APPENDIX F
MONITORING AND ADAPTIVE MANAGEMENT PLAN

Little Manistee River Sea Lamprey Barrier
Stronach, MI

US Army Corps of Engineers®

INTRODUCTION AND RATIONALE FOR MONITORING

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project under the U.S. Army Corps of Engineers ecosystem restoration mission, that the recommended project include a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction to which adaptive management, if needed, should proceed. This monitoring plan includes a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, the estimated cost and duration of the monitoring, and a discussion of adaptive management.

A monitoring plan is an important tool to help establish post-construction success of an ecosystem restoration project. Monitoring provides data to compare pre- and post-project conditions, allowing one to gauge the success of the project, and/or recognize when or if implementation of adaptive management is necessary to achieve the project objectives. The monitoring plan for the Little Manistee River sea lamprey barrier project will be cost shared between the U.S. Army Corps of Engineers, Detroit District (COE) and the US Fish and Wildlife Service for up to 5 years as expressed in the Project Partnership Agreement (PPA) or until the District Commander deems success of the project. Larval surveys take time for the larvae to grow large enough to sample and identify. Based on larval growth rates, it is likely that any larvae spawned upstream of the weir site will not be large enough to collect using standard collection methods and identify until at least Age 1 or age 2. As such, the monitoring period for adoptive management may be extended to a 10 year period for successful ecosystem establishment. Monitoring will be conducted in year 2 or 3 and 5 and as needed, generally every second or third year. If monitoring criteria are met in year 5, the recommendation will be made to the DE that further monitoring will not be required under this program, but the USFWS will likely continue to complete larval lamprey assessments on a 3 year basis or after significant rainfall events.

The purpose of monitoring is to provide actionable information to assess whether the proposed action (spillway weir construction) achieved project objectives of blocking further upstream migration of spawning phase lamprey. The objectives for this project are:

- Block upstream migration of spawning phase adult sea lamprey.

Achieving this objective will require larval lamprey surveys in the upstream river sediments at least every two or three years for two assessments to verify larval lamprey are not in the sediments at a sufficient density to require treatment.

Monitoring the results of the restoration activities will commence after the construction contract has been concluded. Monitoring will determine if larval lamprey were successfully being spawned and reared in the upstream river sediments. If high enough densities of larval lamprey are detected, then adult lamprey moved upstream during a storm event over the weir or one or

more gaps exist somewhere within the weir system that allowed the adult lamprey to pass upstream to spawn.

Adaptive management is an iterative process (Figure 1) that integrates results and analysis of long term monitoring with adjustments to project operation to inform environmental protection and operational efficiency decisions. This adaptive management plan (AMP) describes how the blockage of upstream migration of spawning phase adult sea lamprey will be adjusted if long term monitoring finds that larval lamprey are living in high enough densities in the upstream sediments to warrant treatment. It describes the process for conducting the larval lamprey surveys, evaluating the results of the monitoring program, responsibilities of the interagency team, "triggers" or action points that would necessitate a restoration corrective action of the project and potential changes that would be implemented to mitigate adverse impacts.

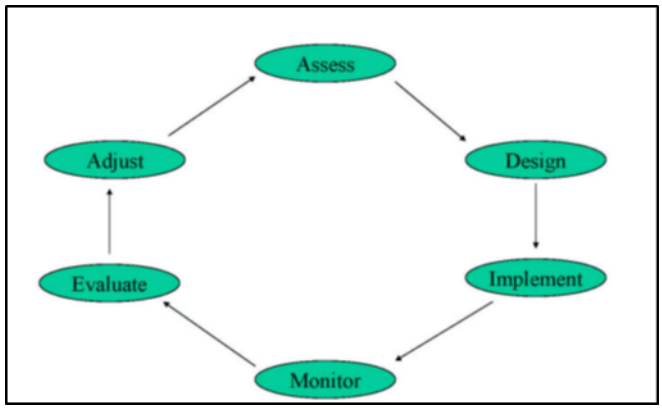

Figure 1. Six steps of adaptive management (from USACE)

MONITORING OBJECTIVES

Key project specific parameters to be measured were identified based on their relevance to determining whether project objectives were met.

Project Specific Parameters for Monitoring

- Monitoring of upstream sediments for larval sea lamprey density.

The spillway will be reconstructed with a weir design to block upstream migration of adult spawning phase sea lamprey at the 4% (25 year) flood discharge. Monitoring will occur on a 2 or 3 year time frame to assess the population density of larval lamprey upstream of the weir. If lamprey larvae density is sufficient to require treatment and the river did not experience a 4% or greater discharge event, the weir structure will be evaluated for gaps/leaking seals/voids that lamprey could escape through the weir for upstream spawning access. Any identified leaks will be repaired. When larval sampling has been completed upstream, the sampling results will be summarized and shared with the USACE with a determination whether upstream treatment is recommended or not. Success is determined if two sequential upstream larval lamprey evaluations do not indicate larval density requiring treatment.

DISPOSITION AND ANALYSIS OF INFORMATION

The information gathered as part of the monitoring program will be collected in coordination with the GLFC to insure consistency and comparability with previously collected data. Results of the larval lamprey sampling should be recorded and the summarized data reported to the USACE not later than December 31 of the data collection year. The data should be presented in well organized and easy to follow excel spreadsheets that are accompanied by a narrative

explaining the results and discussing whether they indicate the project is achieving its objectives.

COST OF MONITORING

Total cost per year for the required monitoring (2 separate years) would be approximately $20,000. It is fully anticipated that the project objectives will be met documented by year 5 of monitoring unless a 4% or greater discharge event occurred during the spawning time period. The following table details the required five year monitoring costs.

Table 1: Monitoring Costs

Year	Parameters to Monitor	Costs
1		
2		
3	Larval lamprey	$10,000
4		
5	Larval lamprey	$10,000
6	Further Monitoring as needed	
7		
8		
9		
10		
Total		$20,000

PARTY RESPONSIBLE FOR MONITORING

The non-federal sponsor is responsible for performing or having the monitoring performed via contract staff or qualified contractors..

ADAPTIVE MANAGEMENT PLAN

Adaptive management is the process of using post action monitoring data to determine whether additional actions are required to meet project objectives. Adaptive management needs to be driven by the information gathered during post action monitoring. It is expected that by the second larval assessment, sufficient information will be available to determine whether the project was a success (barring a 4% or greater discharge event). Success is defined as no larval lamprey densities upstream in sufficient number to require treatment.

Adaptive management measures are not expected to be needed as the proposed ecosystem restoration project is well understood and readily predictable. There is a high level of agreement among the resource agencies and other involved parties that the proposed restoration will effectively provide the desired goals within the constraints of the existing ecosystem restoration project. The desired outcome of this restoration is well understood by the parties involved and

is easy to predict and measure. The nature of this project and the project design combine to provide a high level of confidence that the project goals will be achieved.

The probability of failure to meet the project goals is considered low. The major items of concern for project function are:

- A discharge event at 4% or greater during the spawning phase that permits adult lamprey to pass upstream of the weir to spawn.

Detailed adaptive management actions need to be devised based on the monitoring data as follows:

- Observe and record the larval lamprey density in identified recruitment areas upstream of the weir. If larval lamprey density is sufficient to require treatment and if no discharge event at 4% or greater has occurred, inspect the weirs to determine where escapement is occurring. Block the identified transfer path(s). Re-evaluate larval lamprey densities within two years.

Adaptive management actions need to be tailored to the specific issues encountered and may vary depending on the magnitude of the discrepancy between post construction conditions and desired conditions. Therefore, the specifics of the adaptive management actions should involve a multi-disciplinary group that includes, at a minimum, the GLFC, USFWS, MDNR, MDEQ and USACE. The Section 506 GLFER authority prohibits the agency from cost sharing any activities related to adaptive management.