

2015

# Lockport Prairie Section 206 Aquatic Ecosystem Restoration Study

Appendix H - Monitoring & Adaptive Management Plan



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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 Lockport Prairie 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**

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**

Detailed description of the study area may be found in the [Feasibility Study, 1.4 – Study Background](#). The Lockport Prairie study area is located in Lockport, Illinois along the lower Des Plaines River. The project includes Lockport Prairie Nature Preserve (LPNP), located between Route 53 and the Des Plaines River, and Prairie Bluff Preserve (PBP), located to the east of LPNP along Route 53. The project area consists of various remnants and restored native plant communities that total 927.5-acre, all of which are owned or managed by the Forest Preserve District of Will County. The natural areas have the potential to provide large open grasslands for grassland breeding birds, breeding habitat for a federally listed dragonfly, marsh, oak savanna, sedge meadow and remnant high quality prairie habitat.

### **Habitat Trends Triggering Restoration**

This project aims to remedy adverse trends of:

- Increased coverage of aggressive and invasive plant species
- Fragmentation of local habitat patches by agricultural practices
- Altered hydrological processes
- Lack of large contiguous open grasslands
- Increased coverage by non-native shrubs
- Degradation of rare native plant communities

## Restoration Design Overview

Implementation of Alternative 5, the NER Plan, would greatly improve the ecosystem conditions of Lockport Prairie. 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 Lockport Prairie. Key restoration features include restoring natural hydrologic functions in PBP and subsequently increasing rate of infiltration to groundwater within the recharge zone for Hines Emerald Dragonfly critical habitat, removal of non-native shrubs, removal of invasive and aggressive herbaceous plants, reestablishing periodic grassland burns, increasing native plant diversity in marsh, sedge meadow, oak savanna, floodplain forest and prairie. Structural components of the project include:

- Full hydrologic restoration
  - Drainage tile disablement
  - Erosion control
- Full invasive species removal
  - Selective clearing of woody species
  - Herbicide application of woody and herbaceous species
  - Prescribed burning
  - Selective mowing
- Full native plant restoration
  - Hand sow and plant appropriate plant community mixes to increase habitat diversity and in areas of invasive removal to discourage the reestablishment of said species

## 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 every other year for 10-years. Structural components are currently broken down into the following:

- 1) Erosion control in Oak Savanna
- 2) Non-native shrub control in LPNP
- 3) Aggressive and invasive plant control in both LPNP and PBP
- 4) Hine's Emerald Dragonfly (rivulets)
- 5) Plant community reestablishment
  - a) Marsh
  - b) Sedge Meadow
  - c) Oak Savanna
  - d) Prairie (Wet – Dry Mesic)
  - e) Floodplain Forest

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

1. Erosion control in Oak Savanna
  - a. Presence/absence of erosion
  - b. Cohesiveness and durability of vegetation
2. Non-native shrub control in LPNP
  - a. Presence/absence of non-native shrubs
  - b. Percent coverage
  - c. Map of locations of species
3. Invasive and aggressive herbaceous control in LPNP and PBP
  - a. Presence/absence of non-native shrubs
  - b. Percent coverage
  - c. Map of locations of species
4. Hine's Emerald Dragonfly
  - a. Monitor rivulet stage during critical times of season
  - b. Monitor larval stage of Hine's Emerald Dragonfly in rivulets

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

The monitoring of this species would be most likely carried out by U.S. Fish and Wildlife Service (USFWS), U. S. Geological Survey (USGS) 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 Lockport Prairie. U. S. Fish and Wildlife would coordinate both the USGS (stage monitoring in rivulets, map of rivulets section 2.2.5 Feasibility Report) and larval sampling (in rivulets) to ensure minimal impact to adult and larval populations at Lockport Prairie. It is expected that restoration of hydrology within the rivulets would not impact the species current abundance at the project site. Instead, it is expected that restoration efforts would maintain and possibly improve the current abundance of Hine's Emerald Dragonfly. Monitoring costs are assumed to be \$█████. per year when larval surveys are completed and \$█████ per year when stage only data is collected.

5. Plant Community Zones
  - a. Spatial coverage of each community type
  - b. Invasive species % coverage
  - c. Predator induced damages
  - d. Hydrologic induced damages
6. 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 remnant native/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 (e.g., Marsh, Sedge Meadow, Wet Prairie, etc). 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. Final locations of transects must be determined after the end of construction when final planting plans have been completed. Average costs of completing tansects surveys are \$7,000.00 per year.

#### **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 Will 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.

### **Other Communities**

Ancillary data will be collected on other assemblages as well. During 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 Hydrogeomorphic processes to Support Natural Communities
- Objective 2– Eradicate Invasive Species for all Plant 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	AA HSI*	AA HUs	Net AA HUs
<b>MU1 (PBP)</b>				
Marsh	80	0.51	40.48	29.84
Wet Prairie	115	0.49	56.47	41.17
Wet Mesic Prairie	270.3	0.43	117.04	81.09
Mesic Prairie	158.4	0.53	83.64	62.57
<b>MU2 (LPNP)</b>				
Oak Savanna	15.2	0.47	7.16	5.14
Marsh	4.5	0.46	2.08	1.41
<b>MU3 (LPNP)</b>				
Marsh	80	0.46	36.96	25.12
Sedge Meadow	5	0.49	2.45	0.65
Wet Prairie	10	0.37	3.71	1.01
Wet Mesic Prairie	15.6	0.41	6.32	1.12
Mesic Prairie	7	0.41	2.87	0.62
Dry Mesic Prairie	15	0.41	6.11	0.83
Floodplain Forest	10	0.39	3.87	2.33
<b>MU4 (LPNP)</b>				
Marsh	75	0.46	34.65	23.55
Sedge Meadow	4	0.49	1.96	0.52
Wet Prairie	20	0.37	7.42	2.02
Wet Mesic Prairie	13.8	0.41	5.59	0.99
Mesic Prairie	8	0.41	3.28	0.70
Dry Mesic Prairie	10	0.41	4.07	0.55
Floodplain Forest	10.7	0.39	4.14	2.49

\*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. Specific monitoring activities related to the endangered Hines Emerald Dragonfly would be accomplished by the USFWS, the USGS and the staff from the University of South Dakota. 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 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 Lockport Prairie study area. 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.

Hine’s Emerald Dragonfly – Adaptive management actions regarding Hine’s Emerald Dragonfly habitat and hydrology will be coordinated between Forest Preserve District of Will County, USFWS, USGS and University Of South Dakota.

## Operation & Maintenance

The O&M costs of the project are estimated to an average annual cost of \$[REDACTED] 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 Preserve District of Will 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 Lockport Prairie project area. Aside from minor replantings, 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 Preserve District of Will 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.