

2013

# Ravine 8 Ecosystem Restoration

## Appendix H – Monitoring Plan

Alternative Formulation Briefing Document



Chicago District  
US Army Corps of Engineers  
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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 resource 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 Section 506 Great Lakes Fishery and Ecosystem 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 Monitoring Objectives

As presented in “Guidance on Monitoring Ecosystem Restoration Project” on 12 January 2010, 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

Ravine 8, located in Highland Park, Illinois includes dune, bluff, and ravine habitat. The general study area includes approximately 5 acres entirely within the bounds of the steep slope zone of the ravine and bluff, which is privately owned. Ecological easements are obtained by the non-Federal sponsor, the City of Highland Park. Topography of the site is a direct result of surficial drainage over highly erodible lacustrine clays deposited by the Wisconsin glacial retreat and is termed the Highland Moraine. The area has been primarily impacted by the effects of urbanization including influx of storm runoff due to increased impermeable surfaces, reduced aquatic species richness due to ravine and stream degradation and fragmentation, and vegetation loss through the invasion of exotic and adventives woody plant species.

## Habitat Trends Triggering Restoration

This project aims to remedy problems of:

- Altered stream hydraulics from urbanization and infrastructure configuration within the watershed
- Altered fluvialgeomorphic processes from urbanized watershed and ill-advised in-ravine infrastructure
  - Channel incision
- Altered hydrology, hydraulics and geomorphology from manmade dam at mouth of ravine
- Altered geomorphology from invasive plant and tree species

- Large amounts of unnatural woody debris
- Unnatural erosion
- Altered hydraulics and littoral drift from manmade infrastructure
- Altered coastal geomorphology from manmade infrastructure and land use
- Altered coastal geomorphology from non-native plant species colonization

## Restoration Design Overview

The preferred plan will greatly increase the ecological integrity and complexity of Ravine 8. The specific elements of the proposed plan are:

- Reestablish ravine stream hydraulics, instream complexity, and connectivity
- Reduce invasive species and prevent further infestation or spread
- Maximize floral and faunal species richness and abundance

## Monitoring Components

### Monitoring Plan Goals & Objectives

The goal of the project is to increase habitat complexity and biodiversity in and around the project area. The following specific objectives were established for monitoring the effectiveness of this project:

- Restore ravine stream and riparian corridor habitat as measured by the presence of naturalized stream hydraulics
- Improve native fish species richness as measured by Fish Species Richness: Target R Score for Ravine Stream  $\geq 8$
- Improve native plant species richness and assemblage structure as measured by coefficient of conservatism of the Chicago Region Floristic Quality Index: Target Overall Mean C Score  $\geq 7$
- Eradicate/reduce the presence of non-native and invasive species: Target Invasive Species Eradication Percentage  $< 1\%$  **Areal Coverage**

Fish communities, ravine habitat, ravine hydraulics, and riparian vegetation will be monitored to determine the effectiveness of the restoration plan. All components will be monitored as specified below, once prior to the project and over the course of five years following completion of the project.

### Ravine Stream Hydraulics

Hydraulic parameters will be monitored at each riffle/pool complex within the ravine stream. In order for the created cobble riffles to provide conditions for lotic macroinvertebrates and fishes, induced flow velocities must be apparent; otherwise they are just a pile of rocks in a stream. These flow patterns will be monitored through observation in the field. Velocity, stream morphology, and substrate count data will be collected at certain cross-sections within the stream to determine how the channel is developing after restoration.

## **Ravine Stream Habitat**

Habitat parameters for the restoration reach will be evaluated using the Qualitative Habitat Evaluation Index, or QHEI (Ranking 1989). The QHEI consists of eight sections with a maximum total of 100 points:

1. Characterization of substrate types and effects of siltation
2. Characterization of in-stream cover
3. Characterization of channel morphology
4. Characterization of the riparian zone and bank erosion
5. Assessment of the pool/glide & riffle/run
6. Gradient
7. Shade
8. Channel incision

One raw data sheet consisting of one to five transects will be completed for each site. The sites will be assessed from a river right descending perspective. The transects are dependent and based on the area sampled for fishes and will begin some distance up or downstream from evident bridge disturbance to the stream; however, the impacts from these structures should be taken into consideration when implementing restoration measures since this study recommends remedies to anthropogenic disturbance to stream morphology and function.

## **Fish Community**

This portion of the assessment uses fish species richness (R), which is the total number of native fish species. An assessment was done utilizing the Fishes of the Chicago Region database, which is primarily comprised of fish collection vouchers stowed at the Field Museum on Natural History, the Illinois Natural History Survey and the University of Michigan from 1895 – 2007. One hundred and fifty six (156) fish collections were queried from the whole coast line of Lake County, IL and from two similar streams just north of the study in Kenosha County, WI. It was determined from these historic collections that 32 native species have in the past utilized ravine stream habitat. Several species that formerly used ravines were listed but not counted, such as blacknose shiner, since the chance of these rare and sensitive species recolonization is not likely.

## **Plant Communities**

Evaluation of vegetation will be done using the Floristic Quality Assessment Index (FQA) and native plant richness, as described in the Feasibility Report. In short, the FQA is a measure of overall environmental quality based on the presence or absence of certain plant species. Plant species that are assigned a coefficient of conservatism of 5 to 10 are considered to be indicative of less human mediated disturbance and a higher level of functionality. As the area stabilizes after restoration measures are complete, the number of higher conservative plant species that become established will increase. Communities that have an average mean coefficient of conservatism of between 3 and 5 are considered to be fair quality. This is a good estimate of the future quality of the area based on the current plant community and ‘good’ quality natural sites in the surrounding areas. The overall number of native plant species is expected to increase dramatically as well, helping to increase the overall biodiversity of the area.

## **Sampling Stations**

The stream is short enough to sample it all for fishes. Vegetation will be surveyed and analyzed by both a roaming and stratified random transect survey. Each habitat type will be analyzed separately.

## **Reference Site Discussion**

No reference site is deemed necessary; improvements will be judged from current site conditions.

## **Sampling/Survey Frequency**

### Fish Communities

Monitoring will occur once per year in late spring over the course of 5 years.

### Plant Communities

Plant monitoring would occur between June and August of each year of monitoring activities. Sampling would occur once a year. The total monitoring period will be 5 years.

### Stream Hydraulics and Habitat

Observations will be conducted concurrently with fish sampling periods.

## **Data Analysis**

### Stream Hydraulics, Habitat, and Fish Communities

Fish parameters calculated will be displayed graphically to show trends through time. The repaired hydraulics and habitat structure of the ravine system should allow for an increase in fish species richness (R) scores. If the trends in the data indicate a decrease in condition, adaptive management actions may be taken.

### Plant Communities

The information generated through sampling the plant community would be used to indicate the trend in overall condition of the area. If the FQA analysis indicates a decrease in condition, adaptive management actions may be taken to increase the score for the following sampling year.

## Monitoring Responsibilities

The US Army Corps of Engineers, Chicago District will be responsible for monitoring stream hydraulics, habitat, fish, and plants.

## Monitoring Costs & Funding Schedule

**Table 1 - Monitoring Costs**

<b>Tasks</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Total</b>
Hydraulics & Fish	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
Plant Communities	\$2,600	\$2,600	\$2,600	\$2,600	\$2,600	\$13,000
Final Report	\$ -	\$ -	\$ -	\$ -	\$5,000	\$5,000
<b>Total</b>						\$43,000

## 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 outcomes of the restoration project.

## Contact Information

### Stream Hydraulics, Habitat, and Fish

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## Adaptive Management Planning

Adaptive management needs for this project are minimal and currently not foreseen needs are apparent. However, changes would be planned, approved and implemented if expectations are not being met.