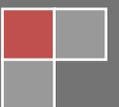
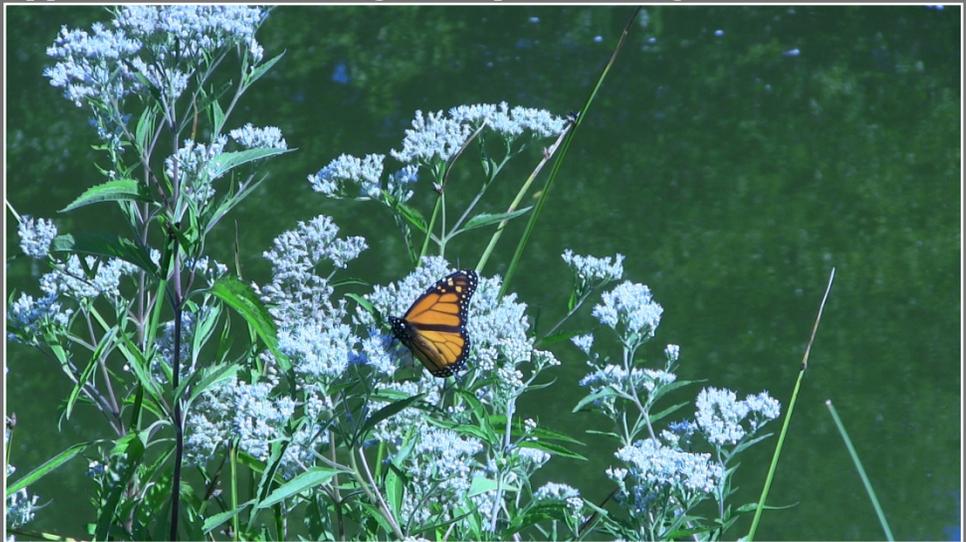


2014

Jeorse Park Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Appendix F - Monitoring & Adaptive Management Plan



APPENDIX F – Monitoring & Adaptive Management Plan

August 2015

Table of Contents

INTRODUCTION	1
GUIDANCE	1
GENERAL MONITORING OBJECTIVES	2
PROJECT AREA DESCRIPTION	2
HABITAT TRENDS TRIGGERING RESTORATION	2
RESTORATION DESIGN OVERVIEW	3
MONITORING COMPONENTS	3
COMPONENT 1 – STRUCTURAL SUSTAINABILITY	3
COMPONENT 2 – BIOLOGICAL RESPONSE	4
COMPONENT 3 – PLANNING GOAL & OBJECTIVES	5
MONITORING RESPONSIBILITIES	6
MONITORING COSTS & FUNDING SCHEDULE	6
REPORTING RESULTS	6
ADAPTIVE MANAGEMENT	6
OPERATION & MAINTENANCE	7

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 Jeorse Park Beach Ecosystem 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:

- 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

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 Feasibility Study, 1.4 – Study Background. Jeorse Park Beach, owned and operated by the City of East Chicago, is located along the Lake Michigan shoreline just southeast of Indiana Harbor and Shipping Canal in Lake County, IN. The park is bounded to the north by the Ameristar Casino, to the west by Cline Avenue and the Majestic Star Hotel parking lot, to the south by the Majestic Star Casino, and to the east by Lake Michigan. The project site is adjacent to Amtrack railroad lines with approximately 15.8 acres of beach and foredune habitat on the lakeside. The beach offers nearly 4500 feet of shoreline for potential aquatic habitat improvement over 25 acres of lake bottom.

Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Altered hydrodynamics of near shore zone
- Lack of nutrient cycling between nearshore and offshore habitats
- Excessive accumulation of algae and debris
- Lack of high quality fish foraging and spawning habitat
- Degradation of existing fish foraging and spawning habitat
- Degradation of aquatic migratory bird habitat

- Instability of coastal incipient dunes
- Lack of native grass and forb species (food bearing plants)
- Lack of dune and lake interactions

Restoration Design Overview

Implementation of Alternative 5, the NER Plan, would greatly improve the ecosystem conditions of Jeorse Park Beach. The addition native plant species abundance and richness along with ensuring robust and sustainable structural diversity would increase the ecological integrity of the surrounding environment. The plan recommended in the feasibility study is the most environmentally and economically justifiable that would address the adverse trends of Jeorse Park Beach. Key restoration features include restoring Jeorse Park Beach dunes, increasing available fisheries habitat in the near shore Lake Michigan and restoring and connecting isolated plant communities. Structural components of the project include:

- a) Light geomorphic contouring of degraded soil structure on dune habitat to promote ammophilous species
- b) Creation of floristic habitat by filling and planting breakwater voids with plant species selected to maintain high ecosystem value while maintaining structural integrity of the breakwater stone
- c) Placement of cobble mound rock reef fish habitat within Lake Michigan
- d) Removal of invasive plant species
- e) Beach and Dune plant communities will be restored and enhanced

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 – Structural Sustainability

This component covers the structural sustainability of the implemented features. It is a qualitative assessment of whether each feature is retaining its physical character and project purpose. The most important information derived from this component would be to determine if adaptive management measures are needed or not. This monitoring would take place once a year for up to 10-years. Structural components are currently broken down into the following:

- 1) Breakwater void fill and rock reef habitat
 - a) monitor stability and erosion
- 2) Plant community reestablishment
 - a) dune
 - b) beach
 - c) breakwater plantings

The following is a list of parameters that would be assessed:

1. Breakwater Void Fill and Rock Reef Habitat
 - a. Cohesiveness and durability
 - b. Conformity
2. Plant Community Zones
 - a. Spatial coverage
 - b. Invasive species % coverage

- c. Predator induced damages
- d. Hydraulic induced damages
3. Human Interference & Damages
 - a. Physical damage
 - b. Removal
 - c. Rubbish and foreign debris

Visual observations during site visits will be used to determine if structural integrity and sustainability exist within the project. Based on said site visits, adaptive management protocols may be initiated.

Component 2 – Biological Response

These monitoring events would occur every other year during a 10-year monitoring period.

Plant Communities

Evaluation of plant community zones would be accomplished using the Floristic Quality Assessment Index (FQA) and native plant richness, as described in the [2.5 Plant Communities Assessment](#). 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 should increase. Communities that have an average mean coefficient of conservatism of between 3 to 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 restorations and ongoing monitoring.

Performance Standards will be set to measure the success of the restored plant communities. Standards are set after a baseline study of existing vegetation is completed. The following standards will be considered as part of the 10 year monitoring plan:

1. By the end of the third growing season, at least 75% of the vegetative coverage (as measured by aerial coverage) will consist of seeded/planted species. The planted area shall exhibit at least the following at the end of each growing season: Year 1 – 25%, Year 2 – 50%, Year 3 – 75%
2. By the end of the tenth growing season, at least 95% of the planted areas must contain native, non-invasive perennial species as measured by aerial coverage. The planted area shall exhibit at least the following at the end of each growing season: Year 1 through 3 – 25%, Year 3 through 6 – 60%, Year 6 through 10 – 95%
3. None of the three most dominant species within the planted areas shall be invasive or non-native species, including but not limited to: Cattail (*Typha* spp.), Reed Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), Common Reed (*Phragmites australis*), Canada Thistle (*Cirsium arvense*), Sandbar Willow (*Salix exigua*), Kentucky Blue Grass (*Poa pratensis*), and Sweet Clover (*Melilotus* spp.)
4. 100% of the planted trees and shrubs shall be alive, in healthy condition, and representative of the individual species at the end of each growing season.

Floristic Data Gathering Protocol

Formal line transect surveys will be conducted yearly. In general, surveys will be conducted in summer/early fall during the course of the monitoring period. Transects will be laid out to include all habitats and restoration measures. Vegetation community composition (identification of plant species and estimated coverage of each) within quadrats will be made along each transect in 10 meter intervals. The

first and last 10 meters within each transect will be skipped. Within each quadrat, percent cover class values will be used and are broken down as follows: 1-5%, 6-25%, 26-50%, 51-75%, 76-95% and 96-100%. Because transect data may not provide information needed to evaluate overall herbicide efficacies (or plant establishment efforts), meander surveys will be conducted at the same time as line transect surveys to supplement transect data, with focuses on plant response to herbicide applications, prescribed burns, volunteer plant species occurrences, and survival, growth, and spread of planted species.

Fish Community

This portion of the assessment uses fish species richness (R), which is the total number of fish species. An assessment was done utilizing the Fishes of the Chicago Region database, which is primarily comprised of fish collection vouchers from multiple sources including the Chicago Field Museum of Natural History and the Illinois Natural History Survey from 1878 - 2005. Thirty six sampling records were queried over forty three miles of southern Lake Michigan shoreline which included all of the Lake County coastline and portions of Cook and Porter Counties to the east and west. Full species lists from those records along with data collected by Corps biologists in 2014 are presented in section 2.3.3 of the detailed project report and within Appendix A. It was determined from the collection data that about 49 species have the potential to utilize restored habitat at Jeorse Park Beach upon completion of the project. In order to keep the scale of R comparable to that of mean C, the HSI for lacustrine restoration will take the calculated R and divide it by one tenth of the total number of projected fish species able to use the project area. Since there are 49 species present within the vicinity of the project area capable of utilizing habitat at Jeorse Park Beach, the HSI will be equal to $R/4.9$.

Fish monitoring will be conducted in late spring to early summer annually for the first ten years post construction of the project. Monitoring will entail a minimum of three 15-minute standardized electrofishing surveys and three beach seine hauls. The three electrofishing surveys will include the areas adjacent to the existing breakwater (within the protected bay and lakeward), directly over the constructed rock reef habitat and one final survey in the area surrounding the rock reefs. Surveys will be conducted separately from one another and will not overlap in spatial coverage. The three beach seine hauls will be performed along the shoreline within wadable water. A 30 foot seine with a maximum bar meshes of 0.25 inches will be used to perform the surveys. A bag seine is preferred but not required. Each seine haul should be pulled over 25 feet with the seine polls separated by 25 feet to effectively sample 625 square feet of lake bottom. The three seine hauls will be equally distributed across the 4500 feet of shoreline for each monitoring trip. All fish species collected will be enumerated and identified. Supplementary data may be collected including total length and weight to help shed light on use of the habitat by different life stages of each species.

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 terrestrial insects, amphibians, reptiles, birds and mammals.

Supporting Data

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

Component 3 – Planning Goal & Objectives

The goal of this study is to determine a cost effective and ecologically beneficial plan, while considering No Action, which would restore self-sustaining native plant communities on shore and improve degraded hydrodynamic and biological processes within the near shore areas of Jeorse Park Beach. Planning objectives for this study are as follows:

- Objective 1 – Restore near shore hydrodynamic processes to a more natural state
- Objective 2 – Increase floristic quality and quantity of fore dune and beach habitats
- Objective 3 – Increase the quality and quantity of available fish habitat

These objectives would be assessed the same way as the FWOP and FWP project benefits were modeled as described in the Main Report, Section 2.5 – Habitat Quality Forecasting. The modeling would be completed as described in Section 2.5 – Plant Communities Assessment and Monitoring Component 2, Biological Response, Plant Communities. If the following specific targets are not achieved, the non-Federal sponsor would need to implement necessary measures to bring the quality of these plant communities up to the functional levels expected from restoration activities:

Habitat Types	Acres	AAHSI*	AAHUs	NAAHUs
Beach and Dune	14.8	4.33	64.08	44.1
Breakwater Plantings	3	14.76	44.28	30.93

*Mean C of the Floristic Quality Assessment

Monitoring Responsibilities

The US Army Corps of Engineers 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

Year 1 of Monitoring starts the following growing season after construction is complete.

Tasks	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Component 1	\$										
Component 2	\$										
Component 3	\$										
Final Report	\$										
Total	\$										

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.

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 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.

Native Plantings – The risk of large scale plant failure is low, mostly due to the species selection of those adapted to the conditions found within Jeorse Park Beach. Most of the requirements for native plant communities are covered under routine operation and maintenance. If for some reason extensive patches of native plant community begin to fail, the cause would need to be determined in order to design and implement repair measures. Accidental or intentional human induced instances have damaged or removed native plantings in the past as well. No matter what the solution would be for the cause of the problem, it would certainly be coupled with reestablishing native plant patches by replanting. It may be that other thriving areas would be able to have live plants and seed transferred to the damaged patch. Or it may be that plants and seed would need to be repurchased.

Operation & Maintenance

The O&M costs of the project are estimated to an average annual cost of \$█ with a 3.75% interest rate over 50 years. A detailed O&M Manual containing all the duties will be provided to the non-Federal sponsor after construction is closed out. The O&M for Chicago District ecosystem projects are practical and minimal due to initial project design efforts and design targets for sustainability. Mostly if not all of the O&M activities are no different than the specific activities that take place during construction. The O&M described here is not the same as the Adaptive Management measures described in the previous section.

Long Term Fish Monitoring – Desirable native fish species should be present within Lake Michigan at the Jeorse Park Beach in perpetuity. It will be important to continue to monitor the presence of native and non-native fish species and their interaction with the rock reef habitat placement. Understanding the use of this habitat over a 50-year period will greatly benefit future restoration projects in the southern Lake Michigan basin by implementing lessons learned.

Invasive Plant Species Control – The maintenance activity is probably the most important to conduct. Preventing the establishment of invasive species and weedy vegetation prevents the need for large scale herbicide or physical eradication and replanting efforts. An annual maintenance plan should be drafted in conjunction with input from the City of East Chicago taking into account the types of invasive and non-native species to be treated and the acreage of the treatment area. Problematic areas may include the establishment of sand loving species of woody trees (White and Jack Pines) along with breakwater plantings. Species such as white and yellow sweet clover, cut-leaved teasel, reed canary grass, common reed, buckthorn, honeysuckle, are known invasive species which will need to be kept at bay.

Precautions should be taken to ensure that any long term herbicide application is appropriately dispensed to remove non-native plants and invasive species while avoiding native plant communities.

Native Plant Community Maintenance – It will be required to maintain the species richness, abundance and structure of the restored plant communities within the Jeorse Park Beach. Aside from minor re-plantings, it will be important to continue to protect plant communities from external changes by man’s daily activities, whether single incidents or chronic stressors. These can cause native plant communities to experience significant species richness declines even to the point of becoming monotypic stands. The best operational measure to quickly identify and rectify external stressors is vigilance. Routine inspections by the non-Federal sponsor’s qualified stewards are imperative to notice adverse change quickly. The long term monitoring plan provided above will not catch quick change as would routine inspection by site stewards.

Precautions should be taken to ensure the City of East Chicago staff understands the limits of native plant communities and how those areas should be maintained. Buffers around aquatic resources and native plants which border mowed turf grass areas should be avoided when routine mowing occurs.