



**UPPER MISSISSIPPI RIVER RESTORATION
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION
INITIAL PERFORMANCE EVALUATION REPORT
2012
FOR
PLEASANT CREEK
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**



**US Army Corps
of Engineers** ®
Rock Island District

**POOL 13
RIVER MILES 548.7 – 552.8
JACKSON COUNTY, IOWA**

ACKNOWLEDGEMENTS

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POINTS OF CONTACT

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EXECUTIVE SUMMARY

General. The design of the Pleasant Creek Habitat Rehabilitation and Restoration Project (HREP) was to provide the physical conditions necessary to improve and enhance wetland habitat quality. As stated in the Definite Project Report, the Pleasant Creek HREP was undertaken to address the following primary problems: increased turbidity and sedimentation. These problems were contributing to the direct loss of aquatic vegetation and deterioration of water fowl and aquatic mammal habitat.

Purpose. The purposes of this Performance Evaluation Report (PER) are as follows:

1. Document the pre- and post-construction monitoring activities for the Pleasant Creek HREP
2. Summarize and evaluate project performance on the basis of project goals and objectives as stated in the Definite Project Report (DPR)
3. Summarize project operation and maintenance efforts, to date
4. Provide recommendations concerning future project performance evaluation
5. Share lessons learned and provide recommendations concerning the planning and design of future HREP projects

Project Goals and Objectives. The specific goals and objectives as stated in the DPR were to:

1. Increase quality food and cover resources for migrating waterfowl, terrestrial birds, and mammals.
2. Increase the rate of success of emergent and moist soil vegetation.

Project Performance Monitoring. Pre- and post-project monitoring, both qualitative and quantitative, was performed in accordance with Section 7.2 of the original DPR. Monitoring and performance evaluation was conducted by the U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service. The period of data collection covered in this report includes the pre-project monitoring, qualitative post-project monitoring through 2011, and anecdotal information through 2012.

Evaluation of Project Objectives. For the evaluation period of 2003 to 2012, observations were made with regard to the efficacy of the objectives in meeting the project goal. In addition, general conclusions were drawn regarding project measures that may affect future project design.

1. Enhance Wetland and Aquatic Habitat
 - a. Increase quality food and cover resources for migrating waterfowl, terrestrial birds and mammals. Increase the rate of success of emergent and moist soil vegetation.
 - i. Evaluation Criteria: Moist Soil Management Unit vegetative cover, mast tree condition and growth.

- ii. General Observation: The project measures were successful in providing the ability to increase potential for reliable food producing areas, potential for reliable resting areas for migratory birds, potential areas for fish spawning and nursing, and potential for overall vegetation diversity and abundance.
- iii. Results: Solid vegetative cover has been observed during annual inspections.
- iv. Success: Project objectives have been met; although water quality from water well has deteriorated to the point waterfowl avoid the project when water well is pumped.
- v. Conclusion: Project was successful in meeting objectives, but water quality issues are preventing wildlife from utilizing project measures.
- vi. Lessons Learned & Recommendations: Periodic maintenance of water well pump is needed to prevent deterioration of water quality.

Evaluation of Project Operation and Maintenance. The O&M manual was completed in June 2006. Periodic Maintenance is required on the shoreline stabilization feature, perimeter levee and moist soil management unit levee, stoplog structures, water well and riprap apron. O&M cost through 2010 are approximately \$41,000. Regular site inspections by the HREP Manager have resulted in proper coordination and corrective maintenance actions, the exception being the water well pump. Corrective actions are proposed for FY12 for cleaning of the water well casing and pump to remove a bacterial infestation.

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INTRODUCTION

The Upper Mississippi River Restoration Environmental Management Program (UMRR-EMP) is a Federal-State partnership to manage, restore and monitor the UMR ecosystem. The UMRR-EMP was authorized by Congress in Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662) and reauthorized in 1999. Subsequent amendments have helped shape the two major components of EMP – the Habitat Rehabilitation and Enhancement Projects (HREPs) and Long Term Resource Monitoring (LTRM). Together, HREPs and LTRM are designed to improve the environmental health of the UMR and increase our understanding of its natural resources.

Habitat Rehabilitation and Enhancement Project (HREP) construction is one element of the UMRR-EMP. In general, the projects provide site-specific ecosystem restoration, and are intended and designed to counteract the adverse ecological effects of impoundment and river regulation through a variety of modifications, including flow introductions, modification of channel training structures, dredging, island construction, and water level management. Interagency, multi-disciplinary teams work together to plan and design these projects.

The Pleasant Creek HREP is part of the UMRR-EMP. This project consisted of construction of a Moist Soil Management Unit (MSMU), water control improvements and mast tree planting that were designed to increase quality food and cover resources for migrating waterfowl, terrestrial birds, and mammals and increase the rate of success of emergent and moist soil vegetation.

1. Purpose of Project Evaluation Reports

The purposes of this Project Evaluation Report for the Pleasant Creek HREP are to:

1. Document the pre- and post-construction monitoring activities for the Pleasant Creek HREP.

2. Summarize and evaluate project performance on the basis of project goals and objectives as stated in the Definite Project Report (DPR).
3. Summarize project operation and maintenance efforts, to date.
4. Provide recommendations concerning future project performance evaluation.
5. Share lessons learned and provide recommendations concerning the planning and design of future HREP projects.

2. Scope

This report summarizes available monitoring data, operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) information, and project observations made by the U.S. Army Corps of Engineers (USACE), and U.S Fish and Wildlife Service (USFWS). The period of data collection covered in this report includes the pre-construction monitoring year 2000 to post-construction monitoring as of 2012.

3. Project References

Published reports which relate to the Pleasant Creek HREP are presented below.

1. Definite Project Report with Integrated Environmental Assessment, Pleasant Creek Habitat Rehabilitation and Enhancement Project, Rock Island District Corps of Engineers, September, 2000.
2. Pleasant Creek HREP Operation and Maintenance Manual, Rock Island District Corps of Engineers, September 2005.
3. Pleasant Creek HREP Annual Inspection Report, USFWS, October 2007.
4. Pleasant Creek HREP Annual Inspection Report, USFWS, October 2008.
5. Pleasant Creek HREP Annual Inspection Report, USFWS, November 2009.

4. Project Location

The Pleasant Creek HREP is located in Jackson County, Iowa, on the right descending bank of the Mississippi River, between 548.7 and 552.8 (Figure 1 – Pleasant Creek HREP project area). The project is operated by Upper Mississippi River National Wildlife and Fish Refuge, U.S. Fish and Wildlife Service. The Pleasant Creek HREP is located in the Pleasant Creek Wildlife Unit (a 2,530-acre bottomland woods). The Wildlife Unit is intermixed with small lakes and sloughs on the Iowa side of the Mississippi River navigation channel in Pool 13.

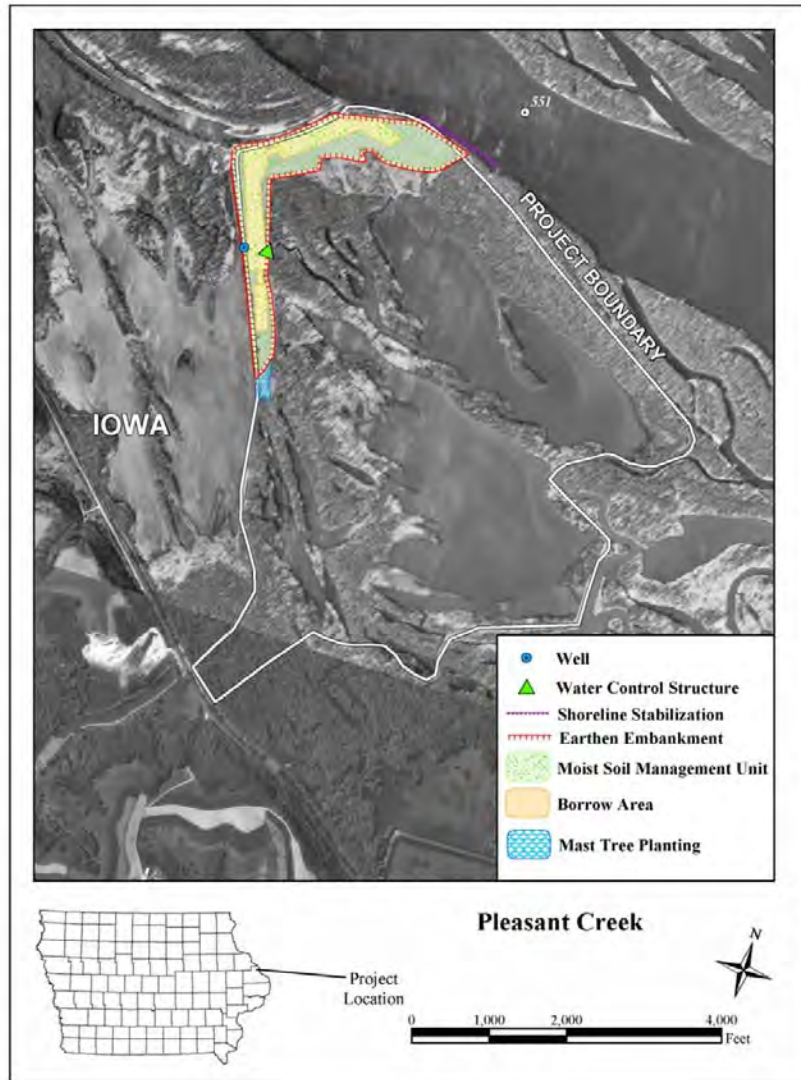


Figure 1. Pleasant Creek HREP Project Area

PROJECT PURPOSE

1. Overview

The design of the Pleasant Creek HREP was to provide the physical conditions necessary to improve and enhance wetland habitat quality. The specific goals as stated in the Definite Project Report (DPR) were to increase quality food and cover resources for migrating waterfowl, terrestrial birds, and mammals and increase the rate of success of emergent and moist soil vegetation. In order to achieve these goals, increased turbidity and sedimentation at the site needed to be addressed. These problems were contributing to the direct loss of aquatic vegetation and deterioration of waterfowl, migratory birds and aquatic mammal

habitat. The problems, goal, objectives and measures implemented to address the goals and objectives are listed in Table 1.

Table 1. Problems, goals, objectives, and measures

PROBLEMS	GOALS	OBJECTIVES	RESTORATION MEASURES
Turbidity & Sedimentation	Enhance Wetland and Aquatic Habitat	<p>Increase quality food and cover resources for migrating waterfowl, terrestrial birds and mammals.</p> <p>Increase the rate of success of emergent and moist soil vegetation.</p>	<p>Construct Moist Soil Management Unit.</p> <p>Develop systematic water control improvements.</p> <p>Mast Tree planting.</p>

PROJECT DESCRIPTION

1. Project Measures

The Pleasant Creek HREP included a combination of tree planting, water control improvements, mast tree planting and construction of a moist soil management unit. (See Figure 2 for locations of measures). A detailed description of each of these measures is provided below.

1. Moist Soil Management Unit (MSMU). The MSMU provides additional feeding areas and still water for migratory birds. The MSMU will be inundated by high water during the spring and drained during the early summer months to facilitate vegetation growth. The MSMU will have an ideal water level during the fall of 18 inches with a maximum of 24 inches.
2. Water Well and Pump. A well with a submersible 10-horsepower electric pump was installed to provide water to the MSMU during the fall when river levels are not expected to inundate the area. The well and the pump are located along the existing upstream levee near station 65+00. The rated capacity of the pump is 600-gpm.
3. Mast Tree Plantings. Mast-producing trees were planted in a 1.7-acre near Station 40+80 (0+00P), see Plate 3 for the tree planting area. The plantings consisted of 120 pin oak and 80 burr oak Root Production Method™ (RPM) trees at a density of

approximately 60-70 trees per acre. The trees were 5/8 inch caliper or more and 4 to 6 feet in height.

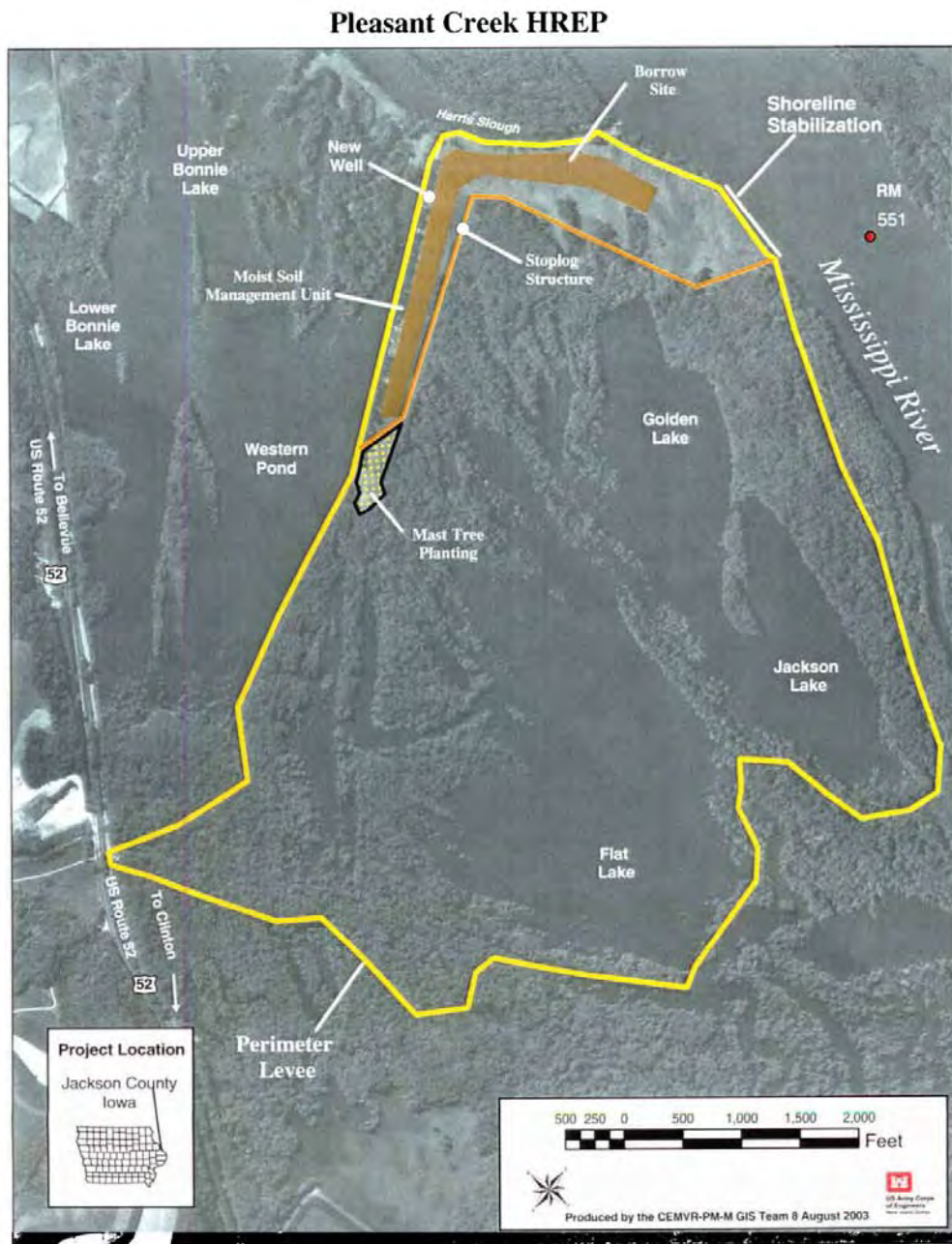


Figure 2. Pleasant Creek HREP Project Measures

2. Project Construction

The Pleasant Creek HREP project was approved for construction in August 2001 at an estimated cost of \$1,360,078 (equivalent to \$1,762,661 in FY2012). Construction included installation of a water well, mast tree plantings, perimeter levee restoration, MSMU levee construction, a

stoplog structure, shoreline stabilization, electric service installation and a riprap apron at the stoplog structure.

3. Project Operation and Maintenance

General. In the original DPR it was estimated that the Pleasant Creek HREP would require little or no maintenance. Operation and maintenance responsibilities for the Pleasant Creek HREP were originally outlined in the DPR. The acceptance of these responsibilities was formally recognized by an agreement signed by the USFWS and the Rock Island District, USACE.

A detailed description of all operation and maintenance requirements can be found in the Project Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual (OMRR&R Manual). The OMRR&R Manual for the project delegated responsibilities and procedures for post project activities. Project operation and maintenance generally consists of the following:

1. Inspection of levees during periods of high water.
2. Advance measures ensuring availability of labor and materials.
3. Emergency filling of MSMU prior to high water event on Mississippi River.
4. Project Inspections conducted annually each May.
5. Periodic inspections of Shoreline Stabilization feature and implementation of steps to remedy adverse conditions, such as rock replacement or debris accumulation.
6. Addition or removal of stoplogs in Stoplog Structure as required to maintain desired water levels in MSMU.
7. Inspection of Stoplog Structure immediately following drainage of MSMU and after high water event for damage and seepage. Conduct periodic inspections of Stoplog Structure. Conduct corrective action activities based on inspections.
8. Manually activate water well pump to inundate MSMU.
9. Conduct well inspections and corrective action to correct adverse conditions.
10. Exercise well pump biannually.
11. Periodically inspect Riprap Apron feature, and conduct corrective action based on inspections.
12. Periodically inspect Mast Tree feature (conducted by USACE).

Project Measures Requiring Operation and Maintenance. Maintenance of the project measures was to be completed on an as needed basis to maintain their structural integrity and continued function in the manner for which they were designed. The main measure needing repair is the water well. To improve the quality of water being pumped into the MSMU, removal of the bacteria infestation in the water well is required.

PROJECT PERFORMANCE MONITORING

1. General

Performance monitoring of the Pleasant Creek HREP has been conducted by USACE to help determine the extent to which the design meets the habitat improvement objectives. Information from this monitoring will also be used, if required, for adaptive management.

The monitoring and performance evaluation matrix is outlined in Table 3. Pre- and post-project monitoring, both qualitative and quantitative by each of the involved agencies is summarized below.

1. U.S. Army Corps of Engineers: The success of the project relative to original project objectives shall be measured utilizing data, field observations, and project inspections provided by USFWS and USACE. The USACE was responsible for post-project analyses of the mast tree plantings. The USACE has overall responsibility to measure and document project performance.
2. U.S. Fish and Wildlife Service: The USFWS is responsible for operating and maintaining the Pleasant Creek HREP. USFWS was responsible for post-project annual field inspections.

Table 2. Monitoring and Performance Evaluation Matrix

Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Remarks
Sedimentation Problem Analysis	System-wide problem definition. Evaluates planning assumptions	USFWS	USFWS (EMTC)	LTRMP	Leads into pre-project monitoring; defines desired conditions for plan formulation
Pre-project monitoring	Identifies and defines problems at HREP site. Established need for proposed project feature	Sponsor	Sponsor	Sponsor	Attempts to begin defining baseline. See DPR.
Baseline monitoring	Establishes baselines for performance evaluation	USACE	Field station or sponsor thru Cooperative Agreements or Corps	LTRMP	See DPR for location and sites for data collection and baseline information. Actual data collection will be accomplished during Plans & Specification phase.
Data Collection for Design	Includes identification of project objectives, design of project, and development of performance evaluation plan	USACE	USACE	HREP	Comes after fact sheet. This data aids in defining the baseline
Construction Monitoring	Assesses construction impacts; assess permit conditions are met	USACE	USACE	HREP	Environmental protection specifications to be included in construction contract documents. Inter-agency field inspections will be accomplished during project construction phase
Performance Evaluation Monitoring	Determine success of project as related to objectives	USACE (quantitative), sponsor (field observations)	Field station or sponsor thru Cooperative Agreements or Corps	LTRMP Cooperative	Comes after construction phase of project
Analysis of Biological Responses to Project	Evaluates predictions and assumptions of habitat unit analysis. Determine critical impact levels, cause-effect relationships, and effect on long-term losses of significant habitat	USFWS	USFWS (EMTC)	LTRMP	Problem Analysis and Trend Analysis studies of habitat projects

2. Project-Induced Habitat Changes

Pleasant Creek habitat conditions have experienced some changes since the pre-project monitoring. Water quality from the water well has deteriorated. The USFWS service Inspection Report from 2009 indicated a foul odor and heavy iron deposits from the water pumped from the water well. This occurrence of these water quality changes have coincided with a drop in waterfowl usage of the MSMU.

PROJECT EVALUATION

1. Construction and Engineering

Construction began in August 2001 and was initially completed in September 2002. Final construction was completed in September 2002.

No modification to the construction plans was required.

2. Costs

In the original DPR, cost estimates for the entirety of the project were \$1,403,775. As of the 2006 Operation and Maintenance Manual, the total cost of the Pleasant Creek HREP was \$1,360,078.54.

3. Operation and Maintenance

In the original DPR, over the 50-year project life the estimated cost was \$674,455. From the estimate, an average annual operation and maintenance cost was calculated to be \$5,400. This amount included inspection and mowing the levee, operation and maintenance of the well pump, and operation of and debris removal from the water control structure and trash rack. Through 2010, the total OMRR&R cost has been \$40,944, with the estimated average annual cost to be \$5,118. Table 3 provides OMRR&R history and cost for the Pleasant Creek HREP.

Table 3. Operation and Maintenance History for the Pleasant Creek HREP

Year	Years in O&M	Est. Annual Cost with Inflation	Actual FWS Costs	Activities
FY2003	1	\$5,770	\$3,015	Mechanical service to pump and WCS, water level management, vegetation survey
FY2004	2	\$5,296	\$3,277	Service locks and gates, remove downed trees, operate WCS, minor levee maintenance, grade roads, inspections
FY2005	3	\$6,127	\$2,145	Operate WCS, pumping costs, mow and grade levees, inspections

FY2006	4	\$6,323	\$9,571	Operate WCS, clean trash racks, mow and grade levees, repair service road, repair MSU pump, inspections
FY2007	5	\$6,506	\$3,366	Operate WCS, clean structures, inspections, pumped fall 2006
FY2008	6	\$6,767	\$3,509	Operate WCS, clean structures, inspections, pumped fall 2007
FY2009	7	\$6,686	\$3,361	Operate WCS, clean structures, inspections, pumping
FY2010	8	Not Available	\$12,700	Operate WCS, clean structures, inspections, pumping
FY2011	9	Not Available	Not Available	Not Available

4. Ecological Effectiveness

The objective of the Pleasant Creek HREP was to increase the potential for reliable food producing areas, the potential for reliable resting areas for migratory birds, the potential areas for fish spawning and nursing, and the potential for overall vegetation diversity and abundance. The levee construction and raising, water control structure, water well and tree plantings were installed to create 49 acres of Moist Soil Management Unit and 1.7 acres of mast producing trees.

Pre- and Post-Project Conditions. Pre-project conditions consisted of a deteriorated waterfowl, aquatic mammal and migratory bird habitat due to spring and fall flooding and a higher pool level. Waterfowl monitoring was conducted in the fall of 1998. The monitoring determined a mean total of 60,845 ducks in a 3 month period, and the identification of at 16 different bird species within the Pleasant Creek Wildlife Refuge. Game and furbearing mammals observed pre-project include squirrel, rabbit, woodchuck, white-tailed deer, muskrat, opossum, skunk, red fox, coyote and beaver.

All post-project features are functioning as expected with the exception of the water well. Water quality sampling was conducted from the water well and MSMU by the USFWS in 2009, and by the Corps in 2011. The sampling was based on the observation of waterfowl avoiding the MSMU after water from the well was pumped. Testing determined that the water well is contaminated with iron oxidizing and sulfur reducing bacteria.

Conclusion. The project measures were initially successful in providing the ability to increase potential for reliable food producing areas, potential for reliable resting areas for migratory birds, potential areas for fish spawning and nursing, and potential for overall vegetation diversity and abundance.

Project measures are functioning as expected, with the exception of the water well. Poor water quality from water well has led to avoidance of the MSMU by waterfowl in recent years.

Fouling of the water by bacteria has deteriorated water quality. To prevent thus occurrence in the future, the well must be thoroughly cleaned initially, and a schedule devised and followed for cleaning the well to prevent bacteria regeneration.

Table 4 summarizes the performance evaluation plan and schedule or Pleasant Creek HREP goals and objectives.

LESSONS LEARNED AND RECOMMENDATIONS FOR FUTURE SIMILAR PROJECTS

Initially the goals and objectives were being met. Observations by USFWS personnel indicated increased use of the MSMU by waterfowl. However, in 2009 USFWS noticed a decline in use of the MSMU by waterfowl when the MSMU was supplied water from the onsite water well. Water quality from the well deteriorated, and the high iron content of the well water deterred wildlife from using the MSMU.

Subsequent testing of the water well indicated a sulfide reducing/iron oxidizing bacteria infestation. It is anticipated that once the bacteria are reduced and removed from the well, water quality will improve and the waterfowl will utilize the MSMU again.

In order to prevent bacteria infestation again, periodic cleaning and disinfection of the water well must occur.

The other structures in the HREP (stoplog structures, perimeter levee, and shoreline stabilization) are performing adequately and it is assumed that continued operation and maintenance of these structures will ensure their viability.

Table 4. Performance Evaluation and Monitoring Schedule

Goal	Objective	Enhancement Measure	Units	Monitoring Target Values		Monitoring Schedule
				Year 0 without project	Year 50 target with project	
Enhance Wetland and Aquatic Habitat	Increase potential for reliable food producing areas, potential for reliable resting areas for migratory birds, potential areas for fish spawning and nursing, and potential for overall vegetation diversity and abundance.	Construct Moist Soil Management Unit (MSMU)	Lineal feet of existing (riverside) levee raised to 594 feet	0	6,460	Annual inspections and high water periods.
			Lineal feet of constructed (landside) levee	0	5,034	Annual inspections and high water periods.
			Mast Tree Planting	0	1.7	
			Acres of MSMU	0	49	
		Install Stoplog Stricture	Number of stoplog structures	0	1	After draining activities, high water events and annually.
		Install Water Well	Number of pumps	0	1	After draining activities, high water events and annually.

REFERENCES

U.S. Army Corps of Engineers: Upper Mississippi River System Environmental Management Program, Environmental Assessment, Pleasant Creek HREP; Rock Island District, Rock Island, IL., Nov. 2000.

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U.S. Fish and Wildlife Service: Pleasant Creek HREP, 2009 Annual Inspection Report; Upper Mississippi River National Wildlife and Fish Refuge, Winona, MN., Nov. 2009.

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