

2023

Fox River Connectivity & Habitat - Section 519, Illinois River Basin Ecosystem Restoration Program

Appendix H - Monitoring Plan



APPENDIX H – Monitoring & Adaptive Management Plan

August 2023

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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 Major Subordinate Command (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 Fox River Connectivity & Habitat Restoration is being met.

Guidance

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

- a. 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.

- b. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration
- c. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.
- d. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles. Washington, D.C.

General USACE 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

Restoration Design Overview

Implementation of the NER Plan would greatly improve the ecosystem conditions of the Fox River system in terms of connectivity and habitat structure. The methods for this project are simple, where the dam structures would be full removed as the main action of restoration. Subsequently, the river will move substrates and materials again to provide riverine habitat within the main stem Fox River and provide connectivity within the mainstem and tributary streams.

Monitoring Components

In order to evaluate the overall effectiveness of the project and to determine if the specific planning objectives are met, the following monitoring specifics are proposed which is focused on fish species and habitat aspects of the restoration. All restored segments of river would be monitored as specified below, one time every other year for ten years (5 times) following completion of the project.

Objective 1 – Reestablish Fluvialgeomorphic Processes to Support Riverine Habitat

Currently, the Fox River within the study area is impaired by 10 run-of-the-river dams, and therefore there is no natural recovery mechanism. These impairments are specific to impeding riverine hydraulics, sediment transport and substrate sorting, resulting in a loss of structural habitat heterogeneity. The effects desired by meeting this objective are to return these riverine functions to restore and sustain habitat. The targeted location of these affects would be in the segments of river that are currently impounded. These

affects would be sustained over the life of the project and optimistically in perpetuity. This objective seeks to reestablish natural fluvialgeomorphic parameters and processes to support riverine and riparian habitats within the Fox River study area. Improvement is measured via the predicted increase in quality of riverine habitat (FWP HSI (QHEI)).

The QHEI methodology for this study is described in Section 2.5.1 with publications provided in Appendix A. The ILDNR will utilize the Ohio EPA protocol to collect data and score QHEI sites for the Fox River, and in particular for the impounded and free-flowing segments of the river. Data parameters that would be assessed for this portion of the monitoring include:

1. Substrate
2. In-stream Cover
3. Channel Morphology
4. Riparian Zone and Bank Erosion
5. Pool/Glide and Riffle-Run Quality
6. Reach Gradient

Objective 2 – Reestablish Connectivity for Riverine Animal Assemblages

Currently, the Fox River study area has 70% of its river miles impounded by run-of-the-river dams. Aside from imparting adverse fluvialgeomorphic and water quality (habitat) impacts on the system, these dams also effectively block the migration of fish, mussel and certain macroinvertebrate species. The effect desired by meeting this objective is to return passage for all riverine organisms that require it. The targeted location of these affects would be in the segments of river that are currently impeding the passage of aquatic organisms. These affects would be sustained over the life of the project and optimistically in perpetuity. This objective seeks to reestablish passage for riverine organisms within the Fox River study area. Improvement is measured via the predicted increase in distribution in species richness of fishes as depicted by **Figure 8**.

Fish Assemblage

Fish species richness, abundance and distributions would be monitored for this objective by the ILDNR utilizing State of Illinois protocols for the Index of Biotic Integrity. Methods, locations and timing are to be followed as presented in the attached ILDNR Status of Fish Assemblages and Sport Fishery in the Fox River: Watershed: Results of 2012 Basin Survey. Special attention would be paid to the two listed fish species, the Greater and River Redhorses.

The monitoring for this community will be implemented by the ILDNR. Baseline surveys and conditions are completed and established. In general, surveys will be conducted in summer/early fall during the course of the monitoring period. Mainstem and larger tributary stations will be sampled with boat DC electrofishing and backpack shocking or electric seine will be used at small stream sites. Fishes would be collected via 15 minute runs along each station, identified to species, enumerated, weighed and measured. Fish community monitoring would be in the Fox River and tributary streams.

Monitoring of fish communities is a well-established approach for evaluating overall aquatic ecosystem health and will be quantified through the use of the Index of Biotic Integrity (IBI). The IBI employs fish assemblage as the indicator of ecological form and function. Fish are not only a highly visible part of the aquatic resource, but they are quite sensitive to the surrounding water and habitat quality. This does not suggest that the use of other organisms is insufficient or inappropriate (Simon 1991). The pre and post dam removal condition of the project reach was and will be evaluated using the IBI (Karr 1981; Karr et. al. 1986; Simon 1991; Smogor 2002). This method makes use of a systematic process to set quantitative

criteria that enables the measurement of riverine stream quality. This index employs ten parameters or “metrics” based on structural and functional components of the fish assemblage. Structural components include diversity, taxonomic guilds, and abundance. Functional components include feeding or trophic guilds, reproductive behavior, tolerance to adverse environmental stressors, and individual stresses (Simon 1991; Smogor 2002). These metrics are calibrated to for differences in stream size and geographic region. The following ten metrics may each receive a score 0 to 6, based on comparison to unaltered reference sites, with a total IBI score ranging from 0 to 60 (Smogor 2002):

1. Number of native fish species
2. Number of native Catostomid species
3. Number of native Centrarchid species
4. Number of native intolerant species
5. Number of native Cyprinid species
6. Number of native benthic insectivore species
7. Proportion of individuals as specialist benthic insectivores
8. Proportion of individuals as generalist feeders
9. Proportion of individuals as obligate coarse-mineral substrate spawners and intolerant
10. Proportion of tolerant species

Mussel Assemblage

Mussel species richness, abundance and distribution would be monitored for this objective by the Illinois Natural History Survey via contract with the ILDNR. Methods, locations and time will be replicative of those conducted for the pre-restoration survey as outlined in Tiemann et al 2007. Effects of Lowhead Dams on Unionids in the Fox River, Illinois. Special attention would be paid to the two listed mussels, the Purple Wartyback and Ellipse.

Generally, samples of both live and dead freshwater mussels will be collected by hand-groping with wading at each site. The number of live individuals will be recorded before returning them to the stream where they were collected. Abundances will be standardized at each site using catch-per-unit-effort (CPUE), the number of live individuals per hour. The collected taxa list will then be compared to historical listings provided by museum collection holdings (including, but not limited to Chicago Academy of Science, Field Museum of Natural History, Ohio State University Museum). This collection will be an effort to determine the effects of the restoration project on the distribution of freshwater mussel species within the Fox River.

Supporting Data

During community assessments, air, water and soils parameters would be measured if appropriate to the given community. These may include but are not limited to: temperature, pH, conductivity, DO, turbidity, flow velocities, etc.

Monitoring Responsibilities

The ILDNR will be responsible for all monitoring components outlined above. The ILDNR will coordinate and work with the INHS for mussel survey and assessment. Primary point of contact for the monitoring activities is:

Stephen Pescitelli
Region II Stream Specialist
5931 Fox River Drive

Plano, IL 60545
office: 630.553.0164
fax: 630.553.1108
cell: 815.786.5688

USACE Monitoring Coordinator is:

Frank M. Veraldi
Restoration Ecologist/Fish Biologist
USACE, Chicago District
231 S. LaSalle St, Suite 1500
Chicago, Illinois 60604

Reporting Results

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

Adaptive Management

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 and establishment of native plant communities. Descriptions of adaptive managements below 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.

Potential adaptive management actions may include constructing riffle structures, rock vanes, j-hooks or other structures that would abate problematic erosion caused by the removal of the dams, yet still facilitate improved upstream fish passage. The degree to which a particular monitoring trend deviates from its intended course, i.e. planning objectives, the matter would be discussed with local managers, sponsors, and USACE personnel to determine the appropriate response.