

# UPPER OHIO NAVIGATION STUDY, PENNSYLVANIA ENVIRONMENTAL APPENDIX

## **Fish and Wildlife Mitigation, Monitoring, and Adaptive Management**

### Note to Reader:

Fish and wildlife mitigation was formulated for both the aquatic and terrestrial impacts associated with lock construction. Habitat losses were quantified through use of the U. S. Fish and Wildlife Service's Habitat Evaluation Procedures and Habitat Suitability Indices. Terrestrial and aquatic mitigation alternatives were subjected to an incremental cost analysis using the USACE Institute for Water Resources Planning Suite Software. The results of this formulation were reported in the Upper Ohio Study's Draft Environmental Impact Statement (DEIS) circulated for 45-day public review period ending June 2, 2014.

Some reviewers commenting on the DEIS questioned certain aspects of the impact calculation and mitigation formulation process, particularly habitat value units of measure and levels of proposed mitigation. In response to these questions, the District subsequently converted the habitat value unit measures and verified all assumptions and calculations. These revised results are reported in the Upper Ohio Study's Final Environmental Impact Statement text. There is no significant change in the recommended mitigation plan between the Draft and Final EIS texts.

The following report furnishes details of the mitigation monitoring and adaptive management requirements and plan summarized in the Final EIS Section 5. THE RECOMMENDED PLAN.



## **Upper Ohio Navigation Study, Pennsylvania**

### **Fish and Wildlife Mitigation, Monitoring, and Adaptive Management**

#### **1. Background**

Section 2036(a) of the Water Resources Development Act of 2007 requires that a plan for monitoring and adaptive management be prepared for all mitigation plans prepared for the US Army Corps of Engineers water resources projects.

#### **2. Lock Construction Aquatic Habitat Mitigation**

The Corps will improve habitat for fish and invertebrates within Montgomery Slough (Figure 1) by creating artificial habitat structure through the placement of large woody debris (LWD) in the form of Porcupine Cribs (Figure 2) or similar structures in a 3.0 acre area of Montgomery Slough (Figure 3). Large woody debris is a vital and naturally occurring component of healthy aquatic habitats. These complex structures provide cover for small fish to avoid predation, and larger fish use them as foraging areas thus they allow the coexistence of predator and prey. Further, they provide important habitat for aquatic invertebrates, providing foraging opportunities for juvenile and adult panfish that rely on invertebrates as a food source (Pennsylvania Fish and Boat Commission 2007).

The Pennsylvania Porcupine Crib was the first artificial habitat structure designed in the Commonwealth by fisheries biologists. These artificial LWD habitats are fish structures designed to provide habitat features that allow fish and reptiles to accomplish their daily and seasonal performance tasks with greater efficiency in areas where naturally occurring LWD is lacking ([http://fishandboat.com/water/habitat/mgmt\\_plans/lake/intro\\_lake\\_hab.htm](http://fishandboat.com/water/habitat/mgmt_plans/lake/intro_lake_hab.htm)). They are long lasting, deep water complex structures made of biodegradable materials. It was also the first habitat device designed to provide improved habitat with fish protection—not fish attraction—as an objective.

Shown to be effective in creating habitat, the Porcupine Crib is used in the majority of the Pennsylvania Fish & Boat Commission approved habitat improvement projects in impoundments and reservoirs (<http://www.fish.state.pa.us/lakes.htm>). Other structures have also been designed to meet other fishery needs, using the same materials and design criteria and with methods similar to the original Pennsylvania Porcupine Crib. The mitigation cost estimate is based upon Commission designs and spacing recommendations for the “porcupine crib” and “short vertical plank structure” (Figure 2). The specific form or forms of LWD to be used at Montgomery embayment will be developed in consultation with federal and state resource agencies prior to installation.

The following mitigation objectives are applicable to the aquatic habitat mitigation:

1. Improve aquatic habitat diversity in Montgomery embayment through placement of woody structures; and
2. Document lessons learned and apply adaptive management for subsequent projects

**Monitoring:** The purpose of monitoring is to verify success as defined in terms of the mitigation objectives and criteria developed to measure success and to identify when and what adaptive management actions should be taken. An impoundment is an incredibly complex aquatic ecosystem and fish populations and natural habitat abundance vary greatly from day to day, season to season and year to year, due primarily to regional environmental conditions ([http://fishandboat.com/water/habitat/mgmt\\_plans/lake/intro\\_lake\\_hab.htm](http://fishandboat.com/water/habitat/mgmt_plans/lake/intro_lake_hab.htm)). Therefore, scientifically speaking, determining the fishery population value of artificial fish habitat in a large impoundment may be close to impossible. As a result, monitoring will focus on the presence and integrity of structures. Monitoring activities include a baseline survey conducted from a boat during late Spring or early Summer at year zero (0), followed by post LWD installation surveys in Years 1, 3, 5, and at the close of construction. Monitoring includes the evaluation of the physical condition of the LWD. This will be accomplished through direct visual surveys from the watersurface of placement stability, condition of material, structural integrity, and sedimentation characteristics. Visible marks will be painted at one-foot increments along the profile of the structure to help gauge the structures rate of degradation and/or subsidence. It is expected that all surveys will be performed by Corps staff or a Corps contractor in conjunction with the Pennsylvania Fish and Boat Commission Fisheries experts.

*Pre-installation.* Baseline survey for depth and substrate stability.

*Post-installation.* Visual surveys of installed structures to assess structure condition, substrate surveys to verify any changes in sedimentation/depth of structures that would diminish performance.

**Performance Measures and Success Criteria:** There is an assumption, based on previous utilization of similar structures that these structures will provide lacking habitat for several species of fish and invertebrates, and if structures are present and intact then benefits are consequently being provided by those structures (Pennsylvania Fish and Boat Commission 2007). Therefore, ecological success will be described in terms of the presence and physical condition of the placed structures. Success will be achieved if 75 percent of the original number of placed structures are present, intact, unobstructed, and performing as intended at the close of construction. To perform as intended, the surface area of the structures above the substrate should be greater than 75 percent of the original structure's surface area calculated through visual surveys using the painted marks and professional judgment. Additional

information that may be collected and qualitatively assessed by the sampling party during the performance period but not included as performance or success criteria could include epiphytic plant and invertebrate growth on LWD and LWD utilization by non-target aquatic and terrestrial species.

**Adaptive Management Trigger:** Adaptive management would be required if at any monitoring cycle, monitoring results show there are less than 75 percent of structures present, generally intact, without significant sedimentation, and performing as intended. Because of the difficulty in monitoring from the surface, this may involve some best professional judgment.

**Adaptive Management Action:** Supplement or replace LWD structures not performing as intended with new LWD structures in order to maintain 75 percent or more of the original number of placed structures. New structures may require different design or different placement methods depending on the reason for failure.

**Monitoring and Adaptive Management Cost:** Estimated cost for monitoring is \$72,085. This includes a baseline survey of depth and substrate at year zero (0) and four (4) visual surveys for structural presence and performance, changes in flow, and sedimentation characteristics at Years 1, 3, 5 and close of construction.

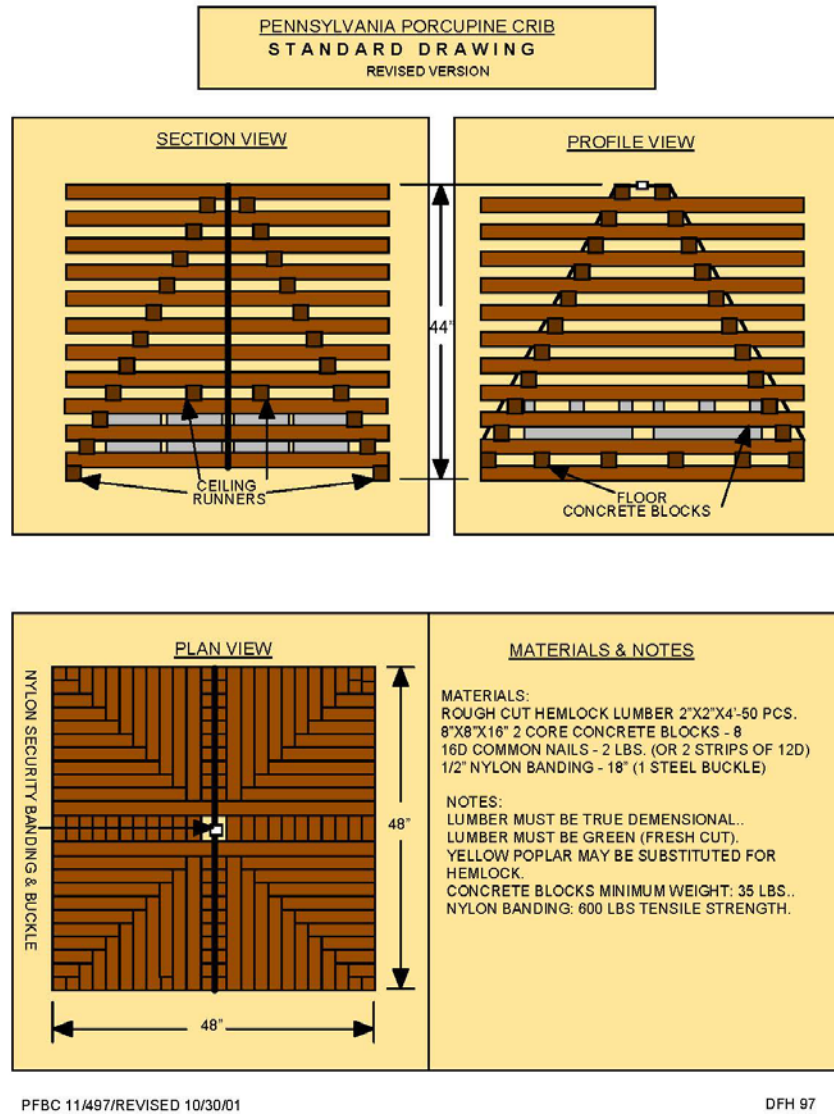
Estimated cost for adaptive management is \$139,806 based on worst case of replacement of all structures due to failure over the life of project construction. An additional cost of \$19,660 will be required for agency coordination.

**Table 1.** Aquatic Mitigation Monitoring and Adaptive Management Costs  
(Oct 2014 Cost Levels)

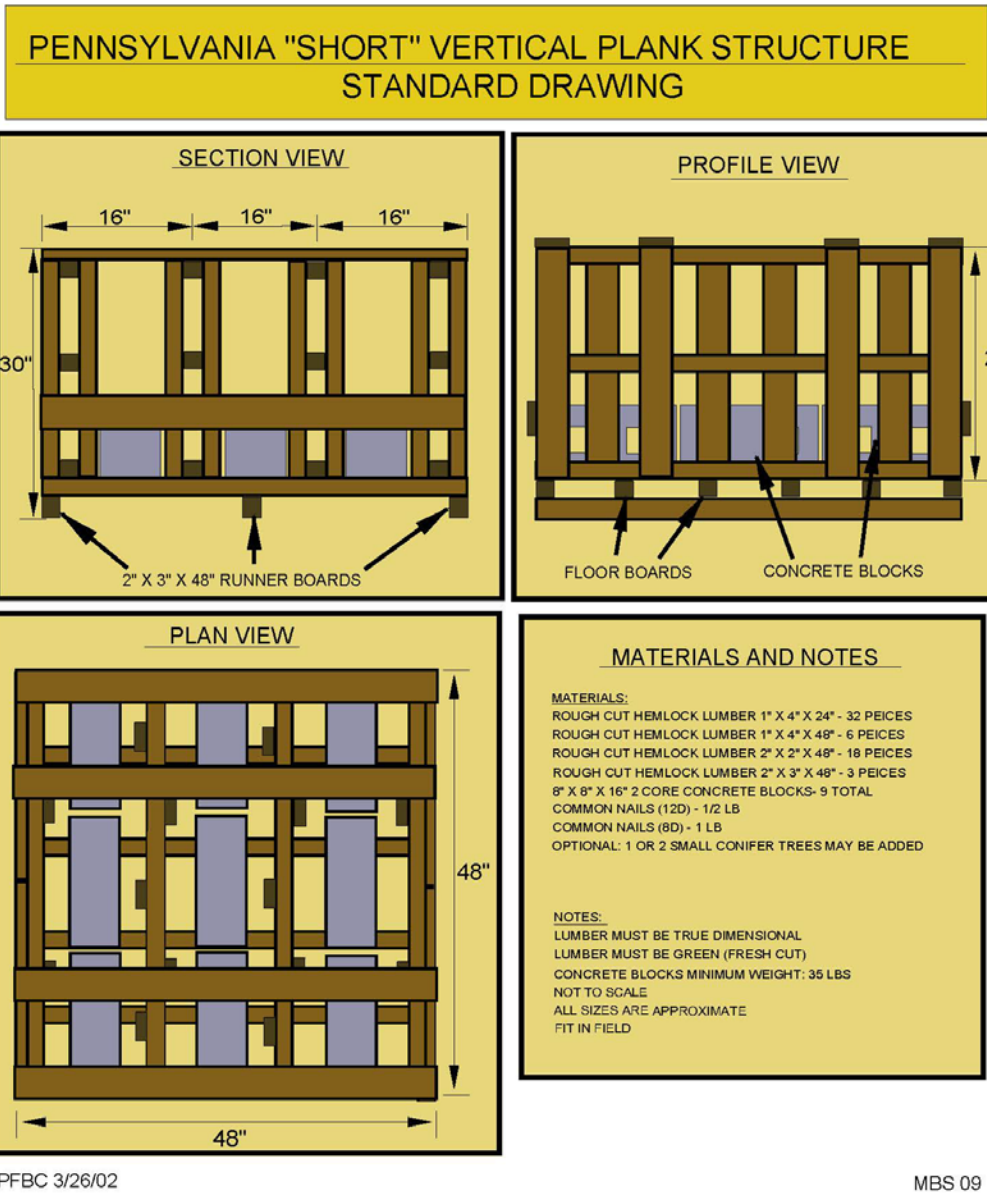
<b>Activity</b>	<b>Cost</b>
Mitigation	\$139,806
Monitoring	\$72,085
Adaptive Management	\$139,806
Agency Consultation	\$19,660
<b>Total</b>	<b>\$371,357</b>



**Figure 1.** Location Montgomery Slough



**Figure 2.** Porcupine Crib



**Figure 3.** Short Vertical Plank Structure



### 3. Lock Construction Terrestrial Habitat Mitigation

The Corps will improve terrestrial habitat at three (3) sites (Figures 4-6) used for lock construction: Emsworth Secondary Laydown Area (SLA), Dashields Primary Laydown Area (PLA), and Montgomery Primary Laydown Area (PLA).

Emsworth SLA, Option #3 – The entire site would be planted with a wildlife habitat herbaceous mix to stabilize the site and establish the old field community. This option includes no woody species landscaping and allows local native species to naturally spread. At year 3 it is expected that the area will be completely colonized by an herbaceous mix. This plan is also applicable to the Emsworth PLA should it become available for use.

Dashields PLA, Option #2 – The entire site would be planted with a wildlife habitat herbaceous mix to stabilize the site and establish the old field community. Shrubs would be planted at a density of 600 per acre.

Montgomery PLA, Option #1 – The entire site would be planted with a wildlife habitat herbaceous mix to stabilize the site and establish the old field community. Trees would be planted at a density of 60 per acre and the shrubs would be planted at a density of 200 per acre. Site restoration and plantings will be performed at each lock construction work and laydown area at the conclusion of each respective construction period. Best practice sedimentation and erosion protection plans will be used.

The following mitigation objectives are applicable to terrestrial habitat mitigation for construction site impacts:

1. Meet the long-term targeted cover percentages for vegetative cover types based on documented vegetation and growth;
2. Minimize invasive species encroachment in the site restoration through monitoring and adaptive management practices; and
3. Document lessons learned and apply adaptive management for subsequent projects.

**Monitoring:** The purpose of the monitoring is to verify success as defined in terms of the mitigation objectives and criteria developed to measure success and to identify when and what adaptive management actions should be taken. Monitoring activities include visual observations using transects to estimate vegetative cover types and proportions during the growing season to document percent cover and growth. Monitoring will occur during Years 1 and 3 following initial plantings. Monitoring would also be required in Year 5 if any adaptive management measures are implemented during Years 1-4. Monitoring will be performed by Corps staff or a Corps contractor.

**Performance Measures and Success Criteria:** Success will be described in terms of native plant survival in planted areas of the three mitigation sites and minimum invasive species.

For the Emsworth site: Success will be achieved if at Year 3 (or 5 if monitoring is necessary) if there is a 90 percent coverage of herbaceous mix of vegetation with less than 5 percent coverage of invasive species as determined by visual transect surveys..

For the Dashields site: This option includes a moderately intensive landscaping restoration that has a Year 3 (or 5 if monitoring is necessary) target community of 25 percent shrub thicket and 75 percent herbaceous old field with less than 5 percent coverage of invasive species as determined by visual transect surveys..

For the Montgomery site: This option includes a moderately intensive landscaping restoration that has a Year 3 target community of 15 percent early succession forest, 10 percent shrub thicket, and 75 percent herbaceous old field with less than 5 percent coverage of invasive species as determined by visual transect surveys..

**Adaptive Management Trigger:** If at any monitoring cycle, adaptive management will be triggered if monitoring results show there is less than a 90 percent survival in the growing season of planted species at each site and/or there is greater than 5 percent invasive species present.

**Adaptive Management Action:** Supplement or replace vegetation to achieve desired composition and percent coverage; modify species utilized in mitigation if necessary. Eradication of invasive species may be required if coverage is greater than 5 percent.

**Terrestrial Monitoring and Adaptive Management Cost:** Total estimated cost for monitoring is \$156,058. This includes visual transect surveys in Years 1, 3, and 5. Total estimated cost for Adaptive Management is \$52,019. An additional cost of \$16,906 will be required for agency coordination.

**Table 2.** Terrestrial Mitigation, Monitoring, and Adaptive Management Costs  
(Oct 2014 Cost Levels)

Activity	Costs			Cost Subtotal
	Emsworth	Dashields	Montgomery	
Mitigation	\$9,559	\$329,225	\$352,300	\$691,084
Monitoring	\$52,019	\$51,613	\$52,426	\$156,058
Adaptive Management	\$13,005	\$19,355	\$19,660	\$52,019
Agency Consultation	\$5,635	\$5,591	\$5,679	\$16,906
<b>Total</b>	<b>\$80,218</b>	<b>\$405,784</b>	<b>\$430,065</b>	<b>\$916,067</b>

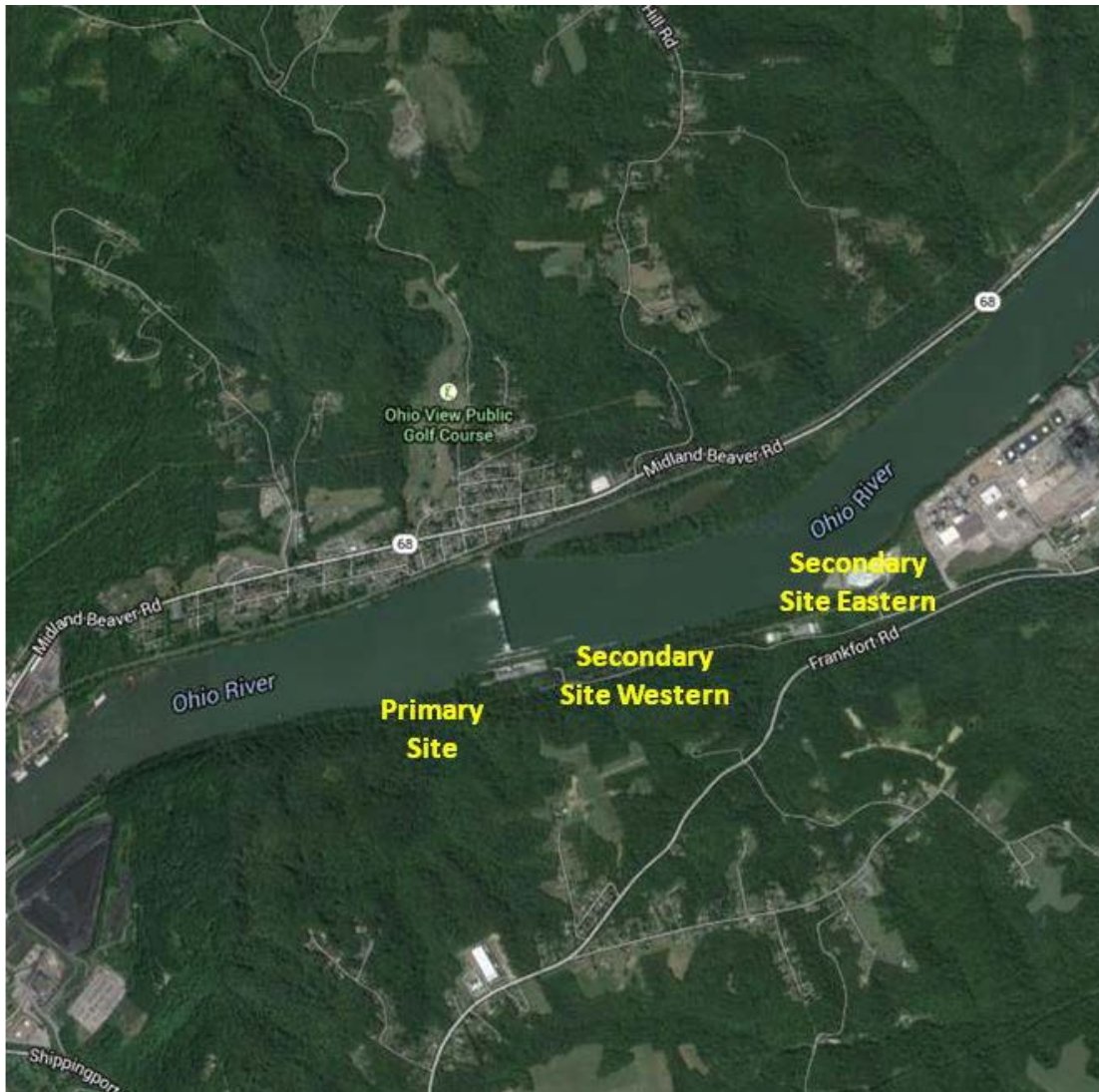


**Figure 4.** Emsworth Terrestrial Area



**Figure 5.** Dashiels Terrestrial Area





**Figure 6.** Montgomery Terrestrial Area

#### **4. Reference**

Pennsylvania Fish and Boat Commission, Division of Habitat Management. 2007. Fish Habitat Management for Pennsylvania Impoundments. [www.fish.state.pa.us](http://www.fish.state.pa.us)