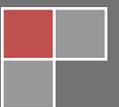


2015

# Saganashkee Slough - McMahan Woods Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Appendix H - Monitoring & Adaptive Management Plan



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## APPENDIX H – Monitoring & Adaptive Management Plan

August 2015

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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 McMahon Woods 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:

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. 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.
  3. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration
  4. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.
  5. 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. McMahon Woods is located near Palos, Cook County, Illinois along the Calumet-Sag Channel. The area resides to the north of the Calumet-Sag Channel, Saganashkee Slough borders most of the area to the east, along with 104<sup>th</sup> Ave. The study area is located adjacent to the remnant graminoid fen, but does not include the fen in the project foot print. The total study area is approximately 410-acres of publicly protected lands within the Palos Preserves area of the Forest Preserves of Cook County. About 300-acres of the study area is designated critical habitat for the Great Lakes subpopulation of Federally Endangered Hine’s Emerald Dragonfly (*Somatochlora hineana*). The study parcels consists of various natural area parcels of land, all of which are owned by the Forest Preserves of Cook County. The natural area parcels have the potential to provide marsh, Oak savanna, and wet mesic woodland habitat.

## Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Degradation of aquatic migratory bird habitat
- Altered hydrologic regime
- Invasive species dominance
- Degradation of groundwater feed (rivulets) wetlands
- Loss of periodic fire
- Lack of native herbaceous and shrub species (food bearing plants)

## Restoration Design Overview

Implementation of Alternative 4, the NER Plan, would greatly improve the ecosystem conditions of McMahon Woods. 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 McMahon Woods. Key restoration features include restoring marsh/rivulets, Oak savanna and wet mesic woodland. Structural components of the project include:

- a) Installation of structures to reduce overflows of Crooked Creek and reduce coverage of bare soil areas within McMahon Woods
- b) Removal of invasive plant and destructive fish species
- c) Plant communities which will be restored and/or enhanced include
  - i. marsh
  - ii. oak savanna
  - iii. wet mesic 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. Assessments would be conducted by walking through the project and visually assessing each of the components or project features that are listed below. This is intended to be fairly quick and to notice problems before they become issues that require complete overhauls and may adversely impact other project features. Structural components are currently broken down into the following:

- 1) Earthen Berm
- 2) Culvert under 107<sup>th</sup> St.
- 3) Hine's Emerald Dragonfly rivulets
- 4) Plant community reestablishment
  - a) Marsh

- b) Oak Savanna
- c) Wet Mesic Woodland

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

1. Earth Berm
  - a. Presence/absence of erosion
  - b. Hydrological indicators
  - c. Invasive species % coverage
2. Culvert under 107<sup>th</sup> St
  - a. Presence/absence of erosion
  - b. Structural integrity
3. Plant Community Zones
  - a. Spatial coverage
  - b. Invasive species % coverage
  - c. Predator induced damages
  - d. Hydraulic induced damages
4. 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. Success of structural components, and any adaptive management triggered by observations, will be determined by the absence of structural problems at the end of 10 years.

## **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. Success will be determined by comparing FQA results with those predicted from the Future With Project Conditions (Table 1). Adaptive management measures will be taken if there is a decreasing trend of floristic quality over a period of three consecutive years. Adaptive management measures may include installation of native plant seed in areas of downward trend, more frequent fires or more intensive efforts to remove invasive species. Results from monitoring will be reported per year of monitoring efforts and project success determined and report in the final report to be completed in the 10<sup>th</sup> year of 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.

#### **Avian Community**

The monitoring for this community will be implemented; however, at this point in the study/project, it is unknown if the USACE, Forest Preserve District of Cook County or Audubon Chicago Region 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.

#### **Hine's Emerald Dragonfly**

The monitoring of this species would be most likely carried out by U.S. Fish and Wildlife Service and University of South Dakota (Dr. Soluk). These organizations have the expertise necessary to appropriately monitor this species in both adult and larval forms without negatively impacting the sensitive population at McMahon Woods. Success will be determined by recording an upward trend in population numbers over the course of the 10 year monitoring period. If a downward trend is detected over 3 consecutive years adaptive management measures would be conducted to reverse negative trend. Adaptive management measures may include additional removal of non-native vegetation and installation

of appropriate native vegetation and/or introduction of more prairie crayfish to increase the number of burrows Hine’s Emerald Dragonfly use to forage and overwinter. Any adaptive management would be closely coordinated with the USFWS and Forest Preserves of Cook County. Monitoring data will be reported each year of monitoring effort and a final report completed on the 10<sup>th</sup> year of the monitoring period.

### 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.

### 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:

- Increase native conservative plant species richness of marsh, Oak savanna and wet mesic woodland (containing wooded fen) communities
- Reduce and/or eradicate invasive species
- Reduce/repair bare soil areas within the marsh and rivulet complex and Crooked Creek riparian area

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:

Table 1.

Community Type	Acres	AAMean C	HSI	AAHU	NetAAHU
Marsh	30.1	4	0.4	12.04	7.83
Oak Savanna	4.5	4.4	0.44	1.98	1.23
Wet Mesic Woodland	376	4.5	0.45	169.2	88.36

\*Mean C of the Floristic Quality Assessment

### Monitoring Responsibilities

The USACE, USFWS and University of South Dakota 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.

Table 2.

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 McMahon Woods. 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.

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 Forest Preserves of Cook County 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 McMahon Woods. 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 Forest Preserves of Cook County 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.