US Army Corps of Engineers®

CHICAGO DISTRICT

HORLICK DAM: ROOT RIVER RESTORATION RACINE, WI

SECTION 506
GREAT LAKES FISHERY & ECOSYSTEM RESTORATION

Integrated Feasibility Report & Environmental Assessment

Appendix C:
Monitoring & Adaptive Management Plan

May 19, 2023

APPENDIX H – Monitoring & Adaptive Management Plan

May 2023

Table of Contents

INTRODUCTION **1**
GUIDANCE 1
GENERAL MONITORING OBJECTIVES 2
PROJECT AREA DESCRIPTION 3
HABITAT TRENDS TRIGGERING RESTORATION 3
RESTORATION DESIGN OVERVIEW 3
MONITORING COMPONENTS **4**
COMPONENT 1 – FLUVIAL GEOMORPHOLOGY 4
COMPONENT 2 – BIOLOGICAL RESPONSE 4
SEA LAMPREY MONITORING 5
MONITORING RESPONSIBILITIES **5**
MONITORING COSTS & FUNDING SCHEDULE 6
REPORTING RESULTS 6
ADAPTIVE MANAGEMENT **6**
OPERATION & MAINTENANCE **6**

Introduction

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the Corps ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. This monitoring and adaptive management plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met.

Section 2039 of WRDA 2007 also directs the Corps to develop an adaptive management plan for all ecosystem restoration projects. The adaptive management plan must be appropriately scoped to the scale of the project. The information generated by the monitoring plan will be used by the District in consultation with the Federal and State resources agencies and the MSC to guide decisions on operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria.

An effective monitoring program is necessary to assess the status and trends of ecological health and biota richness and abundance on a per project basis, as well as to report on regional program success within the United States. Assessing status and trends includes both spatial and temporal variations. Gathered information under this monitoring plan will provide insights into the effectiveness of current restoration projects and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring the changes at a project site is not always a simple task. Ecosystems, by their very nature, are dynamic systems where populations of macroinvertebrates, fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This Monitoring and Adaptive Management Plan describes the existing habitats and monitoring methods that could be utilized to assess projects. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of the River Riparian Restoration Project is being met.

Guidance

The following documents provide distinct Corps policy and guidance that are pertinent to developing this monitoring and adaptive management plan:

1. Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration

   (a) In General - In conducting a feasibility study for a project (or a component of a project) for ecosystem restoration, the Secretary shall ensure that the recommended project includes, as an integral part of the project, a plan for monitoring the success of the ecosystem restoration.
   (b) Monitoring Plan - The monitoring plan shall--
   (1) include a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, and the estimated cost and duration of the monitoring; and

(2) specify that the monitoring shall continue until such time as the Secretary determines that the criteria for ecosystem restoration success will be met.

(c) Cost Share - For a period of 10 years from completion of construction of a project (or a component of a project) for ecosystem restoration, the Secretary shall consider the cost of carrying out the monitoring as a project cost. If the monitoring plan under subsection (b) requires monitoring beyond the 10-year period, the cost of monitoring shall be a non-Federal responsibility.

2. 33 U.S.C.A. §2330a. Monitoring ecosystem restoration

   States the above components of Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration and includes the following:

   (e) Conclusion of operation and maintenance responsibility - The responsibly of a non-Federal interest for operation and maintenance of the nonstructural and nonmechanical elements of a project, or a component of a project, for ecosystem restoration shall cease 10 years after the date on which the Secretary makes a determination of success under subsection (b)(2).
   (f) Federal obligations – The Secretary is not responsible for the operation or maintenance of any components of a project with respect to which a non-Federal interest is released from obligations under subsection (e).

3. USACE. 2011. Implementation Guidance for the Water resources Development Act of 2007 (WRDA 2007) – Section 5011, Great Lakes Fishery and Ecosystem Restoration Program.

   States that the term "monitoring" means the activities performed, including the collection and analysis of data that are necessary to determine if predicted outputs of the project are being achieved. Monitoring plans for Section 506 projects will not be complex but the scope and duration will address the minimum monitoring actions necessary to evaluate project success. Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost.

4. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration

5. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.

6. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles. Washington, D.C.

General Monitoring Objectives

The following are general project monitoring objectives:

- To determine and prioritize needs for ecosystem restoration
- To support adaptive management of implemented projects
- To assess and justify adaptive management expenditures
- To minimize costs and maximize benefits of future restoration projects
- To determine "ecological success", document, and communicate it
- To advance the state of ecosystem restoration practice

Project Area Description

Detailed description of the study area may be found in the Integrated Feasibility Report, 1.4 – Study Area. Horlick's Dam: Root River Restoration (referred to as Horlick's Dam) is located in Racine, Racine County, Wisconsin, along the Root River at river mile 5.3. The Horlick's Dam study area consists of 4.5 miles of river upstream of the Horlick's Dam along with 2 miles of river downstream of the dam. The upstream impoundment surface area is approximately 60 acres with various parcels of different land uses and ownership. The Racine County Public Works owns the Horlick's Dam.

Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Riverine fragmentation
    - Prevents fish/mussel passage during all flows, inhibiting natural migrations and genetic exchange contributing to upstream biodiversity loss
    - Prevents riparian corridor passage for certain amphibians, reptiles and mammals
    - May be impeding migratory fishes from Lake Michigan, such as Longnose Sucker (*Catostomus catostomus*), and important fishery species like Northern Pike (*Esox lucius*) Smallmouth Bass (*Micropterus dolomieu*) and Walleye (*Sander vitreus*).
    - Could be impacting native mussel propagation and dispersal

- Altered natural fluvial processes by dam
    - Altered natural riverine hydraulics / impounding flows / lentic (lake) conditions
    - Altered sediment transport by trapping bedload (sands, gravels, cobbles)
    - Accelerated bedload transport downstream of the dam, or substrate/habitat scouring
    - Artificially induced / unsustainable hydrology for wetlands by raising water table upstream of dam within the impoundment
    - Lost ability to absorb flood pulses

- Altered Riparian Zone
    - Loss of native plant communities, including wild rice wetlands
    - Loss of woodland habitat, including birds and small mammals
    - Loss of native organic and large woody debris inputs to the river

Restoration Design Overview

Implementation of Alternative A – Full Dam Removal, the NER Plan, would greatly improve the ecosystem conditions of the Root River. The removal of the Horlick's Dam would result in the reestablishment of hydrologic connectivity, natural fluvial geomorphic parameters (velocities/substrates) and structure (morphology/habitat) to support, sustain, and connect riverine habitats which would provide upstream passage for fish and mussel dispersal. The plan recommended in the feasibility study is the most environmentally and economically justifiable that would address the adverse trends of Horlick's Dam. Key restoration features include reestablishing quality and connectivity of riverine habitats. Structural components of the project include the removal of Horlick's Dam.

Monitoring Components

All monitoring components will continue to be refined as design and construction progresses. This version of the monitoring plan is based on feasibility level information.

Component 1 – Fluvial Geomorphology

Monitoring of the Root River will be required after dam removal because channel evolution is unpredictable and susceptible to a variety of factors. The monitoring and adaptive management plan will focus on documenting and correcting, if required, potential negative impacts of the dam removal including:

- Excessive suspended sediment concentrations
- River aggradation downstream of the dam that may increase flooding frequency
- Bank erosion in the former impoundment
- Delayed channel evolution due to headcut formation
- Erosion at culvert outlets and utility crossings

The plan includes a combination of visual inspection and cross-section surveys completed at prescribed intervals to monitor for unwanted changes in the river. Cross-sections will be spaced at half mile intervals from the dam location to the mouth at Lake Michigan, a total of 12 cross-sections. An additional six to eight cross-sections will be included in the former impoundment at locations where the channel abuts the valley edge. Cross-sections locations will be set and surveyed during the dam removal process at an interval corresponding to every two-foot drop in impoundment level based on the stop log removals. After the dam removal is completed the monitoring process will continue and the cross-sections will be surveyed at six months and at one year after the removal of the dam. The cross-sections will be compared across time to determine if any negative impacts are occurring. Corrections may include installation of bank protection for eroding banks or sediment removal if significant aggradation is noted at any of the cross-sections. In addition to the cross-section surveys, all utility crossings and sewer outfalls will be visually inspected once annually for a three-year period to monitor for potential erosion and scouring issues.

Component 2 – Biological Response

These monitoring events would occur every year during a 3-year monitoring period.

Fish Community

Monitoring fish community response to dam removal will be conducted using seine and electro-shock methods and fish tagging. Successful restoration is expected to increase fish species richness and diversity upstream of the dam once removal has been completed. Fish monitoring will occur once in the spring and again in the late summer or early fall every year. During fish monitoring, any sea lamprey observations will be noted and reported to the appropriate authority. In addition to monitoring fish response, the Qualitative Habitat Evaluation Index (QHEI) will be used to measure the change in physical habitat as a result of dam removal. The QHEI is described in section 3.2.1 Qualitative Habitat Evaluation Index (QHEI) in the main report. The QHEI is correlated to fish habitat suitability such that as the QHEI score increases so to should native fish species richness and abundance. The QHEI is calculated by visual inspection of the physical characteristics of the stream reach of interest. An inspection of the Root River above the dam will be conducted in order to calculate the QHEI one year after dam removal and again 3 years after dam removal. Successful restoration of fish habitat as a result of dam removal is expected to result in an increase in the QHEI. A comparison with the Future With Project Conditions (Table 5)

predicted from the feasibility stage will also be used to determine success. Adaptive management measures will be triggered by decreasing trends in both the QHEI and fish species richness and abundance. Adaptive management measures may include, but are not limited to, increasing number of riffles to provide more oxygenation of water and/or removal of new unanticipated environmental stressors, such as foreign debris.

Success Criteria:

1. Increases in fish richness and abundance for years 1 and 2 of monitoring. Richness and abundance may stay the same or continue to increase year 3 of monitoring.
2. QHEI will increase the 1st year of monitoring and remain the same or increase at the 3rd year of monitoring.

Fish and QHEI data collection protocol:

Qualitative Habitat Evaluation data collection protocol is described in MEMORANDUM FOR CECW-LRD Recommendation for Regional Approval for Use of the Qualitative Habitat Evaluation Index 11 December 2014.

These objectives would be assessed the same way as the FWOP and FWP project benefits were modeled as described in the Main Report, Section 3.2 – Habitat Assessment Methodology. If the following specific targets are not achieved, the non-Federal sponsor would need to implement necessary measures to bring the quality of the habitat types up to the functional levels expected from restoration activities:

Stream

Habitat Type	Length Units	QHEI	AAHSI	AAHU	NetAAHU
Upstream Reach	33.1	87	.86	28.5	15.8
Downstream Reach	15.2	87	.87	13.2	0.5

Other Communities

Ancillary data will be collected on other assemblages as well. During fish monitoring, effort would be spent observing wildlife utilizing the habitats, including aquatic macroinvertebrates, terrestrial insects, amphibians, reptiles, birds, and mammals.

Sea Lamprey Monitoring

During the biological response monitoring events for fish community, incidental sea lamprey monitoring will occur in the Root River above where the Horlick Dam was located. Ideal sea lamprey habitat will be included in the fish sampling as focus habitat areas to aid in the identification of any sea lamprey infestation if it occurs. In the event that sea lamprey are identified, coordination with the USFWS and WIDNR is to occur for potential implementation of additional sea lamprey control measures such as the use of the WIDNR Root River Steelhead Facility weir as a seasonal sea lamprey barrier.

Monitoring Responsibilities

The USACE and the Chicago Park District will currently be responsible for implementing all three Monitoring Components as described above. Coordination with partner agencies and organizations to discuss future monitoring responsibilities is planned.

Monitoring Costs & Funding Schedule

Table 3: Schedule of Monitoring Costs

Tasks	Year 1	Year 2	Year 3	Total
Component 1	$10,800	$1,200	$1,200	$13,200
Component 2	$14,000	$13,900	$13,900	$41,800
Final Report	$0	$0	$5000	$5,000
Total	$24,800	$15,100	$20,100	$60,000

Reporting Results

A yearly monitoring summary report would be drafted by the USACE that briefly summarizes the data collected and determines if adaptive management is needed. A final monitoring report would be drafted that details the progress and outcomes of the restoration project.

Adaptive Management

Adaptive management measures are currently not allowed according to the GLFER Implementation Guidance, which is non-policy compliant; however, should this stipulation change in the near future, a brief discussion of potential adaptive management features follow:

Adaptive management measures are not the same as typical operation and maintenance activities described in the following section. These measures are technically response actions to changes that adversely affect how the system was predicted to respond. In so being adaptive, there are no absolute measures that can be defined prior to issue arising. The primary concerns for this project are restoration of fluvio-geomorphic processes and riverine connectivity. Descriptions of adaptive management below are not all-encompassing and are brief and will be further detailed once a complete set of plans and specifications are drafted. This is necessary since the adaptive management measures will need to be based upon contracting bid items, final feature designs and predicted adverse responses. It is also noted that these measures have relatively low costs to regain lasting benefits.

Fluvio-geomorphic – Varying fluvio-geomorphic processes that negatively affect anthropomorphic structures such as utilities could trigger adaptive management. Conditions unforeseen, such as unexpected high velocity floods, or scouring around structures could cause issues to arise. Adaptive management actions would be undertaken to offset these issues, such as adding stone to stabilize scouring and secure structures.

Operation & Maintenance

The O&M costs of the project are estimated to a total cost of $0. The natural of the alternative as turning the river back to nature does not require anything further than taking the dam out and letting the river flow. The O&M described here is not the same as the Adaptive Management measures described in the previous section.