP for each project contains procedures that Wisconsin Public Service would implement prior to and during ground-disturbing activities to ensure any adverse effects would be mitigated. Further, we anticipate that any effects on unknown archaeological and historic properties would be taken into account through the executed statewide PA and HPMP for each project. The documents would ensure that any adverse effects on archaeological and historic properties within the APEs would be resolved.

3.4 NO-ACTION ALTERNATIVE

Under the no action alternative, the Tomahawk and Grandfather Falls Projects would continue to operate in their current manner. There would be no changes to the physical, biological, or cultural resources of the area. None of Wisconsin Public Service's proposed new measures would be required. Public access would not change and the existing recreation facilities would not be enhanced.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at Wisconsin Public Service's use of the Wisconsin River for hydropower purposes to see what effects various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[58] 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 projects; (2) the cost of alternative power; (3) the total project cost, including operation, maintenance, and environmental measures; and (4) the difference between the cost of alternative power and total project cost for each of the projects. If the difference between the cost of alternative power and total project cost is positive, the project helps to 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, then the project helps to produce 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 ECONOMIC BENEFITS OF THE PROJECT

Table 10 and table 11 summarize the assumptions and economic information we use in our analysis. This information was provided by Wisconsin Public Service in its license applications or estimated by staff. We find that the values provided by Wisconsin Public Service are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment; estimated future capital investment required to maintain and

[58] *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.

extend the life of facilities; relicensing costs; normal operation and maintenance costs; and Commission fees.

Table 10. Parameters for the economic analysis for Wisconsin Public Service's Tomahawk Project (Source: Wisconsin Public Service and staff).

Economic Parameter	Value (2016 dollars)	Source
Proposed capacity	2.6 MW	Wisconsin Public Service
Proposed average annual generation	9,975.6 MWh	Wisconsin Public Service
Net investment	$310,506[a]	Wisconsin Public Service
Annual operation and maintenance cost	$250,834[b]	Wisconsin Public Service
Cost to prepare license application	$910,000[c]	Wisconsin Public Service
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Cost of capital (Long-term interest rate)	4.54 percent [d]	Wisconsin Public Service
Short-term interest rate (during construction)	2.74 percent [e]	Wisconsin Public Service
Federal tax rate	34 percent	Staff
Local tax rate	3 percent	Staff
Insurance rate	0.25 percent	Staff
Dependable capacity	0.53 MW	Wisconsin Public Service
Energy rate	$31.79/MWh [f]	Staff

Economic Parameter	Value (2016 dollars)	Source
Capacity rate	$190/kilowatt (kW)-year [g]	Staff

[a] Wisconsin Public Service, October 28, 2016, revised Exhibit A of final license application, page 14.

[b] Wisconsin Public Service, October 28, 2016, revised Exhibit A of final license application, page 11. Excludes insurance premium costs of $15,000 per year.

[c] Wisconsin Public Service, October 28, 2016, revised Exhibit A of final license application page 15.

[d] Wisconsin Public Service, October 28, 2016, response to Commission's additional information requests, page 16.

[e] Wisconsin Public Service, October 28, 2016, response to Commission's additional information requests, page 16.

[f] Energy Information Administration's 2016 Annual Energy Outlook.

[g] The capacity rate is based on the Energy Information Administration's 2016 Annual Energy Outlook.

Table 11. Parameters for the economic analysis for Wisconsin Public Service's Grandfather Falls Project (Source: Wisconsin Public Service and staff).

Economic Parameter	Value (2016 dollars)	Source
Proposed capacity	17.24 MW	Wisconsin Public Service
Proposed average annual generation	72,031.72 MWh	Wisconsin Public Service
Net investment	$12,706,122.25[a]	Wisconsin Public Service
Annual operation and maintenance cost	$287,918[b]	Wisconsin Public Service
Cost to prepare license application	$600,000[c]	Wisconsin Public Service
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff

Economic Parameter	Value (2016 dollars)	Source
Cost of capital (Long-term interest rate)	4.54 percent [d]	Wisconsin Public Service
Short-term interest rate (during construction)	2.74 percent [e]	Wisconsin Public Service
Federal tax rate	34 percent	Staff
Local tax rate	3 percent	Staff
Insurance rate	0.25 percent	Staff
Energy rate	$31.79/MWh [f]	Staff
Dependable capacity	7.08 MW	Wisconsin Public Service
Capacity rate	$190/kW-year [h]	Staff

[a] Wisconsin Public Service, October 27, 2017, response to Commission's request for information updating the net investment value of project due to the recent replacement of the wood-stave penstocks with new carbon steel penstocks.

[b] Wisconsin Public Service, October 28, 2016, revised Exhibit D of final license application, page 1. Excludes insurance premium costs of $15,000 per year.

[c] Wisconsin Public Service, October 28, 2016, revised Exhibit D of final license application, page 2.

[d] Wisconsin Public Service, October 28, 2016, revised Exhibit D of final license application, page 5.

[e] Wisconsin Public Service, October 28, 2016, revised Exhibit D of final license application, page 5.

[f] Energy Information Administration's 2016 Annual Energy Outlook.

[g] The capacity rate is based on the Energy Information Administration's 2016 Annual Energy Outlook.

4.2 COMPARISON OF ALTERNATIVES

Table 12 and table 13 summarize the installed capacity, annual generation, cost of alternative power, estimated 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.

Table 12. Summary of the annual cost of alternative power and annual project costs for alternatives for the Tomahawk Project (Source: staff).

	No-Action Alternative	**Wisconsin Public Service's Proposal[a]**	**Staff Alternative**
Installed capacity (MW)	2.6	2.6	2.6
Annual generation (MWh)	9,975.6	9,975.6	9,975.6
Annual cost of alternative power($/MWh)	$317,124 (31.79)	$317,124 (31.79)	$317,124 (31.79)
Annual project cost ($/MWh)	$386,854 (38.78)	$402,416 (40.34)	$393,537 (39.45)
Difference between cost of alternative power and project power (mills/kilowatt hours [kWh])	($69,729) (6.99)	($85,291) (8.55)	($76,413) (7.66)

[a] A number in brackets denotes that the difference between the power value and production cost is negative.

Table 13. Summary of the annual cost of alternative power and annual project costs for alternatives for the Grandfather Falls Project (Source: staff).

	No-Action Alternative	**Wisconsin Public Service's Proposal[a]**	**Staff Alternative**
Installed capacity (MW)	17.24	17.24	17.24
Annual generation Megawatt-hour (MWh)	72,031.72	71,869.72	71,857.72
Annual cost of alternative power ($/MWh)	$2,289,888 (31.79)	$2,284,738 (31.79)	$2,284,357 (31.79)
Annual project cost ($/MWh)	$2,250,991 (31.25)	$2,268,927 (31.57)	$2,260,644 (31.46)

	No-Action Alternative	Wisconsin Public Service's Proposal[a]	Staff Alternative
Difference between cost of alternative power and project power (mills/kWh)	$38,897 0.54	$15,811 0.22	$23,713 0.33

[a] A number in brackets denotes that the difference between the power value and production cost is negative.

4.2.1 No-Action Alternative

Tomahawk Project

Under the no-action alternative, the project would continue to operate as it does now. Based on an installed capacity of 2.6 MW, the Tomahawk Project generates an average of 9,975.6 MWh of electricity annually. The average annual cost of alternative power would be about $317,124 or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $386,854or $38.78/MWh. Overall, the project would produce power at a cost that is $69,729, or $6.99/MWh, more than the cost of alternative power. There are no other costs associated with this alternative, other than Wisconsin Public Service's development cost for preparing its license application ($910,000).

Grandfather Falls Project

Under the no-action alternative, the project would continue to operate as it does now. Based on an installed capacity of 17.24 MW, the Grandfather Falls Project generates an average of 72,031.72 MWh of electricity annually. The average annual cost of alternative power would be about $2,289,888 or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $2,250,991or $31.25/MWh. Overall, the project would produce power at a cost that is $38,897, or $0.54/MWh, less than the cost of alternative power. There are no other costs associated with this alternative, other than Wisconsin Public Service's development cost for preparing its license application ($600,000).

4.2.2 Applicant's Proposal

4.2.2.1 Tomahawk Project

Under Wisconsin Public Service's proposal, the project would have an installed capacity of 2.6 MW and generate an average of 9,975.6 MWh of

electricity annually. The average annual cost of alternative power would be about $317,124 or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $402,416 or $40.34/MWh. Overall, the project would produce power at a cost that is $85,291or $8.55/MWh, more than the cost of alternative power.

4.2.2.2 Grandfather Falls Project

Under Wisconsin Public Service's proposal, the project would have an installed capacity of 17.24 MW and generate an average of 71,869.72 MWh of electricity annually. The average annual cost of alternative power would be about $2,284,738 or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $2,268,927 or $31.57/MWh. Overall, the project would produce power at a cost that is $15,811, or $0.22/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

4.2.3.1 Tomahawk Project

The staff alternative includes the same developmental components as the applicant's proposals, and therefore, would have the same capacity and energy values described above for the applicants' proposal. Under the staff alternative, the project would have an installed capacity of 2.6 MW and generate an average of 9,975.6 MWh of electricity annually. The average annual cost of alternative power would be about $317,124, or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $393,537, or $39.45/MWh. Overall, the project would produce power at a cost that is $76,413, or $7.66/MWh, more than the cost of alternative power.

4.2.3.2 Grandfather Falls Project

The staff alternative includes the same developmental components as the applicant's proposals, and therefore, would have the same capacity and energy values described above for the applicant's proposals with the exception of a 12 MWh increase in total MWhs lost due to greater release in whitewater recreation flows. The average annual cost of alternative power would be about $2,284,357, or $31.79/MWh. The average annual cost of producing this power, including depreciation, operation, and maintenance costs, and taxes would be about $2,260,644, or $31.46/MWh. Overall, the project would produce power at a cost that is $23,713, or $0.33/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 14. Cost of environmental mitigation and enhancement measures considered in assessing the effects of the Tomahawk Project (Source: Wisconsin Public Service and staff).

Enhancement/Mitigation Measures	Entity	Capital Cost (2016$)	Annual Cost($)	Levelized Annual Cost (2016$)	Notes
Aquatic Resources					
(1) Establish an Aquatic Resource Fund that could be used to fund potential tasks such as aquatic invasive plant point-intercept surveys; controlling Eurasian water milfoil; conducting fish surveys; and monitoring water quality.	Wisconsin Public Service	0	13,500	8,910	
(2) Implement a Reservoir Drawdown Management Plan.	Wisconsin Public Service, Staff	0	0	0	e
(3) Implement an Operation Monitoring Plan.	Wisconsin Public Service, Staff	0	0	0	e

Enhancement/Mitigation Measures	Entity	Capital Cost (2016$)	Annual Cost($)	Levelized Annual Cost (2016$)	Notes
(4) Implement a Woody Debris Management Plan.	Wisconsin Public Service, Staff	0	0	0	e
Terrestrial Resources					
(5) Implement a Bald Eagle Plan that includes FWS's *National Bald Eagle Management Guidelines*.	Staff	0	0		a
(6) Implement an Invasive Species Management Plan.	Wisconsin Public Service	0	4,000	2,640	b
(7) Modify and implement the proposed Invasive Species Management Plan to include: (1) a description of the proposed monitoring methods, (2) the proposed frequency of monitoring; (3) the proposed criteria to be used to determine when control measures would be implemented; and (4) a schedule for filing monitoring reports.	Staff	500	4,500	3,002	b

Enhancement/Mitigation Measures	Entity	Capital Cost (2016$)	Annual Cost($)	Levelized Annual Cost (2016$)	Notes
(8) Implement Wildlife Management Plan for the management and protection of wildlife, threatened and endangered species (e.g. northern long-eared bat protection measures), recreation, shoreline resources, and timber harvest.	Wisconsin Public Service, Park Service, River Alliance	0	1,000	660	c
Threatened and Endangered Species					
(9) Implement bat protection and avoidance measures for the northern long-eared bat.	Staff	0	0	0	a
Recreation and Land Use Resources					
(10) Implement the proposed Recreation Plan that includes measures to: (1) continue operating and maintaining project recreation sites and amenities; (2) maintain the vegetation at the shared parking area	Wisconsin Public Service, Staff	0	600	296	b

Enhancement/Mitigation Measures	Entity	Capital Cost (2016$)	Annual Cost($)	Levelized Annual Cost (2016$)	Notes
for the Wisconsin Public Service reservoir and Wisconsin Public Service tailwater boat landing; (3) install and maintain one portable toilet adjacent to the shared parking area of the Wisconsin Public Service reservoir and Wisconsin Public Service tailwater boat landing from Memorial Day to Labor Day; and (4) monitor recreation facility use for the FERC Form-80 schedule requirement.					
Cultural Resources					
(11) Implement the HPMP.	Wisconsin Public Service, Staff	0	4,500	2,970	c
(12) Implement the statewide Wisconsin PA.	Wisconsin Public Service, Staff	0	0	0	a

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

[b] Cost estimated by staff.

[c] Cost provided by Wisconsin Public Service.

[d] These costs are assessed in Terrestrial Resources and are not counted here.

[e] These costs are included in normal operation and maintenance costs for the project.

Table 15. Cost of environmental mitigation and enhancement measures considered in assessing the effects of the Grandfather Falls Project. (Source: Wisconsin Public Service and staff).

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
Aquatic Resources					
(1) Establish an Aquatic Resource Fund that could be used to fund potential tasks such as aquatic invasive plant point-intercept surveys; controlling Eurasian water milfoil; conducting fish surveys; and monitoring water quality.	Wisconsin Public Service	0	13,500	8,910	
(2) Implement a Reservoir Drawdown Management Plan.	Wisconsin Public Service and Staff	0	0	0	e
(3) Implement an Operation Monitoring Plan.	Wisconsin Public Service	0	0	0	e
(4) Modify the Operation Monitoring Plan to include procedures for monitoring whitewater flow releases in the bypassed reach.	Staff	500	0	33	b

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
(5) Implement a Woody Debris Management Plan.	Wisconsin Public Service and Staff	0	0	0	e
Terrestrial Resources					
(6) Implement a Bald Eagle Plan that includes FWS's *National Bald Eagle Management Guidelines*.	Staff	0	0	0	a
(7) Implement an Invasive Species Management Plan.	Wisconsin Public Service	0	4,000	2,640	c
(8) Modify the proposed Invasive Species Management Plan to include: (1) a description of the proposed monitoring methods, (2) the proposed frequency of monitoring; (3) the proposed criteria to be used to determine when control measures would be implemented; and (4) a schedule for filing monitoring reports.	Staff	500	4,500	3,002	b

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
(9) Implement Wildlife Management Plan for the management and protection of wildlife threatened and endangered species, recreation, shoreline resources, and timber harvest.	Wisconsin Public Service, Park Service, River Alliance	0	300	195	c
Threatened and Endangered Species					
(10) Implement bat protection and avoidance measures for the northern long-eared bat.	Staff	0	0	0	a
Recreation Resources					
(11) Implement the proposed Recreation Plan, that contains provisions for: (1) continuing to operate and maintain the recreation facilities for the project; (2) adding one portable toilet at the Grandfather Falls flowage boat landing, Grandfather Falls Dam access, Grandfather Falls intake access, and	Wisconsin Public Service	0	11,050	7,290	d

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
the Grandfather Falls tailrace access, from Memorial Day to Labor Day; (3) providing up to three 4-hour scheduled whitewater boating releases of 1,500 cfs each year with a 2-hour ramping rate (4 hours total) and whitewater recreation support actions, including: (a) clearing a put-in and portage on the east side of the bypassed reach; (b) clearing a path from the Ice Age Trail to an alternative put-in location downstream; (c) installing directional signage; (d) installing a kiosk at the Grandfather Falls Dam access site; (e) posting scheduled whitewater flow releases by April 1 of each year; (f) posting preferred whitewater flows on Wisconsin Public Service's website; (g) developing a webpage for posting preferred whitewater flows, current flow information, and reservoir levels; and (h) monitoring whitewater flows and whitewater					

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
boater usage; and (5) monitoring recreation facility use for the FERC Form-80 schedule requirement.					
(12) Modify and implement the proposed Recreation Plan to include provisions for: (1) continuing to operate and maintain the recreation facilities for the project; (2) adding one portable toilet at the Grandfather Falls flowage boat landing, Grandfather Falls Dam access, Grandfather Falls intake access, and the Grandfather Falls tailrace access, from Memorial Day to Labor Day; (3) providing up to one scheduled whitewater boating recreation flow release of 1,800 cfs, between May 1 and May 31, and up to two 4-hour scheduled whitewater boating releases of 1,500 cfs, between May 1 and June 21, each year with a 2-hour ramping rate (4 hours total) and whitewater support actions, including:	Staff	500	11,310	7,465	d

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
(a) clearing a put-in and portage trail on the east side of the bypassed reach; (b) clearing a path from the Ice Age Trail to an alternative put-in location downstream from the Grandfather Falls Dam; (c) installing directional signage; (d) making changes to the proposed kiosk; (e) making changes to the proposed webpage; (f) posting scheduled whitewater flow releases, and notifying Park Service and American Whitewater of scheduled release dates, by April 1 of each year; and (g) monitoring and preparing an annual report on whitewater boating recreational use at the scheduled whitewater flow releases for 3 years and then subsequently in conjunction with the FERC Form-80; and (4) monitoring recreation facility use at the project for the FERC Form-80 report.					

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)	Notes
(13) Provide up to four scheduled whitewater boating recreation flow releases of 2,000 cfs, between May 1 and June 30, each year, with a 10 percent ramping rate (20 hours total)	Park Service, Interior	10,400	25,000	17,175	f
(14) Provide up to five scheduled whitewater boating recreation flow releases of 2,000 cfs, implementing a ramp-up and ramp-down procedure between flow releases.	River Alliance	NA	NA	NA	g
Cultural Resources					
(15) Implement the HPMP.	Wisconsin Public Service, Staff	0	2,000	1,320	c
(16) Implement the statewide Wisconsin PA.	Wisconsin Public Service, Staff	0	0	0	a

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

[b] Cost estimated by staff.

[c] Cost provided by Wisconsin Public Service.

[d] The cost of this measure include the cost for whitewater recreation enhancements.

[e] These costs are included in normal operation and maintenance costs for the project.

[f] Staff assumed that a “10 percent ramping rate” would correspond to a 10 percent increase in flow per hour, which would yield a 10 hour ramping duration.

[g] River Alliance did not provide a quantitative information that staff could use to develop a ramping duration.

NA Not available

Table 16 demonstrates the total loss in generation and the cost of providing three and four releases for 3-hour and 4-hour combinations of 1,500 cfs, 1,800 cfs, and 2,000 cfs per season. The total cost of scheduling three recreation flow releases at 1,500 cfs, as proposed by Wisconsin Public Service, would be up to $6,510 annually and would cause a total loss in generation of 54 MWh per recreation flow event. As shown in table 17, the recreation release of 2,000 cfs, if provided four times per season with a 10-percent ramp-up and 10-percent ramp-down rate, as Park Service and Interior recommend, would cost up to $25,000 annually and would cause a total loss in generation of 168 MWh per recreation flow event.

Providing one 4-hour recreation flow release provided at 1,800 cfs and two 4-hour recreation flow releases at 1,500 cfs would cost Wisconsin Public Service up to $6,770 annually, only $260 more than its proposal.

Table 16. Total generation losses and total costs of potential recreation flow releases (Source: Wisconsin Public Service, 2017, as modified by staff).

Volume of recreation flow release (cfs)	Duration of recreation flow release (hours)	Generation lost for recreation flow release	Generation lost for 2-hour ramp-up and 2-hour ramp-down	Total lost generation for one event	Value of lost generation for one event (at $21.71/MWh)	Number of events per year	Annual cost of staffing flow events	Total annual cost
1,500	3	27 MWh	18 MWh	45 MWh	$980	3	$3,000	$5,940
						4	$4,000	$7,920
	4	36 MWh	18 MWh	54 MWh	$1,170	3	$3,000	$6,510
						4	$4,000	$8,680
1,800	3	33 MWh	22 MWh	55 MWh	$1,190	3	$3,000	$6,570
						4	$4,000	$8,760
	4	44 MWh	22 MWh	66 MWh	$1,430	3	$3,000	$7,290
						4	$4,000	$9,720
2,000	3	36 MWh	24 MWh	60 MWh	$1,300	3	$3,000	$6,900
						4	$4,000	$9,200
	4	48 MWh	24 MWh	72 MWh	$1,560	3	$3,000	$7,680

Volume of recreation flow release (cfs)	Duration of recreation flow release (hours)	Generation lost for recreation flow release	Generation lost for 2-hour ramp-up and 2-hour ramp-down	Total lost generation for one event	Value of lost generation for one event (at $21.71/MWh)	Number of events per year	Annual cost of staffing flow events	Total annual cost
						4	$4,000	$10,240

Table 17. Total generation losses and total costs of recreation flow release scenarios with a 10-hour ramp-up and 10-hour ramp-down rate (Wisconsin Public Service, 2018, as modified by staff).

Volume of recreation flow release (cfs)	Duration of recreation flow release (hours)	Generation lost for recreation flow release	Generation lost for 2-hour ramp-up and 2-hour ramp-down	Total lost generation for one event	Value of lost generation for one event (at $21.71/MWh)	Number of events per year	Annual cost of staffing flow events	Total annual cost
1,500	3	27 MWh	90 MWh	117 MWh	$2,540	3	$7.800	$15,420
						4	$10,400	$20,560
	4	36 MWh	90 MWh	126 MWh	$2,740	3	$7,800	$16,020
						4	$10,400	$21,360
1,800	3	33 MWh	110 MWh	143 MWh	$3,100	3	$7,800	$17,100
						4	$10,400	$22,800
	4	44 MWh	110 MWh	154 MWh	$3,340	3	$7,800	$17,820
						4	$10,400	$23,760
2,000	3	36 MWh	120 MWh	156 MWh	$3,390	3	$7,800	$17,970
						4	$10,400	$23,960

Volume of recreation flow release (cfs)	Duration of recreation flow release (hours)	Generation lost for recreation flow release	Generation lost for 2-hour ramp-up and 2-hour ramp-down	Total lost generation for one event	Value of lost generation for one event (at $21.71/MWh)	Number of events per year	Annual cost of staffing flow events	Total annual cost
	4	48 MWh	120 MWh	168 MWh	$3,650	3	$7,800	$18,750
						4	$10,400	$25,000

Table 18. Total generation losses and total costs of combination recreation flow releases (Source: Wisconsin Public Service, 2017, as modified by staff).

Volume of recreation flow release (cfs)	Duration of recreation flow release (hours)	Generation lost for recreation flow release	Generation lost for 2-hour ramp-up and 2-hour ramp-down	Total lost generation for one event	Value of lost generation for one event (at $21.71/MWh)	Number of events per year	Annual cost of staffing flow events	Total annual cost
1,800	4	44 MWh	22 MWh	66 MWh	$1,430	1	$1,000	$2,430
1,500	4	36 MWh	18 MWh	54 MWh	$1,170	2	$2,000	$4,340

TOTAL ANNUAL COST								$6,770

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) 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 would 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 relicensing the projects. We weigh the costs and benefits of our recommended alternatives against other proposed measures.

Based on our independent review of agency comments filed on the projects and our review of the environmental and economic effects of the proposed action and alternatives for both projects, we selected the staff alternative as the preferred alternative for both projects. We recommend this alternative because: (1) issuing a new license for each project would allow Wisconsin Public Service to continue operating the projects as dependable sources of electrical energy; (2) the 2.65 MW of electric capacity from the Tomahawk Project and the 17.24 MW of electric capacity from the Grandfather Falls Project come from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of the staff alternative for both projects would exceed those of the no-action alternative for both projects; and (4) the proposed and recommended measures for each project would protect and enhance fish and wildlife resources, and improve public recreation opportunities at the project.

In the following section, we make recommendations as to which environmental measures proposed by Wisconsin Public Service or recommended by agencies should be included in any new licenses issued for the projects. In addition to Wisconsin Public Service's proposed environmental measures listed below for each project, we recommend additional staff-recommended environmental measures to be included in any new license issued for the project.

Appendix A, we describe the draft license articles that we recommend be included in any new licenses for the projects.

5.1.1 Measures Proposed by Wisconsin Public Service

Based on our environmental analysis of Wisconsin Public Service's proposals for both projects in section 3, and the costs presented in section 4, we conclude that the following environmental measures proposed by Wisconsin Public Service would protect

and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any licenses issued for the projects.

5.1.1.1 Tomahawk Project

- Continue to operate in a peaking mode with a maximum daily fluctuation of the Tomahawk reservoir of 0.80 foot or less from the normal pool elevation of 1,435.5 feet NGVD 29 during normal operation to protect aquatic resources.
- Continue to maintain a minimum flow of 162 cfs, or inflow to the project reservoir, whichever is less, from the project tailrace to protect and enhance water quality and fishery resources downstream of Tomahawk Dam.
- Implement the proposed Reservoir Drawdown Plan, filed on October 28, 2016, to protect fishery resources in the reservoir during drawdowns.
- Implement the proposed Operation Monitoring Plan, filed on October 28, 2016, to ensure that project operations are in compliance with operating requirements intended to protect, mitigate, and enhance aquatic resources.
- Implement the proposed Woody Debris Plan, filed on October 28, 2016, to establish procedures for removal of woody debris that accumulates on project trashracks and pass it downstream to benefit aquatic resources in the Wisconsin River.
- Implement the proposed Invasive Species Management Plan, filed on October 28, 2016, which includes provisions for: (1) terrestrial invasive plant monitoring; (2) training staff on terrestrial invasive plant identification; (3) the use of non-invasive seed materials for revegetation; and (4) educational signage to prevent the spread of invasive species.
- Implement proposed bat protection and avoidance measures for the northern long-eared bat.
- Implement proposed protection and avoidance measures for the Bald Eagle in accordance with FWS's *National Bald Eagle Management Guidelines and Conservation Measures.*
- Implement the proposed Recreation Plan, filed on October 28, 2016, which contains provisions to: (1) continue to operate and maintain the recreation facilities at the project; (2) install and maintain one portable toilet at the reservoir boat landing and tailwater boat landing from Memorial Day to Labor Day; and (3) monitor recreation facility use every 6 years for the FERC Form-80.
- Implement the statewide PA for Wisconsin and the HPMP, filed on October 28, 2016, to protect historic properties.

5.1.1.2 Grandfather Falls Project

- Continue to operate in a peaking mode with a maximum daily fluctuation of the Grandfather Falls reservoir of 1.0 foot or less from the normal pool elevation of 1,397.1 feet NGVD 29 during normal operation to protect aquatic resources.
- Continue to maintain a minimum flow of 400 cfs, or inflow to the project reservoir, whichever is less, from the project tailrace to protect water quality and fishery resources downstream of the Grandfather Falls Dam.
- Continue to maintain a minimum flow of 50 cfs in the Grandfather Falls bypassed reach[59] to protect fishery resources in the Grandfather Falls bypassed reach.
- Continue to monitor the minimum flow released at the Grandfather Falls Dam into the Grandfather Falls bypassed reach to ensure the 50 cfs minimum flow is met to protect fishery resources in the bypassed reach.
- Implement the proposed Reservoir Drawdown Plan, filed on October 28, 2016, to protect fishery resources in the reservoir during drawdowns.
- Implement the proposed Operation Monitoring Plan, filed on October 28, 2016, to ensure that project operations are in compliance with operating requirements intended to protect, mitigate, and enhance aquatic resources.
- Implement the proposed Woody Debris Management Plan, filed on October 28, 2016, to establish procedures for removal of woody debris that accumulates on project trashracks and pass it downstream to benefit aquatic resources in the Wisconsin River.
- Implement the proposed Invasive Species Management Plan, filed on October 28, 2016, which includes provisions for: (1) terrestrial invasive plant monitoring; (2) training staff on terrestrial invasive plant identification; (3) the use non-invasive seed materials for revegetation; and (4) educational signage to prevent the spread of invasive species.
- Implement proposed bat protection and avoidance measures for the northern long-eared bat.
- Implement proposed protection and avoidance measures for the Bald Eagle in accordance with FWS's *National Bald Eagle Management Guidelines and Conservation Measures.*
- Implement the proposed Recreation Plan, filed on October 28, 2016, which contains provisions to: (1) continue to operate and maintain the existing and proposed recreation facilities at the project; (2) remove rocks upstream of the Grandfather Falls flowage boat landing; (3) add one portable toilet at the Grandfather Falls flowage boat landing, Grandfather Falls Dam access,

[59] The proposed 50-cfs flow release may be used to contribute to the proposed 400 cfs minimum flow released into the project tailrace.

Grandfather Falls intake access, and the Grandfather Falls tailrace access, from Memorial Day to Labor Day; (4) provide up to three 4-hour scheduled whitewater flow releases of 1,500 cfs; (5) monitor the use of each scheduled recreation flow release; (6) construct a path from the Ice Age Trail to an alternative put-in location downstream of the dam; (7) install directional signage for boaters along the bypassed reach; (8) install a kiosk at the Grandfather Falls Dam access site; (9) develop a webpage to post whitewater flow information; and (10) monitor recreation facility use every 6 years for the FERC Form-80.

- Remove 2,053 acres of land from the existing project boundary that would not be necessary for project operation and maintenance, or not needed for other project purposes.
- Implement the statewide PA for Wisconsin and the proposed HPMP, filed on October 28, 2016, to protect historic properties.

5.1.2 Additional Measures Recommended by Staff

In addition to Wisconsin Public Service's proposed measures noted above for each project, we recommend including the following measures in any new licenses issued for the Tomahawk and Grandfather Falls Projects. Unless otherwise noted, each measure applies to both projects.

- Modify the proposed Operation Monitoring Plan for the Grandfather Falls Project to include methods and procedures for verifying whitewater boating flows in the Grandfather Falls bypassed reach.
- Modify the proposed Invasive Species Management Plan for each project to include: (1) a description of the proposed monitoring methods for invasive aquatic plants within the reservoir, (2) the proposed frequency of monitoring; and (3) the proposed criteria to be used to determine when control measures would be implemented.
- Modify the proposed northern long-eared bat protection measures for each project to include implementing seasonal clearing restrictions on removing trees with a diameter equal to or greater than 3 inches at breast height from April 1 to October 1 to protect roosting northern long-eared bats.
- Modify the proposed Recreation Plan for the Grandfather Falls Project to include provisions for: (1) providing up to one 4-hour scheduled whitewater flow release of 1,800 cfs, between May 1 and May 31 in the bypassed reach, and up to two 4-hour scheduled releases of 1,500 cfs, between May 1 and June 21, each year; (2) modifying the proposed kiosk at the Grandfather Falls Dam access site to remove the provision for Park Service to provide information on hazards along the bypassed reach; (3) modify the proposed whitewater boating webpage to remove the provision to include the results of the 2014 recreation flow study, and include a description of the characteristics of the bypassed reach and general safety

guidelines; and (4) preparing an annual report on recreation use for the first 3 years of scheduled recreation flow releases and, subsequently, in conjunction with the FERC Form-80.

- Remove from the proposed project boundary for the Grandfather Falls Project: (1) 886 acres of hardwood forest located on the west and east side of the reservoir and downstream of the powerhouse, with the exception of the land needed for the Ice Age Trail; and (2) the BLM-owned island downstream of the Grandfather Falls Project and the bypassed reach, all waters downstream of the project tailrace which are not needed for project operation and maintenance.

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

5.1.2.1 Operation Monitoring Plan

As discussed in section 3.3.1, *Aquatic Resources*, implementation of an Operation Monitoring Plan for each project would ensure that the projects are operated in accordance with any new licenses issued for the projects.

FWS recommends that the Operation Monitoring Plan include a provision for documenting inflow to and outflow from the Grandfather Falls Project tailrace and from the Grandfather Falls bypassed reach. As discussed in section 3.3.1, *Aquatic Resources* there is no need to document inflow for purposes of determining compliance with the operational measures. Compliance can be determined by electronic monitoring equipment on site at the Grandfather Falls Project. The inflow and outflow flows are determined by an existing gage at the Grandfather Falls Dam and from measurements collected from flows through the project turbine discharges at the Grandfather Falls powerhouse. Therefore, we do not recommend FWS's recommended measure.

Wisconsin Public Service also proposes whitewater boating flows be released into the Grandfather Falls bypassed reach. We recommend that the proposed Operation Monitoring Plan for the Grandfather Falls Project be modified to include monitoring whitewater boating flow releases in the bypassed reach. The addition of this whitewater flow monitoring component would be of nominal cost and would provide the benefit of confirming that the proper flows and proposed ramping rates associated with the flows are followed for protecting boaters and aquatic resources in the bypassed reach. As discussed in section 4, the levelized annual cost of modifying the Operation Monitoring Plan would be $33. The benefits of modifying the plan would be worth the cost.

5.1.2.2 Invasive Species Management Plan

As discussed in section 3.3.2, *Terrestrial Resources*, surveys have indicated the presence of terrestrial and aquatic invasive plants at the Grandfather Falls and Tomahawk Projects. Eurasian water milfoil and other aquatic invasive plants found in both projects' can be spread by recreational boaters. In addition, increased populations of invasive

plants, such as Eurasian water milfoil, could adversely affect native aquatic plants in project waters by crowding out native aquatic plants.

Wisconsin Public Service's proposed Invasive Species Management Plan, includes measures to monitor terrestrial invasive plants; however, the proposed plan does not include measures to monitor aquatic invasive plants at the projects. Therefore, we recommend modifying the proposed plan to include: (1) a description of the proposed monitoring methods for both terrestrial and aquatic invasive species; (2) the proposed frequency of monitoring for both terrestrial and aquatic invasive species; (3) the proposed criteria to be used to determine when control measures would be implemented; and (4) a schedule for filing monitoring reports. The development and implementation of an Invasive Species Management Plan with these modifications would be worth the levelized annual cost of $3,002 for each project.

5.1.2.3 Northern Long-Eared Bat Protection Measures

As discussed in section 3.3.4, *Threatened and Endangered Species*, Wisconsin Public Service proposes to maintain portages at the Tomahawk and Grandfather Falls Projects, which may require scheduled removal of vegetation, including trees. Also for the Grandfather Falls Project, Wisconsin Public Services proposes to construct a connector path from the Ice Age Trail to an alternative whitewater boating put-in location downstream of the dam, which would require tree removal of around 25 trees, with some equal to or greater than 3 inches in diameter at breast height. Trees provide valuable habitat for the northern long-eared bats during their roosting reproductive phase, which takes place in the summer months, and tree removal during these months may disturb roosting northern long-eared bats.

Wisconsin Public Service proposes to perform all tree clearing between June 1st and July 31st, and consult with FWS if tree removal is required within the established pup season or within 0.25 mile of a known hibernacula. These measures, however, do not provide seasonal protections for the northern long-eared bat, as its summer roosting can extend from April to October. For these reasons, we recommend that Wisconsin Public Service's extend the seasonal tree removal restrictions for trees greater than or equal to 3 inches in diameter at breast height between April 1 and October 31.

Modifying the proposed northern long-eared bat protection measures would result in a nominal cost.

5.1.2.4 Bald Eagle Protection Measures

As discussed in section 3.3.3, *Terrestrial Resources*, project maintenance at the Tomahawk and Grandfather Falls Projects has the potential to disturb resident eagles during their foraging, nest building, incubation, and other phases of their reproductive life cycle. In addition, Wisconsin Public Service proposes to maintain boat portages at both projects, and construct a connecting path from the Ice Age trail to a whitewater boating

put-in site on the Grandfather Falls Project's bypassed reach. Both activities would require tree removal, which could disturb resident eagles.

As part of Wisconsin Public Service's Wildlife Management Plan, it proposes to follow management practices established in the National Bald Eagle Management Guidelines (FWS, 2007) and to consult with FWS in the event that the species or its nests are encountered or disturbed during any proposed project management activities. While we do not recommend the proposed Wildlife Management Plan, as discussed in section 5.1.3, *Measures Not Recommended by Staff*, we do recommend the implementation of a bald eagle plan that includes the bald eagle avoidance and protection measures, as proposed by Wisconsin Public Service. Implementing a plan that includes avoidance techniques and conservation measures listed in FWS's National Bald Eagle Management Guidelines would help ensure that any effects to the bald eagles and their habitat, due to project operation or maintenance, would be minimized at each project.

The implementation a plan that includes the FWS's National Bald Eagle Management Guidelines would be a nominal cost.

5.1.2.5 Grandfather Falls Recreation Plan

Whitewater Flows

As discussed in section 3.3.5, *Recreation and Land Use Resources*, Wisconsin Public Service's proposed Recreation Plans would enhance the recreation facilities at each project. Currently, the Grandfather Falls Project provides access to whitewater boaters at the bypassed reach, but boaters are unable to adequately estimate flow ranges, and are therefore unable to effectively prepare for their trips to the project. Within the vicinity of the project, there are opportunities for participants with a range of skill levels, from beginner to expert, and within this area there is no deficit in availability of opportunity for any particular skill level.

Wisconsin Public Service proposes to provide up to three, 4-hour recreation flow releases of 1,500 cfs between May 1 and June 21 each year. Park Service and the Interior recommend that Wisconsin Public Service provide four, 4-hour whitewater recreation flow releases of 2,000 cfs, with a ramping rate of 10 percent, between May 1 and June 30 each year. River Alliance recommends that Wisconsin Public Service provide five 4-hour whitewater recreation flow releases of 2,000 cfs per year between May 1 and June 21.

Based on the river flows occurring in the Grandfather Falls bypassed reach in May and June between 2000 and 2014, the Grandfather Falls Project would be able to support 1,500-cfs flow events, including Wisconsin Public Service's proposed 2-hour ramping rate before and after each event, for 4 hours 90 percent of the time in May and June, while flows of 2,000 cfs could only be sustained for 2.4 hours in May and 1.6 hours in June. Also, based on the flow data for May and June in 2000 and 2014, a whitewater

recreation flow release of 1,800 cfs, including a 2-hour ramping rate before and after each event, could be sustained for 4.1 hours in May and 2.6 hours in June.

Recalling that the whitewater recreation flow study identified 2,000 cfs as being the uppermost volume released for optimal flows for a standard trip and the start of optimal flows for expert boaters, a recreation flow release of 2,000 cfs would not be reasonable for the widest range of whitewater boaters and is not worth the substantially higher cost. Additionally, flows of 2,000 cfs are not sustainable during May and June to allow a 4-hour recreation flow release, and expert boaters seeking an optimal trip can access the nearby Wausau Whitewater Park for its high-flow events. Furthermore, providing a whitewater recreation flow release of 2,000 cfs for four or five times per season, as recommended by Park Service and Interior or River Alliance, respectively, would only be useable by expert whitewater boaters, and would not be boatable for the widest range of whitewater boaters.

In addition, as discussed in section 4.3, *Cost of Environmental Measures*, the total cost of scheduling three recreation flow releases at 1,500 cfs, as proposed by Wisconsin Public Service, would be up to $6,510 annually and would cause a total loss in generation of 54 MWh per recreation flow event. The recreation release of 2,000 cfs, if provided four or five times per season, as Park Service and Interior or River Alliance recommend, respectively, would cost up to $10,240 annually and result in a total loss in generation of 72 MWh per flow event. Providing one 4-hour recreation flow release at 1,800 cfs and two 4-hour recreation flow releases at 1,500 cfs would cost Wisconsin Public Service up to $6,770 annually, only $260 more than its proposal.

Therefore, we conclude that modifying the Recreation Plan to provide up to one release of 1,800 cfs for 4 hours, between May 1 and May 31 each year, and two 4-hour, 1,500-cfs releases, in subsequent weekends before June 21 would: (1) provide the best balance of recreation uses by expanding the potential for diverse whitewater opportunities for the full spectrum of boating skill levels; (2) meet a public interest need for whitewater recreation in the project area and greater project vicinity; and (3) minimize the cost of diverting the flows in the bypassed reach.

In the event that inflow to the project is insufficient to sustain the proposed 4-hour release, Wisconsin Public Service agrees to Park Service's and Interior's recommendation to shorten the peak flow release period to 3 hours, rather than canceling the event as initially proposed, if the flows are available. This proposal is an appropriate measure for balancing recreation opportunity with project operation needs.

Kiosk

Along with the proposed scheduled recreation flow releases, Wisconsin Public Service proposes to install and maintain a kiosk, as identified in its Recreation Plan for the Grandfather Falls Project. To increase boater preparedness at the bypassed reach and ensure that the needs of boaters are met and facilities are adequate for maintaining and promoting a safe and quality boating experience for recreationists, we recommend

modifying the proposed kiosk to include: (1) a picture and description of any hazards along the bypassed reach, including the rock ledge between reaches 2 and 3; and (2) general whitewater boating safety guidelines, including the importance of wearing a personal floatation device. Further, we recommend modifying the proposed kiosk to include a sign-in sheet and an explanation of the importance and rationale of paddlers signing in at each release to better document use of the bypassed reach for whitewater boating, especially during the fledgling years of implementing the scheduled whitewater releases.

Website

Wisconsin Public Service's proposal to develop a webpage customized for boaters preparing a trip to the project would inform recreationists of current flow and elevation status, including changes in scheduled flows, high- and low-flow events, and curtailed or cancelled events, would enhance boater preparedness. However, the webpage would be limited to flow information and updates on scheduled releases, and would not contribute otherwise to boater preparedness. Therefore, we recommend modifying the proposed webpage to offer the same information that is proposed for the kiosk to include: (1) a map of the bypassed reach that indicates the put-in and take-out locations and portage routes, as well as safety warnings for boating the bypassed reach, including the rock ledge located between reaches 2 and 3; (2) a picture and description of the rock ledge located between reaches 2 and 3; (3) scheduled whitewater flow releases by April 1 of each year; (4) general safety guidelines, including the importance of wearing a personal floatation device; (5) a description of the characteristics of the bypassed reach; (6) an explanation of the importance and rationale of paddlers signing in at each release; and (7) flow status information for scheduled events would prepare recreationists for boating the bypassed reach.

Park Service and Interior recommend that Wisconsin Public Service post the 2014 whitewater study on its webpage. Including the full report from the 2014 whitewater study on the webpage does not serve the webpage's purpose of informing boaters of flow conditions or helping them prepare for a trip to the bypassed reach. Therefore, we do not recommend that Wisconsin Public Service include on its website the results of the 2014 whitewater study.

Notification and Monitoring

We also recommend modifying the proposed Grandfather Falls Project Recreation Plan to include a measure to notify Park Service's Midwest Great Lakes Hydropower Coordinator and American Whitewater of scheduled release dates by April 1 each year, in addition to Wisconsin Public Service's proposal to post its scheduled release dates on its website to foster further cooperation among stakeholders and increase whitewater boating opportunities in the region.

Wisconsin Public Service proposes to monitor recreation facility use every 6 years for the FERC Form-80 schedule requirement. While we agree that monitoring flows and

boater frequency would assist with planning to improve future scheduled releases, the Grandfather Falls Project has never provided scheduled recreation flow releases and preparing a report of recreation use at the scheduled releases and capacity of the whitewater recreation amenities, as recommended by Park Service and Interior, would be appropriate and beneficial. Therefore, we recommend that, in addition to monitoring, Wisconsin Public Service modify its proposed Recreation Plan for the Grandfather Falls Project to include a report on recreation use at the scheduled recreation flow releases and capacity of the whitewater recreation amenities for the Midwest Great Lakes Hydropower Coordinator, American Whitewater, and Commission annually, for the first 3 years of scheduled releases and, subsequently, in conjunction with the FERC Form-80. Doing so would allow entities an opportunity to collaboratively evaluate the need for any operational or facility improvements or modifications related to the scheduled recreation whitewater flow releases.

We conclude that implementing the proposed Recreation Plan with the stated recommendations for each project would be worth the levelized annual cost of $296 for the Tomahawk Project and $7,465 for the Grandfather Falls Project.

5.1.2.6 Grandfather Falls Project Boundary

As discussed in section 3.3.5, *Recreation and Land Use Resources*, there are 886 acres of hardwood forest located within the project boundary for the Grandfather Falls Project, including parts of the Ice Age Trail. Because Wisconsin Public Service proposes to continue to maintain the Ice Age Trail, this facility is considered project recreation and should be kept within the project boundary; however, most of the remaining 886 acres of land is not necessary for project operation and maintenance or for other project purposes, such as recreation, protection of cultural resources, or protection of other environmental resources. Further, the BLM-owned island and bypassed reach serve no project purpose and do not include any cultural or wildlife resources that would be affected by the project. As such, we recommend removing these land, with the exception of the Ice Age Trail described above, and water from the proposed project boundary, and doing so would be negligible in cost.

5.1.2.7 Cultural Resources

The Grandfather Falls Project is considered a historic district and is eligible for listing on the National Register under Criterion A: *Event* and Criterion C: *Design/Construction*. Adverse effects may occur to historic project features due to repairs and modifications that, while necessary for the continued safe and efficient operation, are not in keeping with the project's historic character. Also, future maintenance or emergency situations may adversely affect the Grandfather Falls Project. Within the APE for the Tomahawk Project, site 47LI0105 is eligible for listing on the National Register under Criterion D: *Information Potential*. The site has been vandalized and looted.

To address the adverse effects on both identified and unidentified historic properties, Wisconsin Public Service proposes to implement the statewide PA and HPMPs, as required by the statewide PA. Any effects on unknown historic properties for the projects would be taken into account through the HPMPs. In addition, the HPMP for the Grandfather Falls Project would ensure that Wisconsin Public Service implements measures to avoid, lessen, or mitigate for any adverse effect to the project if future project maintenance requires the modification to the project or emergency situations arise. The HPMP for the Tomahawk Project contains measures to monitor site 47LI0105 and address vandalism or disturbance of the site. We conclude that implementing the executed statewide Wisconsin PA would be negligible in cost, and implementing the HPMP for each project would be worth the levelized annual cost of $2,970 for the Tomahawk Project and $1,320 for the Grandfather Falls Project.

5.1.3 Measures Not Recommended by Staff

5.1.3.1 Aquatic Resource Fund

As previously discussed in section 3.3.1, *Aquatic Resources*, Wisconsin Public Service proposes to implement an Aquatic Resource Fund for both projects. The Aquatic Resource Fund would provide $13,500 each to the Tomahawk Project and to the Grandfather Falls Project, annually in funding potential aquatics- or terrestrial-related activities at each project. The types of activities could include:

(1) conducting an aquatic plant invasive point-intercept survey;

(2) releasing *Galerucella* beetles in nearshore areas of project reservoirs to control invasive terrestrial plants;

(3) controlling Eurasian water milfoil using herbicides;

(4) conducting a fish survey at each project; and

(5) conducting a water quality monitoring study at each project.

As stated in section 3.3.1, *Aquatic Resources*, the water quality is good; fish and aquatic organisms (including mussels) are healthy, robust, and self-supporting; and there is a good sports fishery. In addition, the implementation of staff-recommended measures, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, for terrestrial and aquatic invasive plants in the project boundary would mitigate for any adverse effects to native plants and water-based recreation, such as boating.

In addition, the Commission' Settlement Policy Statement notes that it is the Commission's preference that there should be specific protection, mitigation, and enhancement measures that have a clear nexus to the project (i.e., a relationship between project effects or purposes and a proposed measure must be established) rather than broad funding measures. As discussed in section 3.3.1, *Aquatic Resources* there is no evidence that the types of activities that could be funded by Aquatic Resource Fund are needed to

address a project effect. Therefore, we do not recommend the proposed Aquatic Resources Fund.

5.1.3.2 Consultation with FWS for the Grandfather Falls Project

FWS recommends that Wisconsin Public Service consult with them on matters affecting fish and wildlife resources at the Grandfather Falls Project throughout the term of any new license issued for the project. As discussed in section 3.3.1, *Aquatic Resources*, as component of the proposed Operation Monitoring Plan, Wisconsin Public Service must discuss operational compliance matters of the project with FWS at an annual meeting to be held each year. This meeting provides an opportunity for FWS to discuss with the applicant any issues it has regarding project operational effects on fish and wildlife resources. Therefore, we do not recommend a separate consultation with FWS throughout the term of any new license, if issued.

5.1.3.3 Wildlife Management Plan

As discussed in sections 3.3.2, *Terrestrial Resources;* 3.3.3, *Threatened and Endangered Species*; and section 3.3.4, *Recreation and Land Use*, Wisconsin Public Service proposes to implement the Wildlife Management Plan for each project. The plans include: (1) guidance on how to address project effects on the federally listed northern long-eared bat and gray wolf; (2) proposed measures for the bald eagle and wood turtle; (3) proposed measures for forest management, forest insect and disease programs, and fire control; and (4) management of shoreline resources.

As discussed in section 3.3.4, *Recreation and Land Use*, staff determined that the forested land within the proposed project boundary for the Grandfather Falls Project should be removed from the project not necessary for project operation and maintenance or for other project purposes, such as recreation, protection of cultural resources, or protection of other environmental resources. In addition, the Tomahawk Project does not contain forests in the project boundary, and therefore it is not necessary for forests to be managed because they are not necessary for project operation and maintenance or for other project purposes. Therefore, the measures for forest management would not be necessary for both projects. Similarly, the proposed measures in the plan for federally listed gray wolf would not be necessary because there would be no effect for the gray wolf.

As discussed in section 3.3.5, *Recreation and Land Use Resources,* conducting visual inspections of the shoreline every 6 years, in conjunction with the FERC Form-80 would be redundant and unnecessary because paragraph (b) of the standard article, *Land Use and Occupancy*, requires a licensee to monitor project property for non-conforming structures to ensure that no unauthorized project and non-project uses or occupancies occur within the project boundary. Similarly, as discussed in section 3.3.3, *Threatened and Endangered Species* providing a 200-foot-wide, no-cut buffer zone, would be arbitrary because the staff-recommended measure to avoid cutting trees during certain times of the year to protect the northern long-eared bat would protect trees needed for

northern long-eared bat's maternity roosting season. Further, Wisconsin Public Service's justification for recommending the 200-foot no-cut zone does not include any environmental measures related to license conditions that would manage the lands under the staff alternative. As such, the lands would not serve a project purpose, and providing such a buffer would be unnecessary.

Implementing the proposed individual wildlife measures, as discussed above in section 5.1.2, *Additional Measures Recommended by Staff,* would address any project effects on wildlife. Therefore, we do not recommend the proposed Wildlife Management Plan for each project.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Entrainment, as a result of operating both projects, would continue to cause incidental losses of some fish at the projects; however, fish populations are healthy and self-sustaining at both projects. With the exception of the proposed whitewater boating flows in the Grandfather Falls bypassed reach, Wisconsin Public Service is proposing to continue operating both projects as currently operated, and as a result, we do not foresee any additional effects on fish and water quality in project-affected waters.

5.3 SUMMARY OF SECTION 10(j) 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, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds 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 shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to our March 1, 2017, notices accepting the two applications to relicense both projects and soliciting motions to intervene, protests, comments, recommendations, preliminary terms and conditions, and preliminary fishway prescriptions, Interior filed three recommendations under section 10(j) for the Grandfather Falls Project on April 28, 2017. We found that only one of the three recommendations were within the scope of 10(j). Of the three 10(j) recommendations, we recommend adopting one. Table 19 lists the recommendations filed under section 10(j), and indicates whether the recommendations are included in the staff alternative.

No 10(j) recommendations were made by any federal or state fish and wildlife agency for the Tomahawk Project and the state fish and wildlife resource agency did not make any 10(j) recommendations for the Grandfather Falls Project.

Section 5.1.3, *Measures Not Recommended*, discusses the reasons for not adopting the measures we determined are not within the scope of 10(j).

Table 19. Analysis of fish and wildlife agency recommendations for the Grandfather Falls Project (Source: staff).

Recommendation	Agency	Within Scope of Section 10(j)	Levelized Annual Cost ($)	Recommend Adopting?
(1) Develop a plan to monitor compliance with project operation that employs mechanisms to document inflow to and discharge from the project, including in the Grandfather Falls bypassed reach and in the project tailrace.	Interior	Yes	33	No. Mechanisms are already in place to monitor inflow and outflows from the project. In addition, we are recommending the proposed compliance monitoring plan be modified to include methods and procedures for monitoring whitewater flow releases in the Grandfather Falls bypassed reach.
(2) Consult with FWS on matters affecting fish and wildlife throughout the term of the new license.	Interior	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	0	No. We find no project-related need to include a license requirement for an annual fish

				and wildlife consultation meeting with the agencies.
(3) Consult with either FWS or Park Service on decisions regarding protection and enhancement management activities in the Wisconsin River, including the annual selection of projects or tasks proposed for the Aquatic Resources Fund.	Interior	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	0	No. We find no project-related need justifying including this measure as a license requirement.

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 federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the projects. We reviewed seven qualifying comprehensive plans that are applicable to the Tomahawk and Grandfather Falls Projects.[60] No inconsistencies were found.

[60] (1) National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993; (2) 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.; (3) U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986; (4) U.S. Fish and Wildlife Service. 1993. Upper Mississippi River & Great Lakes region joint venture implementation plan: A component of the North America waterfowl management plan. March 1993; (5) U.S. Fish and Wildlife Service. 1983. Higgins Eye (*Lampsilis higginsi*) mussel recovery plan. Prepared by the Higgins Eye Mussel Recovery Team. Twin Cities, Minnesota. July 29, 1983; (6) Wisconsin Department of

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6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Tomahawk and Grandfather Falls Projects are issued new licenses as proposed with the additional staff-recommended measures, the projects would continue to operate while providing enhancements to aquatic and terrestrial resources, improvements to recreation sites and facilities, and protection of cultural and historic resources in the project area.

Based on our independent analysis, issuance of new licenses for the Tomahawk and Grandfather Falls Projects, with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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8.0 LIST OF PREPARERS

Lee Emery – Project Coordinator, Water Quality and Aquatic Resources (Fishery Biologist; B.S. Biology; M.S. Zoology)

Chelsea Hudock – Recreation, Land Use, Aesthetics, and Cultural Resources (Outdoor Recreation Planner; B.S., Parks, Recreation, and Tourism Management; M.S. Recreation, Park, and Tourism Sciences)

Laura Washington – Terrestrial Resources, Threatened and Endangered Species (Outdoor Recreation Planner, B.S., Animal Science, M.E.M., Ecosystem Conservation and Management)

Tyrone Williams – Need for Power, Developmental Resources (Engineer, M. Eng., Environmental Engineering)

APPENDIX A LICENSE CONDITIONS FOR THE TOMAHAWK PROJECT RECOMMENDED BY STAFF

Draft Article 301. *Project Modification Resulting from Environmental Requirements.* If environmental requirements under this license require modification that may affect the project works or operation, the licensee must consult with the Commission's Division of Dam Safety and Inspections (D2SI)–Chicago Regional Engineer. Consultation must allow sufficient review time for the Commission to ensure that the proposed work does not adversely affect the project works, dam safety, or project operation.

Draft Article 401. *Project Operation.* The licensee must at all times maintain the Tomahawk Reservoir (Lake Mohawksin) within a maximum daily fluctuation of 0.8 foot or less from the normal pool elevation of 1,435.1 feet National Geodetic Vertical Datum 1929.

The operational requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee or for short periods upon mutual agreement between the licensee and Wisconsin Department of Natural Resources. If the operational requirement is so modified, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 402. *Minimum Flow in Project Tailrace.* The licensee must operate the project to maintain a minimum flow of 162 cubic feet per second, or inflow, whichever is less, to the project tailrace to protect water quality and fishery resources in the Wisconsin River.

The minimum flow requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee or for short periods upon mutual agreement between the licensee and Wisconsin Department of Natural Resources. If the minimum flow is so modified, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 403. *Reservoir Drawdown Management Plan*. The Revised Drawdown Management Plan, filed October 28, 2016, is approved and made part of this license and may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the Revised Drawdown Management Plan.

Draft Article 404. *Woody Debris Management Plan.* The Revised Woody Debris Management Plan, filed October 28, 2016, is approved and made part of this license and may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the Revised Woody Debris Management Plan.

Draft Article 405. *Operation Monitoring Plan*. The Operation Monitoring Plan, filed October 28, 2016, is approved and made part of this license and may not be

amended without prior Commission approval. If there are any deviations with the operational requirements of the license, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 406. *Northern Long-eared Bat Protection Measures*. The licensee must implement the following measures to protect northern long-eared bat habitat:

(1) avoid the cutting, trimming, or destruction of trees on project land from April 1 through October 31, unless they pose an immediate threat to human life or property; and

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

Draft Article 407. *Invasive Species Management Plan.* Within 1 year of license issuance, the licensee must file with the Commission, for approval, a revised Invasive Species Management Plan that includes the provisions of the Invasive Species Management Plan, filed on October 28, 2016, with the following additional provisions:

(1) a description of monitoring methods for both terrestrial and aquatic invasive species;

(2) the frequency of monitoring for both terrestrial and aquatic invasive species;

(3) the criteria to be used to determine when control measures would be implemented; and

(4) a schedule for filing monitoring reports with Wisconsin Department of Natural Resources (Wisconsin DNR) and the Commission.

The licensee must modify and implement the plan after consultation with Wisconsin DNR. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to Wisconsin DNR, and specific descriptions of how the agencies are accommodated by the plan. The licensee must allow a minimum of 30 days for Wisconsin DNR to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information. The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 408. *Bald Eagle Avoidance and Protection Plan.* Within 1 year of license issuance, the licensee must file with the Commission, for approval, a Bald Eagle Avoidance and Protection Plan to avoid and minimize effects to nesting bald eagles. The plan must include, but not necessarily be limited to, the following:

(1) a description of the measures to avoid or mitigate for effects to nesting bald eagles within the project boundary; and

(2) an explanation of how the measures take into consideration United States Fish and Wildlife Service's *2007 Bald Eagle Management Guidance*.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 409. *Recreation Plan*. The Recreation Plan, filed October 28, 2016, is approved and made part of this license and may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the Recreation Plan.

Draft Article 410. *Programmatic Agreement and Historic Properties Management Plan*. The licensee must implement the "Programmatic Agreement Among the Federal Energy Regulatory Commission, 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 Continued Operation of Hydroelectric Projects in the State of Wisconsin and Adjacent Portions of the State of Michigan," executed on December 16, 1993, and including, but not limited to, the Historic Properties Management Plan (HPMP) for the project, filed on October 28, 2016, and approved herein. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 411. *Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or

occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap will be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and will not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that

discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is 5 acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project lands and waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings will be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

APPENDIX B

LICENSE CONDITIONS FOR THE GRANDFATHER FALLS PROJECT RECOMMENDED BY STAFF

Draft Article 301. *Project Modification Resulting from Environmental Requirements.* If environmental requirements under this license require modification that may affect the project works or operation, the licensee must consult with the Commission's Division of Dam Safety and Inspections (D2SI)–Chicago Regional Engineer. Consultation must allow sufficient review time for the Commission to ensure that the proposed work does not adversely affect the project works, dam safety, or project operation.

Draft Article 401. *Project Operation.* The licensee must maintain the Grandfather Falls reservoir within a maximum daily fluctuation of 1.0 foot or less from the normal pool elevation of 1,397.1 feet National Geodetic Vertical Datum 1929.

The operational requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee or for short periods upon mutual agreement between the licensee and Wisconsin Department of Natural Resources. If the operational requirement is so modified, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 402. *Operation Monitoring Plan*. Within 6 months of license issuance, the licensee must file with the Commission, for approval, a revised Operation Monitoring Plan that includes, at a minimum, the provisions of the Operation Monitoring Plan on filed October 28, 2016, and the following:

(1) a detailed description of how project facilities will be operated to comply with the whitewater boating flows required in Article 410;

(2) a detailed description of the methods and procedures that would be used to monitor whitewater flow releases into the Grandfather Falls bypassed reach, including a description of the types and exact locations of all flow monitoring equipment, techniques and procedures for maintaining and calibrating the monitoring equipment, and a description of the frequency that whitewater boating flows would be verified; and

(3) a detailed description of the protocols the licensee will implement during scheduled and unscheduled project shutdowns.

The licensee must modify and implement the plan after consultation with Wisconsin Department of Natural Resources (Wisconsin DNR). The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to Wisconsin DNR, and specific descriptions of how the agencies are accommodated by the plan. The licensee must allow a minimum of 30 days for Wisconsin DNR to comment

and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information. The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 403. *Minimum Flow in Project Tailrace.* The licensee must operate the project to maintain a minimum flow of 400 cubic feet per second (cfs), or inflow, whichever is less, immediately downstream of the project tailrace to protect water quality and fishery resources in the Wisconsin River. The 50-cfs minimum flow release required by Article 403 may contribute to the 400-cfs, or inflow if less, requirement.

The minimum flow requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee or for short periods upon mutual agreement between the licensee and Wisconsin Department of Natural Resources. If the minimum flow is so modified, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 404. *Minimum Flow in the Bypassed Reach.* The licensee must operate the project to release a minimum flow of 50 cubic feet per second, or inflow, whichever is less, to the bypassed reach of the Wisconsin River between the project dam and the tailrace discharge.

The minimum flow requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee or for short periods upon mutual agreement between the licensee and Wisconsin Department of Natural Resources. If the minimum flow is so modified, the licensee must notify the Commission as soon as possible, but no later than 10 days, after each such incident.

Draft Article 405. *Ramping Rates*. Upon approval of the Recreation Plan required by Article 411, the licensee must implement a 2-hour up-ramping and 2-hour down-ramping duration for each whitewater boating flow release.

Draft Article 406. *Woody Debris Management Plan.* The Revised Woody Debris Management Plan, filed October 28, 2016, is approved and made part of this license and may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the Revised Woody Debris Management Plan.

Draft Article 407. *Reservoir Drawdown Management Plan*. The Revised Drawdown Management Plan, filed October 28, 2016, is approved and made part of this license and may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the Revised Drawdown Management Plan.

Draft Article 408. *Northern Long-eared Bat Protection Measures*. The licensee must implement the following measures to protect northern long-eared bat habitat:

(1) avoid the cutting, trimming, or destruction of trees on project land from April 1 through October 31, unless they pose an immediate threat to human life or property; and

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

Draft Article 409. *Invasive Species Management Plan.* Within 1 year of license issuance, the licensee must file with the Commission, for approval, a revised Invasive Species Management Plan that includes the provisions of the Invasive Species Management Plan, filed on October 28, 2016, with the following additional provisions:

(1) a description of monitoring methods for both terrestrial and aquatic invasive species;

(2) the frequency of monitoring for both terrestrial and aquatic invasive species;

(3) the criteria to be used to determine when control measures would be implemented; and

(4) a schedule for filing monitoring reports with Wisconsin Department of Natural Resources (Wisconsin DNR) and the Commission.

The licensee must modify and implement the plan after consultation with Wisconsin DNR. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to Wisconsin DNR, and specific descriptions of how the agencies are accommodated by the plan. The licensee must allow a minimum of 30 days for Wisconsin DNR to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information. The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 410. *Bald Eagle Avoidance and Protection Plan.* Within 1 year of license issuance, the licensee must file with the Commission, for approval, a Bald Eagle Avoidance and Protection Plan to avoid and minimize effects to nesting bald eagles. The plan must include, but not necessarily be limited to, the following:

(1) a description of the measures to avoid or mitigate for effects to nesting bald eagles within the project boundary; and

(2) an explanation of how the measures take into consideration United States Fish and Wildlife Service's *2007 Bald Eagle Management Guidance*.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the

Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 411. *Recreation Plan*. Within 6 months of license issuance, the licensee must file with the Commission, for approval, a revised Recreation Plan that includes the provisions of the Recreation Plan, filed on October 28, 2016, with the following additional provisions:

(1) modify the scheduled whitewater releases by providing up to one 4-hour scheduled whitewater flow release of 1,800 cfs, between May 1 and May 31, and up to two 4-hour scheduled releases of 1,500 cfs, between May 1 and June 21, each year;

(2) modify the kiosk at the Grandfather Falls Dam access site to include: (a) a map panel of the bypassed reach that indicates the put-in and take-out locations and portage routes, as well as safety warnings for boating the bypassed reach, (b) a picture and description of the rock ledge between reaches 2 and 3, (c) scheduled whitewater flow releases by April 1 of each year, (d) general whitewater boating safety guidelines, including the importance of wearing a personal floatation device, (e) a description of the characteristics of the bypassed reach, (f) a visible sign-in sheet and an explanation of the importance and rationale of paddlers signing in at each release, (g) flow status information for scheduled events, and (h) the link for Wisconsin Public Service's whitewater boating webpage;

(3) modify the whitewater boating webpage to include: (a) posting the schedule recreation flow releases by April 1 of each year, (b) a map of the bypassed reach that indicates the put-in and take-out locations and portage routes, as well as safety warnings for boating the bypassed reach, including the rock ledge located between reaches 2 and 3, (c) a picture and description of the rock ledge located between reaches 2 and 3, (d) general safety guidelines, including the importance of wearing a personal floatation device; (e) a description of the characteristics of the bypassed reach, (f) an explanation of the importance and rationale of paddlers signing in at each release, and (g) flow status information for scheduled events;

(4) notify National Park Service's Midwest Great Lakes Hydropower Coordinator and American Whitewater of scheduled release dates by April 1 each year; and

(5) prepare an annual report of whitewater recreation use during the scheduled recreation flow releases for the first 3 years of scheduled releases and, subsequently, in conjunction with the FERC Form-80.

The licensee must modify and implement the plan after consultation with National Park Service and U.S Department of Interior. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation,

the filing must include the licensee's reasons, based on project-specific information. The Commission reserves the right to require changes to the plan. The licensee must not begin implementing the plan until the Commission notifies the licensee that the plan is approved. Upon Commission approval, the licensee must implement the plan and schedule, including any changes required by the Commission.

Draft Article 412. *Programmatic Agreement and Historic Properties Management Plan*. The licensee must implement the "Programmatic Agreement Among the Federal Energy Regulatory Commission, 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 Continued Operation of Hydroelectric Projects in the State of Wisconsin and Adjacent Portions of the State of Michigan," executed on December 16, 1993, and including, but not limited to, the Historic Properties Management Plan (HPMP) for the project, filed on October 28, 2016, and approved herein. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 413. *Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads,

retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap will be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and will not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on

recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is 5 acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project lands and waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including

shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings will be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.