UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

APPENDIX G

PROJECT POSTERS

Lake Odessa

UMRR - Habitat Rehabilitation and Enhancement Project
Upper Mississippi River Pools 17 and 18 - Louisa County, Iowa

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

April 2017

Partners:

U.S. Fish and Wildlife Service
Iowa Department of Natural Resources

Description:

Lake Odessa is a 6,465-acre backwater complex that falls within the boundaries of the Port Louisa National Wildlife Refuge and Odessa Wildlife Management Area. It is located on the Mississippi River at the confluence of the Iowa and Mississippi rivers near Wapello, Iowa. The complex is owned by the U.S. Army Corps of Engineers and managed by the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

History:

Traditionally, Lake Odessa supported high numbers of waterfowl populations in the fall and significant duck production in the spring. Water-level management became limited overtime due to inadequate water control structures, high amounts of seepage and the overall size of the complex. Existing levee breaches resulted in frequent loss of aquatic vegetation used by migratory waterfowl. Additionally, sedimentation from frequent levee breaks and overtopping flood events decreased the extent of deep water aquatic habitat.

Project Goals:

The goals of the project are to restore and protect wetland, terrestrial, and aquatic habitat. The objectives identified to meet these goals were:

- Reduce forest fragmentation
- Increase bottomland hardwood diversity
- Enhance migratory bird habitat
- Restore native grasslands
- Increase habitat for overwintering fish
- Provide safe areas for developing fish
- Protect habitat features
- Protect archeological sites

Upper Mississippi River Restoration
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Lake Odessa

UMRR - Habitat Rehabilitation and Enhancement Project
Upper Mississippi River Pools 17 and 18 - Louisa County, Iowa

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

April 2017

Features:

- Restore the existing perimeter levee system that protects the Lake Odessa complex. Efforts include appropriate levee heights and slopes, and a clay cap to protect from overtopping events.
- Construct spillways to protect the levee during flood events.
- Enhance water management capability at moist soil management areas through pump pads, portable pumps, water control structures, and placement of impervious material over sand lenses.
- Dredge deep channels to enhance overwintering habitat for the fishery.
- Plant hardwood trees.
- Construct ephemeral wetlands.
- Construct measures to protect archeological sites.

Milestones:

- The Definite Project Report (feasibility report) completed in 2005.
- The Stage I Contract awarded in 2006 and included the construction of a new spillway, enhancing the existing levee with pervious embankment, and construction of ephemeral wetlands.
- The Stage IIA awarded in 2007 and included hydraulic and mechanical dredging for overwintering habitat, construction of new water control structures, placement of riprap, and construction of articulated concrete mat pump pads.
- Portable electric pumps were purchased by the Upper Mississippi River Restoration Program and provided to the project sponsors. These pumps are used to manage interior water levels throughout the site.
- The Stage IB awarded in 2009 and included enhancing the top two feet of the perimeter levee with impervious material to allow for uniform overtopping during flood events.
- The Stage IIB Contract awarded in 2009 and included mechanical dredging for overwintering habitat.
- The tree-planting contract awarded in 2010 and included planting over 1,000 trees on 403 acres for timber stand improvement.
- The Lake Odessa 2013 Flood Recovery Project awarded in August 2014. Work included the construction of two new spillways and levee repairs.

Project Cost:

The Lake Odessa Project was planned and constructed at a cost of approximately $22.8 million. These funds were allocated as part of the Upper Mississippi River Restoration Program which is managed by the U.S. Army Corps of Engineers, Rock Island District. For more information on this program visit:

- http://www.mvr.usace.army.mil/Missions/Environmental-Protection-and-Restoration/Upper-Mississippi-River-Restoration/
- https://www.fws.gov/refuge/port_louisa/
- http://www.iowadnr.gov/idnr/Hunting/Places-to-Hunt-Shoot/Wildlife-Management-Areas/Lake-Odessa-WMA

Upper Mississippi River Restoration Program

The Lake Odessa Habitat Rehabilitation and Enhancement Project was completed as part of the Upper Mississippi River Restoration or UMRR. The UMRR Program has two primary elements: Habitat Rehabilitation and Enhancement Projects and Long Term Resource Monitoring. The program monitors the ecological conditions of the river, obtains information needed for effective river management and constructs projects to restore and protect fish and wildlife habitat on the Upper Mississippi River.

In 1986, Congress authorized the U.S. Army Corps of Engineers to implement the UMRR, formally known as the Environmental Management Program, in close partnership with the U.S. Fish and Wildlife Service, the U.S. Geological Survey and the states of Minnesota, Wisconsin, Iowa, Illinois and Missouri.

Since impoundment of the river system for navigation about 80 years ago, there has been considerable degradation of important fish and wildlife habitats. Impoundment, river regulation, sedimentation, fragmentation and isolation of the floodplain are considered the main causes of habitat degradation and loss on the river. UMRR habitat projects are designed to offset habitat degradation by protecting existing habitats, restoring aquatic, wetland and floodplain habitats, as well as restoring the natural processes that maintain the mosaic of river habitats.

In 2016, the Upper Mississippi River region celebrated two significant events, the 150th anniversary of the U.S. Army Corps of Engineers, Rock Island District and the 30th anniversary of the Upper Mississippi River Restoration Program. During the past 30 years the Corps of Engineers along with its partners have restored more than 102,000 acres of aquatic habitat on the Upper Mississippi River through the UMRR Program.

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Lake Odessa

Upper Mississippi River Restoration
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Habitat Rehabilitation and Enhancement Project

Ribbon Cutting Ceremony

April 6, 2017

10:30 a.m.

US Army Corps of Engineers ®
Rock Island District

IOWA DNR Natural Resources

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

Lake Odessa
Habitat Rehabilitation and Enhancement Project

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The Lake Odessa Habitat Rehabilitation and Enhancement Project, which is part of the Upper Mississippi River Restoration Program, was developed to restore and protect wetland, terrestrial and aquatic habitats needed to support plant and animal life along the Mississippi River.

The $22.8 million Lake Odessa project has enhanced habitats within the complex by restoring the existing perimeter levee system, constructing spillways and enhancing water management capabilities. Additional project efforts include dredging channels, planting hardwood trees and constructing wetlands. The project reduced forest fragmentation, increased bottomland hardwood diversity, enhanced migratory bird habitat, restored native grasslands and increased habitat for overwintering fish within the area.

For more information on the Upper Mississippi River Restoration Program and the Lake Odessa Project visit: https://go.usa.gov/xXXA7.

Schedule of Events

Welcome and Introductions

Col. Craig Baumgartner
Commander
U.S. Army Corps of Engineers, Rock Island District

Remarks

Sabrina Chandler
Refuge Manager
Upper Mississippi River National Wildlife and Fish Refuge

Bruce Trautman
Deputy Director
Iowa Department of Natural Resources

Marvin Hubbell
Program Manager, UMRR
U.S. Army Corps of Engineers, Rock Island District

Ribbon Cutting

Site Tour and Wildlife Viewing

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Moist Soil Units

MSU water level management capability was enhanced in several areas, including Fields 4, 5 and 21, MSY 20, Unit 2, Fox Pond, IA DNR MSU, and Swarms and Bebee Ponds.

The features increased water level control, reliability, and increased the flooded areas; thereby providing moist soil habitat, enhanced wetland vegetation diversity and growth during the summer months, and provided better, more reliable food supplies to migratory waterfowl during fall migration. In general, fields are dewatered after spring floodwaters have receded using pumps or control structures (gravity). During the drier summer months, wetland vegetation flourishes in the MSUs. Beginning in September, water is gradually added to the units, attracting migrating waterfowl by providing feeding and resting opportunities.

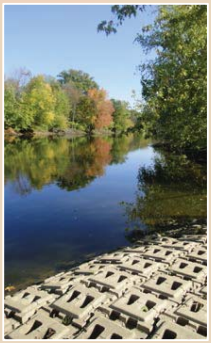

Figure 38: IADNR MSU Pump Pad Looking at Timber Stand Improvement Area (Mitvalsky, USACE 2011)

Figure 8: Little Goose Pond Pump Pad (Mitvalsky, USACE 2013)

Figure 11: Temporary Pump Filling MSU (Mitvalsky, USACE 2005)

Figure 33: IADNR MSU after final grading (IADNR, 2012)

Figure 16: Fox Pond Water Control Structure with stoplogs removed (Mitvalsky/USACE)

Figure 19: Geese on Fox Pond (Bolser/USFWS 2016)

Figure 20: Snow geese and greater white-fronted geese standing on a mostly frozen Fox pond on the Louisa Division. (Bolser/USFWS 2017)

Figure 31: IADNR MSU Structure at interior of MSU (Robbins, IADNR 2017)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Levee Restoration

The objective of levee restoration was to reduce flood damages to the Lake Odessa complex and to reduce incidences of levee failure.

The Refuge is intended to inundate during flood events. The survival of the 9.5 mile perimeter levee depends on the interior filling nearly as fast as the river rises, such that when the levee is overtopped, damages are minimized.

The levee was restored to have a top elevation profile starting at the 25-year level of protection (downstream) and gradually increasing the height to the 50-year level of protection (upstream). Additionally, the interior side slopes are graded to a flat enough slope to limit overtopping damage, and allow for a gradual overtopping during flood events.

The top two feet of the levee was constructed using clay to allow for protection from erosion during overtopping events. Clay, especially when covered with established vegetation, is less likely to erode and breach than a similar embankment constructed of sand. Following final grading, the levee was seeded with a select mix able to withstand overtopping events.

Riprap armoring was also added to select areas along the levee to provide further protection during flood events. The armoring occurred near the inlet structure, the site of a 2014 breach that is located in a bend in the river with little protection from riverside trees. Armoring also occurred around the outlet structure where active erosion was observed in the 2008 event.

Dredge for Levee Sand (USACE, 2007)

Delivering Clay for two foot clay cap (Mitvalsky, USACE 2011)

Restored Levee (Mitvalsky, USACE 2016)

Sand Embankment (USACE, 2007)

Levee Repairs post Seeding (Robbins, IADNR 2016)

Riprap Providing Flood Protection (Mitvalsky, USACE 2017)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Spillways

Three articulated concrete mat spillways were constructed by USACE, and one by the USFWS. These spillways were built to an elevation and width which will allow flooding river water to enter the system in a controlled rate, and allow the refuge to fill prior to an overtopping event. By raising the interior water levels, damage to the perimeter levee is greatly reduced. Since the initial Iowa River spillway has been constructed, it has been overtopped in 2008, 2011, 2013 and 2014. The newer Iowa River spillway was overtopped in 2016.

Mississippi River Spillway (Mitvalsky, USACE 2016)

Iowa River Downstream Spillway (Mitvalsky, USACE 2016)

Iowa River Upstream Spillway (Mitvalsky, USACE 2016)

Iowa River Spillway Overtopping (USACE 2008)

Iowa River Spillway Overtopping (USACE, 2011)

Iowa River Spillway Overtopping (Robbins, IADNR 2011)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Ephemeral Wetlands

Iowa DNR biologists have identified the areas inside and adjacent to the Mississippi and Iowa River levees as Copperbelly and Diamondback watersnake habitat. As part of the levee construction several shallow pools, or ephemeral wetlands, (approximately 1.5 feet deep or less) will be constructed in more forested areas to enhance habitat for these state-listed watersnakes.

Ephemeral Wetland (Robbins, IADNR 2012)

Ephemeral Wetland (Robbins, IADNR 2012)

Diamondback Water Snakes (Robbins, IADNR 2016)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Fisheries Habitat

The primary emphasis of fisheries enhancement was creating areas of deeper water and/or access to existing deeper water at the Lake Odessa complex. Sedimentation and flood damage have reduced deep-water habitat over time. Additionally, access channels to Swarms/Bebee Ponds and Yankee Chute have silted in, reducing the ability of fish to leave some areas if conditions would necessitate (low dissolved oxygen in the summer, escape from freezing water in the winter). Both of these problems can result in localized fish kills. Water depths in the Lake Odessa complex were no deeper than 6 feet pre project. Water depths of 8 feet or more are considered ideal, primarily for overwintering habitat. For the deepwater dredging, a sedimentation rate of 1-2 cm/yr was calculated. This rate assumes that the levee restoration will reduce flood damages and sediment deposition over existing conditions. The access channel dredging depths were adjusted to include the estimated 50 years of sedimentation. The deeper areas will provide oxygenated water (during summer and winter) as well as escape routes (all season) and overwintering habitat during the winter months.

Upper Goose Pond Cut (Mitvalsky, USACE 2010)

Blackhawk Chute Yankee Chute (Mitvalsky, USACE, 2008)

Middle Goose Pond Placement (Mitvalsky, USACE 2011)

Lake Odessa/Swarms Pond Dredge Cut and Sidecast Area (Mitvalsky, USACE 2009)

South End of Blackhawk Chute with placement sites on each side (Mitvalsky, USACE 2017)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Floodplain Forest

Restoring and improving bottomland hardwood forests on portions of the Lake Odessa complex improved wetland and terrestrial habitat. Tree planting improved the quality and quantity of forest habitat in the project area by re-introducing a component of mast-producing species to a forest community increasingly dominated by silver maple and cottonwood. Mast-producing tree plantings restores some of the historic diversity of the bottomland forest community and reduces forest fragmentation.

Flood Line on Trees following the 2008 flood (Mitvalsky, USACE 2009)

Tree Planting (Harper, USACE, 2010)

Timber Stand Improvement Locations (Mitvalsky, USACE 2011)

Tree Planting (Lundh, USACE 2012)

Tree Planting on Dredged Material Berms (Mitvalsky, USACE 2017)

Lake Odessa

Habitat Rehabilitation and Enhancement Project

Louisa County, Iowa, Rock Island District

Shoreline Protection of Historic Sites

The project area is one of the most archeologically rich areas in the Upper Mississippi River region. The first extensive occupation of the floodplain occurred during the Middle Archaic period. Early and Middle Woodland sites are distributed on almost every landform in the Lake Odessa bottoms. During the Mississippian period, the bottoms were occupied by the Oneota culture, with a principal village site on the bluff top at Toolesboro. The major historic site in the area is Burris City, dating from 1855-1859. This short-lived city and National-Register-eligible site was abandoned due to repeated flooding.

Shoreline protection of archeological sites was required to protect from further erosion caused by frequent water level fluctuation. In general, rock was placed on the banks being protected, or offshore to prevent wind/wave erosion. Rock placed in the water has ancillary aquatic benefits, primarily for fish, in an area with little to no rock structure.

Bankline protection using riprap was supplemented with sand to provide protection from human interaction at site 98/99. This area is a heavily used recreational area, and while the rock protection will prevent erosion, the additional layer of sand will provide protection from unauthorized removal of archeological artifacts from visitors at this location.

Erosion Protection Site 446 (Robbins, IADNR 2017)

Site 98 & 99 erosion protection (Mitvalsky, USACE 2009)

Site 424 Erosion Protection (Mitvalsky, USACE 2009)