

Appendix H

MONITORING AND ADAPTIVE MANAGEMENT

Monitoring and Adaptive Management Appendix H

1. Introduction

Section 2039 of WRDA 2007 requires that when conducting a feasibility study for ecosystem restoration, the proposed project includes a plan for monitoring the success of the ecosystem restoration. Additionally, paragraph (3)(d) of Section 2039 states that “an adaptive management plan will be developed for ecosystem restoration projects...appropriately scoped to the scale of the project.” The implementation guidance for Section 2039, in the form of a CECW-PB Memo dated 31 August 2009, also requires that an adaptive management plan be developed for all ecosystem restoration projects. Adaptive management “prescribes a process wherein management actions can be changed in response to monitored system response, so as to maximize restoration efficacy or achieve a desired ecological state” (Fischenich et al. 2012).

The adaptive management plan for the Lake Lou Yaeger, IL, Section 206 project describes and justifies whether adaptive management is needed in relation to the proposed project management alternatives identified in the project feasibility study. This appendix outlines how the results of the project-specific monitoring plan would be used to adaptively manage the project, including monitoring targets which demonstrate project success in meeting project objectives. The USACE intent was to develop monitoring and adaptive management actions appropriate for the project’s goal and objectives.

Adaptive management provides a process for making decisions in the face of uncertainty. The primary incentive for implementing an adaptive management plan is to increase the likelihood of achieving desired project outcomes given the identified uncertainties, which can include incomplete description and understanding of relevant ecosystem structure and function; imprecise relationships among project management actions and corresponding outcomes; engineering challenges in implementing project alternatives; and ambiguous management and decision-making processes.

The study team determined that uncertainties surrounding the success of the project are primarily linked to the following: 1) successful establishment of desirable aquatic vegetation in the wetland area, and 2) possible higher than estimated sedimentation rates in the wetland area.

2. Goals and Objectives

The primary goal of the Lake Lou Yaeger, IL, Section 206 project is to restore, to the extent practical, quality, functional wetlands and habitat for aquatic organisms in Lake Lou Yaeger. Implementation of the recommended plan would result in the restoration of emergent wetland upstream of the berm and also restore habitat for aquatic species downstream of the berm.

The following objectives and proposed restoration features were considered during the study to achieve the project goal:

- 1) *Restore herbaceous emergent wetlands* – Construct a berm to retain sediment and allow wetland vegetation to naturally establish over time as water depths decrease.
- 2) *Improve habitat for aquatic organisms* – Construction of the berm will reduce the amount of sediment deposited downstream of the berm, thereby reducing the rate of habitat loss for aquatic organisms.

3. Performance Indicators

Performance indicators to the above objectives were developed with the best available knowledge. They were developed to be specific, measurable, attainable, realistic, and timely. Because the two areas of greatest risk and uncertainty are related to the goal of wetland restoration, and because the achievement of

the second goal is dependent on the success of the wetland restoration, USACE is only proposing monitoring and adaptive management related to wetland restoration.

Vegetation Monitoring

- 1) **Performance Indicators:** Species composition and quality of annual or perennial herbaceous vegetation.
- 2) **Rationale:** This survey will be conducted to evaluate effectiveness of restoration features to successfully establish a diverse wetland habitat while keeping invasive species at a tolerable level.
- 3) **Methodology:** For the first five years, herbaceous vegetation surveys will be conducted by the Sponsor once each year within the restored emergent herbaceous wetland areas. Surveys will be conducted between August 1st and September 15th. Prior to the end of the construction phase, 20 (50 × 50 cm) plots will be randomly located above the berm. GPS points will be recorded for each plot and subsequent monitoring will be done at the same coordinates. Percent cover of each plant species will be visually estimated for all plants within the plot. Species will be classified as native, non-native (invasive), and/or woody. For each year two average percent cover (all plots both samples) values will be provided: a total plant percent cover value and a native emergent herbaceous wetland percent cover value. These values will be used to determine success. If ecological success targets are not being achieved at year two, then adaptive management will be considered.
- 4) **Monitoring Targets (Desired Outcomes):** With the restoration of native wetland communities, the targets for species composition and quality include the following:
 - a. Native wetland herbaceous species ≥ 75%
 - b. Percentage of invasive species < 25%.
- 5) **Action Criteria (Adaptive Management triggers):** Adaptive management actions should be implemented if any of the below action criteria are triggered. Adaptive management could include, but is not limited to, planting native wetland species, removing invasive species, and/or modifying the berm. The exact management action implemented will be decided by USACE.
 - a. Native wetland herbaceous species ≤ 75%
 - b. Percentage of invasive species > 25%.

Performance indicators are summarized in Table 1. The conceptual monitoring schedule and estimated costs are provided in Table 2.

Table 1. Project objectives, indicators, and time before the effects of the Lake Lou Yaeger, IL Section 206 project become apparent

Objective	Performance Indicator	Monitoring Target (Desired Outcome)	Action Criteria (AM triggers)	Time of Effect	Responsible Party
Restore herbaceous emergent wetlands	Species composition and quality of annual and perennial herbaceous vegetation	Native wetland herbaceous species ≥ 75% Percentage of invasive species < 25%.	Apply adaptive management actions if any of the monitoring targets fall outside the desired thresholds	5- years post-construction	Sponsor/USACE

Table 2. Lake Lou Yaeger, IL, Section 206 project conceptual monitoring schedule and estimated monitoring costs. Construction completion is set at year 0.

Performance Indicator	0	+1	+2	+3	+4	+5
Plant Species Diversity*	Construction	X	X	X	X	X
Est. Cost (\$)		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
SUBTOTAL	\$5,000					

*These data will be collected annually by the Sponsor and visually confirmed by USACE during a site visit.

4. Data Management Plan

The data management plan has been developed to support the monitoring and adaptive management plan. The surveys will be documented in an annual written report that will be provided by the Sponsor to USACE for review by the end of the calendar year. The report will include:

- A figure showing the location of all sample plots
- GPS coordinates for all sample plots
- Day, month, and year monitoring was performed
- Name(s) of company/individuals conducting the monitoring
- Herbaceous species and percent cover for each species listed by sample plot
- Classification (native, non-native, woody, wetland, non-wetland) of herbaceous species by plot

5. Adaptive Management Plan

In the event that USACE determines that ecological success is not likely to be met using information provided in the monitoring reports, the following adaptive management measures could be implemented to aid the achievement of ecological success.

If native herbaceous plants do not constitute 75% of the total plant percent cover then adaptive management measures may be necessary. If species survivorship is low, then live plant plugs of native herbaceous wetland species suitable for the area’s hydrology should be planted. If the hydrology fails, modification of the berm could be conducted to restore the hydrology.

If invasive encroachment exceeds 25% of percent land cover, measures will be taken to remove invasives. Common invasives include Johnsongrass, Reed Canary Grass, Kudzu and Japanese Hops. Common management techniques include burning, hand removal, and herbicide application. Management techniques would be implemented until percent cover of invasive plants is reduced to less than 25%.

Table 3 below outlines the estimated timing and cost of potential adaptive management measures. The timing and costs may be adjusted based on the monitoring results. If implementation of adaptive management measures occur in years 3, 4 or 5, then annual monitoring as described above will be continued for an additional 3 years following the adaptive management action. Ecological success will be evaluated and additional adaptive management and subsequent monitoring cycle could be conducted. This process will continue until success is determined.

Table 3. Lake Lou Yaeger, IL, Section 206 project conceptual adaptive management schedule and estimated costs. Construction completion is set at year 0.

Management Measure	0	+1	+2	+3	+4	+5
Plantings	Construction	N/A	\$2,500	N/A	N/A	N/A
Invasives Management		N/A	\$2,500	N/A	N/A	N/A
Berm Modification		N/A	\$15,000	N/A	N/A	N/A
Total	\$20,000					