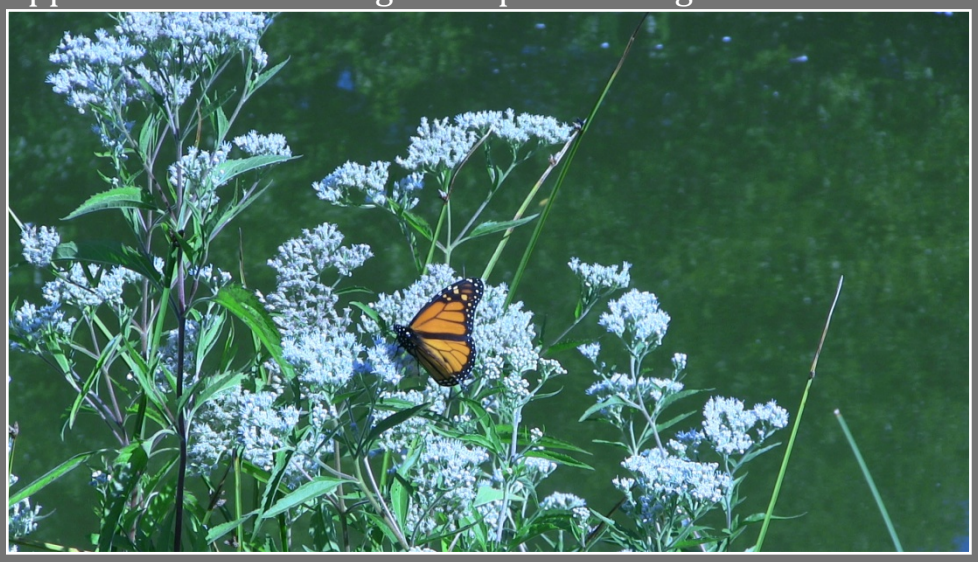
2014

Jackson Park Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Appendix F - Monitoring & Adaptive Management Plan



USACE
Chicago District
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APPENDIX H – Monitoring & Adaptive Management Plan

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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 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 Jackson Park 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. The Jackson Park is located in Chicago, Illinois along the western coast of Lake Michigan. The park resides between 56th Street to the north and 67th Street to the south. The eastern boundary is Lake Shore Dr. and Lake Michigan and to the west Stony Island Ave. The study parcels consists of various natural area parcels of land that total about 162-acres, all of which are owned by the Chicago Park District within Jackson Park. The natural area parcels have the potential to provide pond, hemi-marsh, savanna and woodland habitat.

Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Lack of a natural mosaic and gradient of submerged to upland coastal habitats
- Fragmentation of local habitat patches
- Overabundance of unnatural conditions that promote invasive species success
- Lack of rich coastal plant communities
- Lack of rare and sensitive coastal plant and animal species
- Lack of critical habitat for locally endangered and rare fauna
- Lack of migratory bird resting and forage habitats

Restoration Design Overview

Implementation of Alternative 5, the NER Plan, would greatly improve the ecosystem conditions of Jackson Park. The addition of several native habitat types and native plant species would increase richness and abundance 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 Jackson Park. Key restoration features include restoring Jackson Park lagoons, including minor grading of the banks and restoring and connecting isolated plant communities. Structural components of the project include:

a) Geomorphic contouring of degraded banks within the lagoons
b) Creation of vernal pools through excavating to an elevation which promotes temporal hydrology exposure
c) Placement of large limestone slabs for mud puppy habitat
d) Removal of invasive plant and fish species
e) Plant communities which will be restored and/or enhanced include

i. Pond
ii. Existing Islands
iii. Hemi Marsh
iv. Sedge Meadow
v. Oak Savanna
vi. Woodland

Monitoring Components

All monitoring components will continue to be refined and 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 every other year for 10-years. Structural components are currently broken down into the following:

1) Contoured banks of the lagoon
2) Newly created vernal pools
4) Newly created mud puppy habitat
3) Plant community reestablishment
    a) Pond
    b) Existing Islands
    c) Hemi Marsh
    d) Sedge Meadow
    e) Oak Savanna
    f) Woodland

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

1. Geomorphic contouring along Lagoon

   a. Presence/absence of erosion
   b. Cohesiveness and durability
2. Newly Created Vernal Pools
   a. Presence/absence
   b. Hydrology indicators
   c. Spatial coverage of vegetation
   d. Invasive species % coverage
3. Newly Created Mud Puppy Habitat
   a. Presence/absence
   b. Indicators of species present
4. Plant Community Zones
   a. Spatial coverage
   b. Invasive species % coverage
   c. Predator induced damages
   d. Hydraulic induced damages
5. 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 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 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 dominate 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

Shannon-Wiener diversity index will be used to calculate species richness and evenness within the Jackson Park lagoons and vernal pools. The use of the simplified metrics for fish community is appropriate for this system since fewer metrics lend themselves to this small, highly altered system. Species richness and relative abundance would be collected once in spring and fall for fishes. Species richness, evenness, and diversity will be calculated using the Shannon-Wiener index. Species richness is simply the count of the number of native species present. The Shannon- Wiener diversity index is defined as:

$$H' = \sum_{i=1}^{s} (Pi)(\ln (Pi))$$

where s= number of species, and pi= proportion of the total samples represented by the ith species (Kwak and Peterson 2007). The value rarely exceeds 5 and the value is specific to the region being sampled. Evenness is a function of the above diversity index and is defined as:

$$J' = \frac{H'}{Ln(s)}$$

The combination of species diversity and evenness can provide a look into the functionality of the ecosystem and will help qualitatively assess the macroinvertebrate and fish communities. The goal for fishes will be to maintain a Shannon-Weiner index value of 3.0 or greater. Failure to meet these criteria will result in the implementation of adaptive management processes. 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. Fishes would be collected via 15 minute runs of boat electrofishing along each transect, identified to species, enumerated, weighed and measured.

Mussel Community

Should native mussels be reintroduced into the Jackson Park lagoons, a specific monitoring plan to document introductions, recruitment and establishment would be drafted. This monitoring activity could be contracted out to a local institution such as the Field Museum of Natural History, Illinois Natural History Survey or Shedd Aquarium.

Avian Community

The monitoring for this community will be implemented; however, at this point in the study/project, it is unknown if the USACE, CPD or Audubon Chicago would take on this role. The metric for avian communities will be a species count. The goal will be to document habitat specific species within each vegetation community. For instance, in a grassland community we would expect to see at least three grassland species utilizing the habitat. The use of the habitat via community specific species is a great indicator that the habitat is functioning appropriately. Failure to meet these criteria will result in the implementation of adaptive management processes.

Amphibian Community

Monitoring amphibian populations would be coupled with other monitoring activities and would note the presence or absence of amphibian species. Specific monitoring for the presence/absence of mudpuppies would be conducted at the locations mudpuppy habitats was installed. If the reintroduction of Eastern Newt is implemented, a detailed and specific monitoring plan could be contracted out to a local institution such as the Field Museum of Natural History, Illinois Natural History Survey or Shedd Aquarium.

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 proposed project is to restore native wetlands and create a more complex ecosystem to benefit fish, amphibians, reptiles, mammals, and migratory birds. Planning objectives for this study are as follows:

- Objective 1 – Reestablish Hydrogeomorphology to Support Natural Communities
- Objective 2 – Eradicate Invasive Species from Pond, Wetland, & Riparian Communities

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
Pond	17.7	5.62	99.5	99.5
Existing Island	2	6.51	13.0	10.2
New Island	1.3	6.51	8.5	8.5
Fringe Marsh	20	5.62	112.4	76.8
Sedge Meadow	2.3	5.80	13.4	9.8
OS/Woodland	113.1	6.28	710.1	435.3

*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	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ 5,000
Component 2	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$ 50,000
Component 3			$1,000	$ -	$ -	$ -	$1,000	$ -	$ -	$ 1,000	$ 3,000
Final Report	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$10,000	$ 10,000
Total	$5,000	$ 6,000	$6,000	$ 6,000	$5,000	$ 6,000	$6,000	$ 6,000	$5,000	$17,000	$ 68,000

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.

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 Jackson Park. 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 $7,500 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 Jackson Park lagoon in perpetuity. It will be important to continue to monitor the presence of native and non-native fish species. Human introduction of non-native, or undesirable fish could lead to damaging effects on the restoration measures implemented within Jackson Park lagoon. These species should be removed if reoccurring issues arise.

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 Chicago Park District taking into account the types of invasive and non-native species to be treated and the acreage of the treatment area. Problematic areas will include the bank transition and emergent marsh zones. 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 Jackson Park. 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 Chicago Park District 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.