2010

Biological Opinion on the Operation of the Missouri River Main Stem System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System

Follow this and additional works at: http://digitalcommons.unl.edu/usarmyceomaha

Part of the Civil and Environmental Engineering Commons


http://digitalcommons.unl.edu/usarmyceomaha/10

This Article is brought to you for free and open access by the U.S. Department of Defense at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in US Army Corps of Engineers by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
Final
2010 Annual Report

for the

Biological Opinion on the
Operation of the Missouri River Main Stem System,
Operation and Maintenance of the Missouri River Bank Stabilization
and Navigation Project,
and Operation of the Kansas River Reservoir System

March 2011

Prepared by:

U.S. Army Corps of Engineers
Omaha District
Kansas City District

&

U.S. Fish and Wildlife Service
Table of Contents

Executive Summary ............................................................................................................................................... 1
I. Introduction ..................................................................................................................................................... 2
   I.A. Purpose of Report .................................................................................................................................. 2
   I.B. Background ........................................................................................................................................... 3
      I.B.I. History ............................................................................................................................................. 3
      I.B.II. Missouri River Recovery Program ............................................................................................... 8
II. Missouri River, 2010 .................................................................................................................................... 11
   II.A. Description of the Overall Condition of the Missouri River in 2010 ................................................... 11
      II.A.II. Oil Spill in Gulf Effects on Wintering / Migrating Terns and Plovers ......................................... 12
   II.B. Accomplishments ................................................................................................................................. 12
      II.B.I. MRRIC- Recommendations ........................................................................................................... 12
      II.B.II. National Academy of Sciences Independent Sediment Study Completed .................................. 13
      II.B.III. Title VII & IX ................................................................................................................................ 14
      II.B.IV. Lower Yellowstone Intake Diversion Dam Modification Project .................................................. 15
      II.B.IV. Real Estate ..................................................................................................................................... 16
III. Recovery Status of Federally Listed Species ............................................................................................ 16
   III.A. Least Tern ............................................................................................................................................. 16
      III.A.I. Recovery Criteria for Delisting ...................................................................................................... 17
      III.A.II. Population Assessment ................................................................................................................ 17
      III.A.III. Least Tern 2010 Nesting Summary ............................................................................................. 19
      III.A.IV. Actions to Meet BiOp Requirements .......................................................................................... 19
   III.B. Piping Plover ....................................................................................................................................... 28
      III.B.I. Recovery Criteria for Delisting ...................................................................................................... 28
      III.B.II. Population Assessment ................................................................................................................ 29
      III.B.III. Piping Plover 2010 Nesting Summary ......................................................................................... 30
      III.B.IV. Actions to Meet BiOp Requirements .......................................................................................... 42
   III.C. Least Tern & Piping Plover Adaptive Management / Future Projects / Vision Forward .................... 45
      III.C.I. Status of Adaptive Management Strategy ..................................................................................... 45
      III.C.II. Progress towards Objectives (Report Card) ............................................................................... 45
      III.C.III. Lessons Learned and PDT Observations .................................................................................... 48
      III.C.IV. Recommendations/Future Direction of Implementation .............................................................. 48
   III.D. Pallid Sturgeon .................................................................................................................................... 50
      III.D.I. History of the Pallid Sturgeon ....................................................................................................... 50
      III.D.II. Estimated Population ................................................................................................................... 52
      III.D.III. Downlisting and/or Delisting Criteria ......................................................................................... 53
      III.D.IV. Recovery Successes in the Past Year .......................................................................................... 53
      III.D.V. Describe BiOp Requirements ....................................................................................................... 56
      III.D.VI. Monitoring, Research, & Population Assessment ...................................................................... 58
      III.D.VII Actions to Meet BiOp Requirements ........................................................................................... 62
      III.D.VIII. Adaptive Management / Future Projects / Vision Forward ..................................................... 65
IV. Flows and Sediment ................................................................................................................................. 65
   IV.A. Annual Operation Plan ........................................................................................................................ 65
   IV.B. Flow Modifications ............................................................................................................................... 66
   IV.C. Unbalanced System Regulation .......................................................................................................... 66
   IV.D. Fort Peck ............................................................................................................................................... 66
   IV.E. Lewis and Clark Sediment Study ........................................................................................................ 66
   IV.F. National Academy of Sciences Sediment Study .................................................................................. 68
   IV.G. Adaptive Management Activities ....................................................................................................... 70
V. Conservation Recommendations ................................................................................................................ 70
   V.A. Bald Eagle ............................................................................................................................................ 70
List of Figures

Figure 1: Missouri River Watershed ..................................................................................................................3
Figure 2: Pile dikes on the Missouri River circa 1920 .........................................................................................4
Figure 3: Missouri River Mainstem Dams and Reservoirs Authorized under the Flood Control Act of 1944.....5
Figure 4: MRRP authorizations and relationships to one another .................................................................9
Figure 5: Tyson Bend ............................................................................................................................................9
Figure 6 shows emerged sandbars near river mile 795 in 2009 and submerged sandbars in 2010 ..............12
Figure 7 shows Smokey Waters SWH project in 2004 and 2010. ......................................................................12
Figure 8: Headworks construction ground breaking ceremony ........................................................................16
Figure 9: Audubon Bend Site Location Map .....................................................................................................16
Figure 10: Least tern ..........................................................................................................................................16
Figure 11: Least Tern Adult Numbers on the Missouri River, 1986-2010 ............................................................18
Figure 12: Least tern nest ....................................................................................................................................19
Figure 13: Least Tern Fledge Ratio - 3 Year Running Average ............................................................................20
Figure 14: Least Tern Fledge Ratio – 5 Year Running Average ..........................................................................21
Figure 15: Restriction Sign ................................................................................................................................26
Figure 16: Piping plover with chick ..................................................................................................................28
Figure 17: Piping Plover Adult Number on the Missouri River, 1986-2010 .......................................................30
Figure 18: Piping Plover nest on sandbar ...........................................................................................................30
Figure 19: Piping Plover Fledge Ratio - 3 Year Running Average ....................................................................31
Figure 20: Piping Plover Fledge Ratio - 10 Year Running Average ....................................................................33
Figure 21: Protective cage ..................................................................................................................................39
Figure 22: Constructed ESH sites on the Missouri River ....................................................................................43
Figure 23: Location of 2010 ESH construction projects .....................................................................................44
Figure 24: Photograph showing a geotube during the installation process near river mile 757 .......................45
Figure 25: Map of RPMA segments on the Missouri River .................................................................................52
Figure 26: Total number of fingering and yearling-sized pallid sturgeon stocked into the Missouri River during 2010 .................................................................................................................................54
Figure 27: Length frequency of hatchery, wild, and unknown origin ............................................................55
Figure 28: Number of Pallid Sturgeon Stocked by year class (as yearling equivalents) since 2001 in the Missouri River within each Recovery Priority Management Area .......................................................... 55
Figure 29: SWH created versus BiOp requirements with display of historical measurements ................................................. 57
Figure 30: Flooded terrestrial vegetation in the headwaters area of Lake Sakakawea, North Dakota ......................................... 59
Figure 31: Study area for the Pallid Sturgeon Population Assessment Project ........................................................................... 60
Figure 32: Location of fixed Missouri River and tributary water quality monitoring sites ......................................................... 62
Figure 33: View of Dredge Operating at the Boyer Bend Backwater Project ........................................................................ 63
Figure 34: Map depicting locations of 2010 SWH construction projects ................................................................................ 63
Figure 35: Map depicting locations of all SWH creation projects ............................................................................................... 64
Figure 36: Land Cover Mapping Summary for Mitigation Sites .................................................................................................. 75
Figure 37: 1879 Land Cover Mapping Summary for the Missouri River Floodplain .................................................................... 75
Figure 38: Shovelnose (top) and pallid (bottom) sturgeon ............................................................................................................ 87

List of Tables
Table 1: 2005 adult census results by recovery goal areas ........................................................................................................ 17
Table 2: 2005 rangewide results and recovery plan goals ........................................................................................................... 18
Table 3: Incidental Take - Least Terns, 2008-2010 ......................................................................................................................... 20
Table 4: Adult Census and Productivity Monitoring of the Interior Population of Least Terns by Missouri River Segment, 2010 ........................................................................................................... 22
Table 5: Least Tern Nest Moving and Raising, 2010 ....................................................................................................................... 24
Table 6: Least Tern Nest Success on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010 .......................................................................................................................... 25
Table 7: Least Tern Nest Success on Constructed vs. Non-Constructed Sandbars - Gavins Point River Segment, 2010 ........................................................................................................................................ 25
Table 8: Least Tern Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010 ......................................................................... 26
Table 9: Least Tern Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructive Sandbars - Gavins Point River Segment, 2010 .................................................................................. 26
Table 10: International Piping Plover Adult Census Results ........................................................................................................ 29
Table 11: Adult Census and Productivity Monitoring of the Piping Plover on the Missouri River, 2010 ............................................ 34
Table 12: ESH baseline area (acres) estimates for 2005-2010 ............................................................................................................ 36
Table 13: Flows for Available Acreage (2005: flows for habitat delineation; 2006-2010: July maximum outflows from upstream reservoir) .................................................................................... 36
Table 14: ESH available area estimates for 2005 - 2010 based on habitat measurements, corrected to maximum July flows ................................................................................................................. 37
Table 15: Piping Plover Nest Moving and Raising, 2010 ................................................................................................................... 38
Table 16: Piping Plover Caged vs. Non-Caged Nests by Segment, 2010 ...................................................................................... 40
Table 17: Piping Plover Caged vs. Non-Caged Nests by Cause of Non-Success, 2010 ............................................................. 40
Table 18: Piping Plover Nest Success on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010 ............................................................................................................... 41
Table 19: Piping Plover Nest Success on Constructed vs.: Non-Constructible Sandbars - Gavins Point River Segment, 2010 ...................................................................................................................... 41
Table 20: Piping Plover Adults, Fledglings and Fledge Ratios on Constructed vs. Non-Constructible Sandbars - Lewis and Clark Lake Segment, 2010 .............................................................................. 42
Table 21: Piping Plover Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructible Sandbars - Gavins Point River Segment, 2010 .............................................................................. 42
Table 22: ESH on the system from 1998 to 2010 .......................................................................................................................... 47
Table 23: Comparison of target and observed (from monitoring data) values for performance metrics from the draft ESH AM Strategy ........................................................................................................ 47
Table 24: Required Sampling Effort (River Bends Replication) for Each River Segment ............................................................... 61
Table 25: Mitigation Lands Authorized in WRDA 86 and 99 and Remaining Acquisition Authority ............................................................................................................................... 77
Table 26: Cumulative Land Effects in Acres - Sioux City, Iowa to St. Louis, Missouri .................................................................. 78
**List of Acronyms and Abbreviations**

<table>
<thead>
<tr>
<th>Acronym/Abbreviation</th>
<th>Phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Adaptive Management</td>
</tr>
<tr>
<td>AOP</td>
<td>Annual Operating Plan</td>
</tr>
<tr>
<td>BA</td>
<td>Biological Assessment</td>
</tr>
<tr>
<td>BGEPA</td>
<td>Bald and Golden Eagle Protection Act</td>
</tr>
<tr>
<td>BRT</td>
<td>Biological Review Team</td>
</tr>
<tr>
<td>BSNP</td>
<td>Bank Stabilization and Navigation Project</td>
</tr>
<tr>
<td>CA</td>
<td>Cooperating Agency</td>
</tr>
<tr>
<td>CAT</td>
<td>Cooperating Agency Team</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>cm</td>
<td>centimeter</td>
</tr>
<tr>
<td>Corps</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>CR</td>
<td>Conservation Recommendation</td>
</tr>
<tr>
<td>CW</td>
<td>Civil Works</td>
</tr>
<tr>
<td>CY</td>
<td>calendar year</td>
</tr>
<tr>
<td>cy</td>
<td>cubic yards</td>
</tr>
<tr>
<td>DOI</td>
<td>Department of Interior</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>ESH</td>
<td>Emergent Sandbar Habitat</td>
</tr>
<tr>
<td>FEIS</td>
<td>Final Environmental Impact Statement</td>
</tr>
<tr>
<td>FNRs</td>
<td>Focal Natural Resources</td>
</tr>
<tr>
<td>FTC</td>
<td>Fish Technology Center</td>
</tr>
<tr>
<td>FY</td>
<td>Fiscal Year</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HAMP</td>
<td>Pallid Sturgeon Habitat Assessment and Monitoring Program</td>
</tr>
<tr>
<td>HTC</td>
<td>Hydrosience and Training Center, Colorado State University</td>
</tr>
<tr>
<td>IEPR</td>
<td>Independent External Peer Review</td>
</tr>
<tr>
<td>ISP</td>
<td>Integrated Science Program</td>
</tr>
<tr>
<td>kcfs</td>
<td>thousand cubic feet per second</td>
</tr>
<tr>
<td>LCC</td>
<td>Landscape Conservation Cooperatives</td>
</tr>
<tr>
<td>LCLSMS</td>
<td>Lewis and Clark Lake Sediment Management Study</td>
</tr>
<tr>
<td>MAF</td>
<td>million acre-feet</td>
</tr>
<tr>
<td>Master Manual</td>
<td>Missouri River Master Water Control Manual</td>
</tr>
<tr>
<td>MDC</td>
<td>Missouri Department of Conservation</td>
</tr>
<tr>
<td>Mitigation Project</td>
<td>Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project, Iowa, Nebraska, Kansas and Missouri</td>
</tr>
<tr>
<td>mg</td>
<td>milligram(s)</td>
</tr>
<tr>
<td>mm</td>
<td>millimeter(s)</td>
</tr>
<tr>
<td>MNRR</td>
<td>Missouri National Recreational River</td>
</tr>
<tr>
<td>MRAPS</td>
<td>Missouri River Authorized Purposes Study</td>
</tr>
<tr>
<td>MRBIR</td>
<td>Missouri River Basin Interagency Roundtable</td>
</tr>
<tr>
<td>MRERP</td>
<td>Missouri River Ecosystem Restoration Plan</td>
</tr>
<tr>
<td>Acronym</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>MRMS</td>
<td>Missouri River Mainstem System</td>
</tr>
<tr>
<td>MRNRC</td>
<td>Missouri River Natural Resources Committee</td>
</tr>
<tr>
<td>MRRIC</td>
<td>Missouri River Recovery Implementation Committee</td>
</tr>
<tr>
<td>MRRP</td>
<td>Missouri River Recovery Program</td>
</tr>
<tr>
<td>NAS</td>
<td>National Academy of Sciences</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Protection Agency</td>
</tr>
<tr>
<td>NGPC</td>
<td>Nebraska Game and Parks Commission</td>
</tr>
<tr>
<td>NPWRC</td>
<td>Northern Prairie Wildlife Research Center</td>
</tr>
<tr>
<td>NWHC</td>
<td>National Wildlife Health Center</td>
</tr>
<tr>
<td>PDT</td>
<td>Product Delivery Team</td>
</tr>
<tr>
<td>PEIS</td>
<td>Programmatic Environmental Impact Statement</td>
</tr>
<tr>
<td>PMP</td>
<td>Project Management Plan</td>
</tr>
<tr>
<td>RM(s)</td>
<td>River Miles(s)</td>
</tr>
<tr>
<td>ROD</td>
<td>Record of Decision</td>
</tr>
<tr>
<td>RPA</td>
<td>Reasonable and Prudent Alternative</td>
</tr>
<tr>
<td>RPM</td>
<td>Reasonable and Prudent Measure</td>
</tr>
<tr>
<td>RPMAs</td>
<td>Recovery Priority Management Areas</td>
</tr>
<tr>
<td>SEIS</td>
<td>Supplemental Environmental Impact Statement</td>
</tr>
<tr>
<td>SES</td>
<td>Senior Executive Service</td>
</tr>
<tr>
<td>SWH</td>
<td>Shallow Water Habitat</td>
</tr>
<tr>
<td>System</td>
<td>Missouri River Main Stem System</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
</tr>
<tr>
<td>USD</td>
<td>University of South Dakota</td>
</tr>
<tr>
<td>USDA-WS</td>
<td>U.S. Department of Agriculture Wildlife Services</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>USGS</td>
<td>U.S. Geological Survey</td>
</tr>
<tr>
<td>USGS-NPWRC</td>
<td>USGS Northern Plains Wildlife Research Center</td>
</tr>
<tr>
<td>WRDA</td>
<td>Water Resources Development Act</td>
</tr>
</tbody>
</table>
Executive Summary

This Annual Report summarizes implementation efforts in response to the Biological Opinion on the Operation of the Missouri River Main Stem System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System. The document improves upon the previous annual Biological Opinion (BiOp) compliance reports by incorporating:

- The first combined U.S. Fish and Wildlife (USFWS) and U.S. Army Corps of Engineers (Corps) report documenting recovery efforts on the Missouri River satisfying reporting requirements of the 2003 Amended BiOp on the Operation of the Missouri River Main Stem System (System), Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP) and Operation of the Kansas River Reservoir System.
- Additional multi-year content/context relating the 2010 activities to overall program efforts and biological/species response.
- More maps, photographs and performance assessment graphics.
- Adaptive management strategies for Emergent Sandbar Habitat (ESH) and Shallow Water Habitat (SWH) construction and monitoring.

The year 2010 proved to be unique and interesting. Planned construction of ESH was precluded due to high river stages and discharges throughout the construction season (2010 was the third highest runoff year on record above Sioux City). The rock ramp modeling results for the diversion dam modification on the Yellowstone at Intake, Montana, created the need to revisit the ramp’s design criteria. These changed conditions and new information resulted in shifts in the program’s work plan. The list below highlights some of the developments in 2010.

- Impact of high flows on MRRP implementation.
  - SWH: High flows may have helped widen chutes and increase flood plain connectivity
  - ESH: While precluding mechanical sandbar construction, the high flows may have increased sediment deposition on submerged sandbars, which may make more habitat available in 2011.
- Innovative approaches for ESH construction were tested using geotubes
- ESH coordination efforts in North Dakota, NEPA ongoing for 2011/12 projects
- Shovelnose sturgeon listed due to similarity of appearance, September 2010
- National Academy of Sciences (NAS) sediment study completed in September 2010 providing additional information and context for basin discussions.

A brief list of accomplishments related to recovery efforts are listed below.

- The performance assessment of Reasonably Prudent Alternatives (RPA) and Reasonably Prudent Measures (RPM) described in the BiOp improved in 2010. Three RPA metrics (IV. IV.B.B1.C, and VI.A.4) and three RPM metrics (least tern – measure 5 and piping plover – measure 6 and 8) that were incomplete have been finished in 2010.
- Construction on Yellowstone intake headworks structure initiated in August, 2010
- PEIS for ESH released for public review in November, 2010
- Integrated Science Program (ISP) Program Review Completed August, 2010
- Missouri River Recovery Implementation Committee (MRRIC) made five substantive recommendations to federal agencies
- The least tern three year running average fledge ratio improved from 0.84 to 0.93
- The piping plover three year running average fledging ration improved from 0.88 to 1.01
- Incidental take of listed birds decreased significantly from 176 eggs in 2009 to 60 eggs in 2010
- A SWH accounting estimates that approximately 9,201 acres of SWH (constructed and naturally occurring) are available on the system as of 2009.
I. Introduction

I.A. Purpose of Report

This document is the 2010 Annual Report satisfying reporting requirements for the Biological Opinion on the Operation of the Missouri River Main Stem System (System), Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP) and Operation of the Kansas River Reservoir System, prepared by the U.S. Fish and Wildlife Service (USFWS), dated November 30, 2000, and the Amendment thereto, dated December 16, 2003 (2003 Amended BiOp). This Annual Report is the result of a collaborative effort between the USFWS and the U.S. Army Corps of Engineers (Corps).

Compliance with the 2003 Amended BiOp requirements allows the Corps to operate the Missouri River to meet congressionally authorized project purposes without jeopardizing the continued existence of the least tern, piping plover and pallid sturgeon. The Missouri River Recovery Program (MRRP), which encompasses the BSNP Mitigation Project authority, allows the Corps to strategically implement management actions that will meet congressionally authorized project purposes while protecting native species and the ecosystems in which they depend upon.

This report is organized into nine sections that describe activities and progress in implementation of the elements of the Reasonable and Prudent Alternative (RPA), Reasonable and Prudent Measures (RPM), and Conservation Recommendations (CR) outlined in the BiOp for federally listed threatened and endangered species on the Missouri River and activities implemented under the combined MRRP and Mitigation Project.

It is the intent of the MRRP and all those who work with the program to give the reader a sense of why particular management decisions are undertaken, the results achieved and how they ultimately move the program towards successfully achieving the goal of recovering listed species and their habitat within the Missouri River watershed. Activities described in this Annual Report are summarized below. More detailed descriptions of these activities are provided in this report in the sections identified below.

This section (Section I) introduces the report and provide history of why the MRRP was formed. Description of the authorities of which the MRRP were founded, goals of the program and, the adaptive management philosophy behind program implementation are also discussed.

Section II discusses the conditions of the Missouri River in 2010 and the impact that these factors had on program implementation and listed species. Accomplishments and significant events that occurred in 2010 will also be discussed.

Section III focuses on the recovery status of federally listed species within the Missouri River basin. For the three species, the report walks through BiOp requirements, population assessments, research and monitoring efforts, and actions to meet BiOp requirements. Lessons learned and adaptive management strategies with recommendations for future direction of project implementation are also discussed.

Section IV describes the flows and sediment transport on the Missouri River and share results of recently completed and ongoing studies on these topics.

Section V discusses the conservation recommendations with specific emphasis on cottonwood restoration and bald eagle developments.

Section VI focuses on developments within the BSNP and Missouri River Fish and Wildlife Mitigation Project.

Section VII and Section VIII describes the Missouri River Ecosystem Recovery Program (MRERP) and the Missouri River Recovery Implementation Committee (MRRIC), respectively.

Section IX and X outlines future program management action recommendations and acknowledge those who contribute to the important effort of improving the Missouri River for all who inhabit the watershed.
I.B. Background

The Missouri River is the longest river in the United States and is formed by the convergence of the Madison and Jefferson Rivers near Three Forks, Montana. The Missouri River flows 2,321 miles before it empties into the Mississippi River near St. Louis, Missouri and drains one-sixth of the United States. The river flows through the states of Montana, North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri (Figure 1). From the time of its exploration by the Lewis and Clark expedition in the early 1800s, the Missouri River has been a component of our nation’s heritage. The last century has brought many changes to the river’s form and function, as its utilization and manipulation has brought many benefits to the nation. Progress has come at the expense of the river’s dynamic ecosystem resulting in listing of threatened and endangered species and decline to native populations. While the Missouri River can never be restored to the wild, untamed river it once was, some of the river’s ecological integrity and function can be recovered. See Figure 1 below for a map depicting the geographic extent of the Missouri River watershed.

![Figure 1: Missouri River Watershed](image)

I.B.I. History

I.B.I.1. Bank Stabilization and Navigation Channel Project (BSNP)

The Missouri River, in its original form, was a wide dynamic system with murky muddy water; nearly 98% of the main channel was only ten (10) feet deep. The river was laden with sediment and organic nutrients from constant bank erosion and periodic violent over-the-bank flooding. The river meandered wildly and had many channels, which supplied the resident wildlife with a diversity of habitat. These habitats included a diverse variety of shallow water wetlands, exposed sand bars, stagnant backwaters, and free flowing main channels.
Between 1912 and 1945, Congress, by funding and authorizing seven (7) different acts, charged the US Army Corps of Engineers (Corps) with stabilizing the Missouri River and providing a navigation channel. The Corps' river management efforts have included removing snags, protecting banks, building levees, and constructing and maintaining navigation channels. This collection of projects is known as the Missouri River Bank Stabilization and Navigation Project (BSNP). The BSNP projects included placing revetments on the riverbanks, closing off sloughs and side channels, and constructing pile dikes (Figure 2). Later work included dredging and rock dike construction. Construction and long-term operation and maintenance (O&M) of the BSNP created an inland navigation system and provided many benefits such as protecting utilities, transportation networks, bridges, and adjacent landowners and farms.

I.B.I.2. The Flood Control Act of 1944

The Flood Control Act of 1944 (also called the Pick-Sloan Plan) (P.L. 78–534), authorized a water development plan for the Missouri River Basin. This plan included the construction of six (6) large dams on the main stem of the river with the authorized purposes of flood control, navigation, irrigation, hydropower generation, water supply, water quality, recreation, and fish and wildlife. These six main stem dams (storage projects) from north to south, including the first year storage was available for regulation of flows, are: (1) Fort Peck (1940); (2) Garrison (1955); (3) Oahe (1962); (4) Big Bend (1964); (5) Fort Randall (1953); and Gavins Point (1955) (Figure 3). The Flood Control Act of 1944 also included numerous projects for construction by the Bureau of Reclamation (BOR) and projects for environmental restoration and preservation. In enacting the 1944 Flood Control Act, Congress did not assign a priority to these operational purposes. Instead, it was contemplated that the Corps, in consultation with affected interests and other agencies, would consider all of the authorized purposes when making decisions to optimize development and utilization of the water resources of the Missouri River basin to best serve the needs of the people. Regulation of the main stem dams as an integrated system is outlined in the Missouri River Master Water Control Manual (Master Manual). The Missouri River Main Stem Reservoir System can store approximately 73 million acre-feet of water, making it the largest reservoir system in North America.

Figure 2: Pile dikes on the Missouri River circa 1920
Figure 3: Missouri River Mainstem Dams and Reservoirs Authorized under the Flood Control Act of 1944.

Pick-Sloan - Authorized Purposes

The Corps operates the dams on the Missouri River to meet eight congressionally authorized project purposes: flood control, water supply, navigation, water quality, irrigation, recreation, hydropower, and fish and wildlife. Total estimated value of benefits gained from Corps management of the Missouri River was over one billion dollars in 2010.

- **Flood Control** - Federal projects, such as dams and levees, were built to protect flood-prone areas. However, flood risk reduction measures can never totally eliminate the potential for severe flooding. The 1993 flood ranks among the nation’s most costly. As bad as this flood was, flood control measures resulting from the Flood Control Act of 1944 prevented even more damage. Measures now in place are estimated to have prevented billions of dollars in damages to homes, businesses, public facilities, farms, and infrastructure.

- **Water Supply** - Today, the Missouri River continues to be a major source of water for cities, towns, rural water systems, industry, agriculture and domestic use. Missouri River water is withdrawn through intakes at about 25 power plant facilities and nearly 60 municipal water supply facilities. Millions of people rely on the municipal facilities along the Missouri River for their drinking water.

- **Navigation** - The Missouri River supports navigation from Sioux City, Iowa to the confluence with the Mississippi River, near St. Louis, Missouri. Flows from the Missouri River also contribute to navigation on the Mississippi River from St. Louis to New Orleans, Louisiana. Drought and low water on the Missouri River have limited barge traffic in recent years.

- **Water quality** - The Missouri River provides water to many rural communities and cities that are relying less on local aquifers with water quality issues. The reliability and importance of Missouri River water quality is essential to the future of many communities in the Basin.
• Irrigation - Water from the Pick-Sloan Plan irrigates approximately 550,000 acres throughout the arid and semi-arid portions of the Missouri River Basin. Around 400,000 of those irrigated acres receive water from gravity-fed ditches from water impounded for irrigation in the tributaries of the Missouri River. The remaining 150,000 acres receive water pumped with Pick-Sloan hydroelectric power from the Missouri River and its tributaries.

• Recreation – The Missouri River affords fishing, boating, floating, hunting, hiking, camping, sightseeing, swimming—outdoor activities that we might all expect. However, one recent survey along the Missouri River revealed that visitors engaged in over 70 distinct outdoor recreational activities.

• Hydropower - Power generation output is generally dependent upon seasonal patterns of water flow in the Missouri River. If possible, adjustments are made to provide more energy during winter and summer when demand is higher. Once the power is generated, it is turned over to Western Area Power Administration (Department of Energy) that sells power to customers including Tribes, communities, rural electric cooperatives, public utility and irrigation districts, Federal and State agencies, investor-owned utilities, and power marketers. They, in turn, provide electric services to millions of consumers in Iowa, Minnesota, Wyoming, North Dakota, South Dakota, Colorado, Kansas, Montana and Nebraska.

• Fish and Wildlife - The MRRP is focused on recovering native game and fish species including the threatened and endangered pallid sturgeon, least tern, and piping plover. The Corps is working in partnership with the U.S. Fish and Wildlife Service and many other agencies and organizations to restore some of the Missouri River’s natural form and function, creating an ecosystem in which native river species will thrive in conjunction with human needs and uses.

I.B.I.3. BSNP Mitigation Project, Other projects, and Authorizations

To mitigate the various habitat losses on the lower river, Congress authorized the Missouri River Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project (Mitigation Project) in Water Resources Development Act (WRDA) 1986, Section 610 (a) for a total of 48,100 acres. Section 334 of WRDA 1999 increased the acreage of habitat to be mitigated for the Mitigation Project by 118,650 bringing the total acres to be mitigated to 166,740 acres. The BSNP Mitigation Project authority was further amended in Section 3176(a) of WRDA 2007 allowing funds made available for recovery or mitigation activities in the lower basin of the Missouri River to be used for recovery or mitigation activities in the upper basin of the Missouri River, including the states of Montana, Nebraska, North Dakota, and South Dakota.

Some other authorities applicable to the basin include: Section 514 of WRDA 1999, Missouri and Middle Mississippi Enhancement Projects, a cost sharing authority to conduct ecosystem restoration and creation projects; Section 33 of WRDA 1988 that directed measures to alleviate bank erosion and related problems associated reservoir releases along the Missouri River between Fort Peck Dam, Montana and Gavins Point Dam, South Dakota, and Nebraska; and Section 206 of WRDA 1996 which provides for aquatic ecosystem restoration at sites throughout the country.


The Master Manual is the guide used by the Corps of Engineers to operate the system of six dams on the Missouri River Mainstem Reservoir System which include: Fort Peck, Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point. The original Master Manual for operating the authorized purposes was published in 1960 and revised in 1973, 1975, 1979, and the latest revision beginning in 1989 was adopted in 2004, which was further revised in 2006. The 1979 Manual described the sequential approach for the considering of the various interests. The first priority was flood control, followed by irrigation, water supply and water quality, navigation and power, then recreation and fish and wildlife. The 1979 Manual set forth an operation to provide an eight month navigation season. The 2004 Manual calls for suspension of navigation if system storage is not high enough at the beginning of spring and for an unbalance of the
upper three reservoirs on a three year cycle to provide for resident fishery production. The technique of unbalancing the reservoirs creates additional spawning coverage and can contribute to more emergent sandbar and shoreline habitat for ESA listed birds. The Master Manual and its revisions have attracted a long litigation record which has contributed to the need for revisions, and the delays in adopting new versions. (Seeronen, John R. Missouri Environmental Law and Policy Review: Vol. 16, No1. Judicial Challenges to Missouri River Mainstem Regulation pg 60-107. University of Missouri School of Law).

The Corps’ Master Manual was updated in March 2004 to include more stringent drought conservation measures, unbalancing of the upper three reservoirs, modifications to non-navigation flows, and an adaptive management (AM) process. The Master Manual was updated again in March 2006 to include technical criteria for the release of spring pulse flows from Gavins Point dam.

I.B.1.5. Corps Biological Assessments

In accordance with the Endangered Species Act (ESA), the U.S. Army Corps of Engineers (Corps) must ensure, in consultation with the U.S. Fish and Wildlife Service (USFWS) that any action carried out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The federal action subject to ESA consultation is the Corps’ operation of the Missouri River Mainstem Reservoir System, operation of the Kansas River projects, and the operation and maintenance of the Bank Stabilization and Navigation Project (BSNP).

In the 2000 Biological Opinion, the USFWS determined that the Corps’ action would jeopardize the continued existence of the least tern, piping plover, and pallid sturgeon. The USFWS provided the Corps an RPA that, if accomplished, would likely avoid jeopardizing these species. In November 2003, the Corps provided to USFWS a Biological Assessment (BA) that indicated that the Corps wanted to reinitiate consultation because of new information about the effects of the action, because piping plover critical habitat had recently been designated, and because they had determined that portions of the original RPA were not reasonable or prudent.

The Corps reasoned that the original RPA may not be reasonable and prudent and would likely not be successful in creating the desired amount of habitat using the flows required in the 2000 Biological Opinion RPA. The Corps presented an engineering analysis in their 2003BA that determined that the flows required in the 2000 RPA would not accomplish the intended habitat objectives specified, and that the RPA flows would likely accelerate erosion of sandbars beyond the effects of the current water control plan. The Corps stated that the results of their studies showed that the long term net result of the RPA would be less available habitat. Therefore, in their BA, the Corps proposed to meet the habitat goals specified in the 2000 Biological Opinion RPA through alternate means (e.g., mechanical creation of sandbars and restoration of existing sandbars through vegetation removal). USFWS accepted the Corps’ results regarding the efficacy of the required RPA flow modifications to create habitat.

In their BA, the Corps described for the USFWS alternative elements for the RPA that they believed would likely avoid jeopardizing the three species if done in conjunction with the other requirements of the 2000 Biological Opinion. The proposed alternative elements of the RPA did not contain the flow modifications from Gavins Point Dam or full implementation of the modifications out of Fort Peck Dam. The Corps believes that its proposed action as described in the BA, is a reasonable and rational near-term approach to the conservation of listed species and avoids the likelihood of jeopardizing the continued existence of the interior least tern, the piping plover, and pallid sturgeon, and does not result in an adverse modification of piping plover critical habitat.

I.B.1.6. USFWS Biological Opinions

At the end of the 20th century, the infrastructure on the Missouri River (e.g., dams, levees, upkeep of the navigational channel, etc.) provided for both flood control and navigation, but also contributed to losses in fish and wildlife populations. Three (3) million acres of river habitat had been altered, 51 of 67 native species have been rated as uncommon or decreasing, the dominant cottonwood forests along the river have ceased reproduction, and aquatic insect diversity, a key food source in the river, has declined by 70%. The cumulative result of these factors has contributed to the decline of three (3) species which are now designated as threatened or endangered. This designation triggered the federal government into mandatory action (Section 7 Consultation under the Endangered Species Act). The FWS determined in 2000 that
continued USACE operations of the Missouri River jeopardized the continued existence of the least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), and pallid sturgeon (*Scaphirhynchus albus*) (Figure 5, 6 and 7), as well as the bald eagle. The least tern, pallid sturgeon, and bald eagle are endangered species and the piping plover is a threatened species.

To avoid jeopardizing the continued existence of the tern, plover, and sturgeon, the FWS mandated it is necessary to: (a) restore a portion of suitable riverine aquatic habitats and hydrologic conditions necessary for successful reproduction and recruitment of the three species, and (b) provide population augmentation for the pallid sturgeon to ensure genetic viability of the species. To achieve that while continuing river O&M, it is necessary to:

1. implement flow enhancement (*i.e.*, variability, volume, timing, and temperature) with the goal of providing the hydrologic conditions necessary for species reproduction and recruitment;
2. implement a habitat restoration program with the goal of restoring habitat quality, quantity, and diversity so that the benefits of adequate dynamic natural river processes are restored;
3. conduct a comprehensive endangered species habitat and monitoring program to better characterize habitat use (by all life stages), longevity, and availability and guide habitat restoration and flow modification; and
4. establish an adaptive management (AM) framework to implement, evaluate, and modify the actions in response to variable river conditions, species responses, and increasing knowledge base. AM is being implemented at the programmatic and project-scale levels.

The 2000 BiOp was amended in 2003 (2003 Amended BiOp). The 2003 Amended BiOp retains the vast majority of the measures included in the 2000 BiOp, but incorporates a performance-based approach that allows greater flexibility while providing equal or greater biological benefits to all three listed species. The 2003 Amended BiOp mandated a watershed approach including habitat creation and restoration (emergent sandbar habitat and shallow water habitat), rises along the river (evaluate annual spring rise), and an aggressive AM and monitoring program (Integrated Science Program). This comprehensive approach builds on the measures that were endorsed by the National Academies of Sciences (NAS) when it conducted its review of the Missouri River in 2000. The success of the 2003 Amended BiOp will be measured not simply by process or prescriptive flow rates, but by results. The BiOp uses reasonable and prudent alternatives (RPAs), reasonable and prudent measures (RPMs) as well as specific FWS goals (for mitigation) and conservation recommendations (CRs) to measure progress. Each of these metrics of progress has its own timeframe for evaluation (*i.e.*, some metrics are evaluated annually, some are evaluated every five years, some have targets that are year specific [2010, 2020]). Additionally, the FWS has developed biological targets for the three listed species and the Corps can determine how best to achieve those targets, while still managing the Missouri River.

**I.B.II. Missouri River Recovery Program**

The collective set of actions being taken in response to the 2003 Amended BiOp, BSNP Mitigation and related authorizations for MRERP and MRRIC is known as the Missouri River Recovery Program (MRRP). The 2003 Amended BiOp was prepared in response to the Corps’ Final Environmental Impact Statement (FEIS) for the Review and Update of the Missouri River Master Water Control Manual (Master Manual) and its corresponding Biological Assessment.

**I.B.II.1. Authority**

The MRRP was established by the Corps in 2004 essentially combining two related efforts including the responsibilities of compliance with the 2003 amended BiOp and acquiring and developing lands to produce habitat as directed by the Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project.

The Missouri River Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project of Missouri, Kansas, Iowa, and Nebraska was authorized by Section 601 (a) of the Water Resources Development Act of 1986 [Public Law (PL) 99-662]. The authorization included the acquisition and
development of 29,900 acres of land, and habitat development on an additional 18,200 acres of existing public land in the states of Iowa, Kansas, Missouri, and Nebraska. The total amount of land authorized for mitigation by WRDA86 was 48,100 acres. Section 334(a) of WRDA 1999 (PL 106-53) modified the Mitigation Project by increasing the amount of acreage to be acquired and/or mitigated by 118,650 acres. As a result, the total amount of land authorized to be acquired for mitigation is currently 166,750 acres.

The Corps prepared a Feasibility Report and Environmental Impact Statement (Corps 1981) on the original Mitigation Program of 48,100 acres. After Congress modified the Mitigation Project in WRDA99, the Corps initiated a Supplemental Environmental Impact Statement (SEIS; Corps 2003a) in September 2001 for the additional 118,650 acres. The SEIS was completed in early 2003 and the Record of Decision (ROD) was signed in June 2003.

Section 3109 of WRDA 2007 further amended the Mitigation Project authorization allowing funds made available for recovery or mitigation activities in the lower basin of the Missouri River to be used for recovery or mitigation activities in the upper basin of the Missouri River, including the states of Montana, Nebraska, North Dakota, and South Dakota. More specifically, these funds have recently been used to study and construct a fish passage at the Lower Yellowstone Intake Diversion Dam Modification Project (Intake Diversion Dam Project) near Intake, Montana.

Congress further directed the Corps to develop a Missouri River Ecosystem Recovery Plan (MRERP) as well as a stakeholder group (Missouri River Recovery Implementation Committee [MRRIC]) as part of the MRRP. Per Section 5018 of WRDA 2007, the Corps is required to:

1. Prepare a study to determine the actions required to mitigate losses of aquatic and terrestrial habitat; recover federally listed species under the Endangered Species Act; and to restore the ecosystem to prevent further declines among other native species. The study, referred to as the Missouri River Ecosystem Restoration Plan (MRERP), is in the early stages of planning. More information on the study is available at: www.MRERP.org and in Section VII of this document.

2. Establish a Missouri River Recovery Implementation Committee (MRRIC Committee). The MRRIC Committee will include representatives from federal agencies, Tribes, states, local governments and non-governmental stakeholders in the Missouri River basin.

Consequently, the Corps and the FWS are working collaboratively to develop a plan to identify and guide actions required to restore ecosystem functions, mitigate habitat losses and recover native fish and wildlife on the Missouri, while seeking balance with social, economic and cultural values for future generations.
When completed, the ecosystem restoration plan will guide the work that needs to be done throughout the Missouri River Basin and is anticipated to serve as an accounting tool for Congress to measure progress on recovering the Missouri River ecosystem.

I.B.II.2. Vision, Mission, and Goals

The MRRP vision is that of a sustainable ecosystem supporting thriving populations of native species while providing for current social and economic values, \( \text{(i.e. the congressionally authorized purposes established by the Flood Control Act of 1944).} \)

The mission is to implement actions to accomplish Missouri River ecosystem recovery goals in coordination and collaboration with agency partners and stakeholders. The program is structured into several unique components including habitat creation, hatchery support, flow modification, science, and public involvement.

Goals and objectives, taken from the MRRP Program Management Plan (May, 2010), of the MRRP are as follows:

1. Comply with the BiOp;
2. Implement the Mitigation Program;
3. Conduct a study (Missouri River Ecosystem Restoration Plan [MRERP]) to determine actions required to mitigate, recover and restore;
4. Collaborate and coordinate with stakeholders and agency partners including MRRIC; and
5. Implement other congressionally and WRDA directed projects (\textit{e.g.}, Intake Diversion Dam Modification Project, Montana).

I.B.II.3. Adaptive Management Process

I.B.II.3.a. Framework

FY 2010, the Corps took significant steps forward in formalizing an Adaptive Management Process to be integrated into the Planning, Implementation and Monitoring of the MRRP. This process was documented in a draft MRRP Adaptive Management Process Framework which describes how AM principles will be used in the MRRP to reduce uncertainty and ensure that program objectives are achieved over time. The draft document is available at [http://im4.nwo.usace.army.mil/mrrp/MRRP_PUB_DEV.download_documentation?p_file=6643](http://im4.nwo.usace.army.mil/mrrp/MRRP_PUB_DEV.download_documentation?p_file=6643). By applying the AM process to the MRRP; the USACE seeks to accomplish the following goals:

- Improve involvement of stakeholders and Tribes in the decision-making process
- Improve integration of Planning, Implementation, and Monitoring & Investigations activities
- Ensure monitoring and investigations are directly tied to objectives
- Ensure data is collected, analyzed, and documented in a way that results in learning from the outcomes of management actions and influences decision-making
- Ensure that necessary adjustments are made to the MRRP to achieve success in meeting objectives

This Framework describes the process by which AM will be used throughout the MRRP to achieve these goals. Additional information on the MRRP - including roles, responsibilities, mission and activities, and an example AM document outline is provided in appendices to this framework.

I.B.II.3.a.i. Major Components of an Adaptive Management Plan

In order to ensure that the AM process is integrated across the MRRP, AM Strategies will be developed by interagency Product Delivery Teams (PDT) for sets of related management actions (such as restoration of tern and plover habitat) that share common objectives, implementation techniques and monitoring activities. Major elements of these AM strategies include:

- **Objectives** that are measurable and scoped appropriately to the proposed management actions
• **Metrics** which determine data necessary to measure progress towards objectives
• **Monitoring** - the process of collecting data to compare against the metrics
• **Investigations** - research activities intended to reduce uncertainty
• **Analyses & Assessments** - the methods used to translate data into management recommendations (includes models)
• **Management Actions** - a suite of proposed or potential actions to be taken by an agency

I.B.II.3.b. Status of Efforts

In FY 2010, a draft Adaptive Management strategy was developed for Emergent Sandbar Habitat (ESH) which is currently under review along with the Programmatic Environmental Impact Statement for ESH. The Shallow Water Habitat (SWH) PDT is currently in the process of developing a draft AM Strategy for SWH construction which is expected to be completed in FY 2011 and initial efforts are underway on developing a scope of effort for a Spring Pulse AM Strategy.

I.B.II.4 Partnerships

MRRIC – See Section VIII for detailed information.

MRERP – See Section VII for detailed information.

CAT – See Section VII for detailed information.

ACT- See Section VI.C for detailed information.

Missouri River Futures – Missouri River Futures (MRF) was established in 2004 to coordinate efforts from various agencies and private landowners on Missouri River issues. MRF primarily focuses its efforts on the 39-mile and 59-mile segments of the Missouri National Recreational River (MNRR). Over 35 different federal, state, local, and nonprofit organizations are working on issues regarding the MNRR. For more information see the MRF website: [http://www.missouririverfutures.com/](http://www.missouririverfutures.com/).

II. Missouri River, 2010

The following section highlights the 2010 condition and activities on the Missouri River.

II.A. Description of the Overall Condition of the Missouri River in 2010

The Missouri River basin (above Sioux City) received approximately 39 million acre feet of runoff in 2010, representing the third highest runoff of 113 years of record. Approximately 83 million acre feet of runoff were received below Sioux City. Flows below Sioux City were near or above the 10 percent duration exceedance flow from June 15 until November 1. These flows are an extreme contrast to the period from 2005 thru 2008 which endured low flows with a significant portion of the 1 April through 30 November period below the 90 percent exceedance flow level. It is too early to fully understand how these flows have impacted future river conditions and the implementation of the overall Missouri River Recovery Program (MRRP).

High water years typically have a short term negative impact on the availability of emergent sandbars available in the system, but are conversely typically good for primary productivity and young-of-year fish production, key food sources for least terns. Figure 6 shows submerged sandbars during high flow events in 2010. Lower water in future years is anticipated to again re-expose these sandbars.
II.A.I.2 Effects of High Flows on Shallow Water Habitat

The high water can also have a multitude of impacts on chutes, side-channels, and backwater wetlands which have been constructed in the lower Missouri River. The high water could accelerate critical cut-and-fill alluvial processes resulting in net erosion and increased shallow water habitat at previously constructed chutes and bank notches. Potential effects of these high flows also include deposition within constructed backwaters and some chutes, floodplain deposition, channel widening due to bank erosion at numerous locations, and erosion of grade control rock at several chutes with potential impacts to the navigation channel.

II.A.II. Oil Spill in Gulf Effects on Wintering / Migrating Terns and Plovers

Plover adult survival may be negatively impacted by the Deepwater Horizon Oil discharge. Plovers spend approximately two-thirds of their life cycle on the wintering grounds. Northern Great Plains plovers winter primarily in the Gulf of Mexico, where the Deepwater Horizon Oil discharge may impact piping plover survival. An on-going study in the Gulf is designed to look at over-winter plover survival in impact compared with reference areas which the oil did not reach.

Interior least terns are believed to migrate through the Deepwater Horizon oil spill zone; however, it is difficult to determine how tern and plover populations that nest along the Missouri River channel have been affected by the oil spill. Their migration habits are not specifically monitored. The USFWS is addressing how fish and other wildlife were affected by the spill through ongoing Natural Resource Damage Assessment studies which may give us a better understanding in the future of how these species were affected.

II.B. Accomplishments

II.B.I. MRRIC- Recommendations
During calendar year 2010, the Missouri River Recovery Implementation Committee (MRRIC) made five substantive recommendations to the federal agencies. Full text of the recommendations along with the federal agencies' responses can be found in Appendix D.

Final consensus was reached on the following substantive recommendations at the July 2010 MRRIC meeting:

1. Recommendation on reimbursement of travel expenses for MRRIC members to Assistant Secretary of the Army for Civil Works
   The MRRIC Committee - Tribal, stakeholder, and state members request the congressional delegations from the Missouri River basin, the Assistant Secretary of the Army for Civil Works, the U.S. Fish and Wildlife Service, and all other federal agencies working with MRRIC to seek federal legislation and/or other means as appropriate to authorize and appropriate funds for reimbursement of Tribal, stakeholder, and state travel expenses.

2. Transmittal of Values Workshop Summary for MRERP
   The MRRIC recommends that the perspectives included in the attached summary be considered by the U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS) as the agencies develop the list of social, economic, tribal and cultural values for characterizing existing conditions for the Missouri River Ecosystem Restoration Plan (MRERP) and Environmental Impact Statement (EIS).

3. Prioritization of FY11 Work Plan for Recovery Program
   If Congress appropriates less than the President’s budget for FY 2011, MRRIC recommends the Corps of Engineers exercise its best professional judgment to allocate these resources in the manner which will least damage the efforts to meet the requirements of the Biological Opinion with emphasis placed on maintaining: 1) the Integrated Science Program (ISP) at the highest possible levels; and 2) construction of Emergent Sandbar Habitat (ESH), including ESH on tribal lands.
   If Congress appropriates more than the President’s budget for FY 2011, MRRIC recommends these additional funds be used to aggressively pursue the ISP and increase support for the development and implementation of the Adaptive Management process. MRRIC recommends that ESH receive an increased level of funding, including ESH on Tribal Lands.

Final consensus was reached on the following substantive recommendations at the October 2010 MRRIC meeting:

4. Constructing habitat for terns and plovers in non-traditional areas
   Emergent Sandbar Habitat (ESH) for terns and plovers is of particular importance. Federal agencies should initiate work on the required steps to implement a pilot project to create ESH in areas outside of the current approach, such as adjacent to the channel and/or within reservoirs.

5. Conducting government-to-government consultation with basin tribes to encourage more tribal participation in the MRRIC.
   The MRRIC recommends that the USACE and the USFWS jointly conduct government-to-government consultation with as many of the 29 Missouri River basin Tribes as possible between the end of October 2010 and the first MRRIC meeting of 2011. The formal consultation will include sharing opportunities for involvement in MRRIC and gathering information on Tribal obstacles to participating in the MRRIC.

II.B.II. National Academy of Sciences Independent Sediment Study Completed

The National Academy of Sciences released the 2-year independent review on Missouri River Recovery Program Sediment Management Practices to the public on September 28, 2010. Concerns regarding MRRP sediment management led to the Corps, Environmental Protection Agency (EPA), and USFWS, agreeing in 2008 that an independent review from the National Academy of Sciences was warranted. The Academy was tasked to add scientific clarity to key uncertainties regarding sediment in the Missouri River.
and downstream effects to the Mississippi River and the Gulf of Mexico. Three of the main areas of the report are discussed below.

First, the report highlights the importance of historical conditions to the ecology of the Missouri and Mississippi Rivers. For example, page 42 of the report says, “High concentrations of sediment and high turbidity in the pre-regulation river were important to the evolution and adaptation of native species such as the pallid sturgeon.”... "For many river processes and services, sediment concentrations and transport are as important as the quantity and flow of water."

Second, the report also addresses the Missouri River restoration project effects on the Gulf of Mexico. According to the report on page 106, “A comparison of potential phosphorus loads from Corps Shallow Water Habitat projects, with load increments required to produce measurable changes in the area extent of Gulf hypoxia, shows that these projects will not significantly change the extent of the hypoxic area in the Gulf of Mexico.”

Phosphorous is discussed at length in the report, highlighting the root of some of the sediment concerns with SWH creation. For example on page 99 the report states “the Corps of Engineers Missouri River restoration projects, and any additional future projects, deliver additional nutrients to the river and Gulf at a time that federal and state agencies, and a variety of nongovernmental organizations, are seeking ways to reduce nutrient loadings across the Mississippi River basin.”

Additional context on phosphorous is provided on page 103 stating that “phosphorus is a nutrient closely correlated with sediment. As a result, it is likely that there were background concentrations of phosphorus in the Missouri River prior to the construction of the mainstem dams and river control structures that were part of the ecosystem that supported populations of the native species.” In addition, the report states on page 104 to 105 that “Development of numeric criteria for sediment and nutrients should be based on further understanding of the sediment and phosphorus history of the river, and the effects on native species, as that information becomes available through the MRRP and other ongoing studies.”

Third, the report addresses the Clean Water Act and how it interacts with the Endangered Species Act. Page 56 states, “it is possible to develop water quality criteria that are consistent with the Clean Water Act and that do not conflict with Biological Opinion requirements for the Missouri River.”... “the legislative history and origins of the Clean Water Act show that it long has been recognized that historic watershed conditions can be a template for setting water quality uses and criteria.”

The Missouri River Recovery Program Sediment Management Practices report can be found on the web at the following location: http://download.nap.edu/cart/deliver.cgi?record_id=13019

II.B.III Title VII & IX

The Missouri River Restoration Act of 2000 – Title IX (South Dakota) was authorized in the Water Resources Development Act of 2000 (P.L. 106-541). The legislation was created to reduce siltation of the Missouri River in South Dakota and develop and implement long-term strategy to meet the objectives of the Pick-Sloan plan. Congress recognized that the Oahe, Big Bend, Fort Randall and Gavins Point Dams have reduced the ability of the Missouri River to carry sediment downstream, resulting in the accumulation of sediment in the reservoirs known as Lake Oahe, Lake Sharpe, Lake Francis Case and Lewis and Clark Lake. Some of the problems this accumulation of sediment has caused include shoreline flooding, destruction of wildlife habitat, reduced water quality, threats to the reliable use of intakes for drinking water, and threats to the long-term ability of dams to provide hydropower and flood control.

The Missouri River Protection and Improvement Act of 2000 – Title VII (North Dakota) was authorized in the Water Resources Development Act of 2000 (P.L. 106-541). The legislation was created to reduce siltation of the Missouri River in North Dakota and develop and implement long-term strategy to meet the objectives of the Pick-Sloan plan. Congress recognized that the Garrison and Oahe Dams have reduced the ability of the Missouri River to carry sediment downstream, resulting in the accumulation of sediment in the reservoirs known as Lake Sakakawea and Lake Oahe. Some of the problems this accumulation of sediment has caused include shoreline flooding, destruction of wildlife habitat, reduced water quality,
threats to the reliable use of intakes for drinking water, and threats to the long-term ability of dams to provide hydropower and flood control.

An Assessment was completed in June 2009. The Missouri River Joint Water Board was the cost-share sponsor. A Task Force meeting was held in October 2009 and the members discussed Plans and Projects for potential implementation. The 2003 implementation guidance directed the District to finish the Assessment phase and return to Division for additional guidance. Draft implementation guidance in 2010 indicates that USACE Planning processes may be prohibitive for small projects in rural communities where benefit-cost ratios are likely less than 1.0. This would prohibit many of identified projects to move to the Project (construction) phase and the Task Force is reluctant to further cost-share additional studies that will not lead to construction.

II.B.IV. Lower Yellowstone Intake Diversion Dam Modification Project

The Water Resources Development (WRDA) Act of 2007 authorized the U.S. Army Corps of Engineers (USACE) to use funds appropriated to carry out the Missouri River Recovery Program (MRRP) to assist the Bureau of Reclamation (Reclamation) in the design and construction of Reclamation's Lower Yellowstone Intake Diversion Dam Modification Project (Intake Diversion Dam Project) for the purpose of ecosystem restoration. Subsequent to the passage of WRDA 2007, the USFWS issued a letter dated 23 October 2009 formally revising the Missouri River Biological Opinion for protection and recovery of threatened and endangered species on the Missouri River. This letter substituted elements of the Reasonable and Prudent Alternative (RPA) related to pallid sturgeon to include the Intake Diversion Dam Project for fish passage and entrainment protection and defer activities associated with flow and temperature modifications at Ft. Peck Dam until evaluating the efficacy of the Intake Diversion Dam Project. In addition, the RPA revision included delaying the acreage milestones for shallow water habitat on the Lower Missouri for up to four years equal to the timeline required for completion of the Intake Diversion Dam Project.

Reclamation and the Corps jointly prepared an Environmental Assessment and Finding of No Significant Impact (FONSI) for the Intake Diversion Dam Project which was released for public review in March 2010. The FONSI was signed in April 2010 by the Corps and the BOR. The chosen alternative includes a rock ramp for fish passage and a new main canal headworks structure with removable rotating drum screens for entrainment protection.

A few members of the MRRIC requested an independent review of the science for the Intake Diversion Dam Project. The Department of Interior (DOI) contracted with PBS&J to convene an independent panel to review the science used as the basis for the Intake Diversion Dam Project as well as the likelihood that the preferred alternative for passage would work for pallid sturgeon. A final report was submitted on 30 Nov 2009 and is available for review at http://www.usbr.gov/gp/mtao/loweryellowstone/EA/Final%20EA/StartCD.pdf. In summary, the panel concluded that the best science available was used in the development of the draft EA and BA. The review concluded that information effectively supports hypotheses that:

1. The project will provide passage and enhance upstream migration for adult pallid sturgeon.
2. Suitable spawning habitat exists upstream of the project.
3. Conditions at the potential upstream spawning sites are suitable for the development and survival of pallid sturgeon eggs.
4. There is sufficient downstream drift distance for larval development for at least a portion of the larvae in some years for some level of natural recruitment to occur.
5. Proposed fish screens will effectively decrease entrainment of adult, juvenile, larval, and embryonic pallid sturgeon and other fish species.
6. Conditions in the Yellowstone and connected sections of the Missouri River are suitable conditions to support completion of the pallid sturgeon life cycle.

The panel concluded that additional analysis or research might marginally reduce uncertainties regarding the probability of success, but is not likely to lead to fundamentally different conclusions. The true test and quantification of project benefits can only be made by project implementation and subsequent monitoring.
of the response. This action clearly represents a reasonably realistic alternative for restoration of natural recruitment for this distinct and evolutionarily significant population of pallid sturgeon.

Due to the complexity of the project and the aggressive schedule, Senior Executive Service (SES) level conference calls occur on a regular basis between Corps, USFWS, Reclamation, and EPA. The calls work to both strengthen the collaborative partnership of the agencies as well as to address potential issues as they develop.

Groundbreaking for the headworks structure (Figure 8) took place on August 13, 2010. Since that time the cofferdam required for construction of the structure has been completed and work has been initiated on the new drainage canal. Work on the structure will proceed with a target completion date of February 2012.

The ramp and weir design has been completed through 15%. A physical model of the proposed ramp has been constructed by the Bureau of Reclamation at their Denver facility and this model was reviewed by the design team and Biological Review Team (BRT) in early November. The model has illustrated the overall efficacy of the proposed structure while at the same time identifying some features that required modification to meet Pallid passage requirements. A design review meeting was held November 18, 2010 to discuss the status of the design and to discuss a number of design options that remain open at this time.

II.B.IV. Real Estate

II.B.IV.1. Audubon Bend Conservation Fund Partnership

On November 16, 2009, during Fiscal Year 2010, the Omaha District acquired 2,371 acres of land by Warranty Deed from The Conservation Fund, a Maryland non-profit organization. The land is located in Cedar County, Nebraska. See Figure 8 below for a Site Location Map. This site is anticipated to be utilized for constructing ESH, staging restoration construction efforts, cottonwood regeneration and other efforts to improve habitat for native species.

III. Recovery Status of Federally Listed Species

III.A. Least Tern

**Least Tern**: The interior population of the least tern (Figure 11) was listed as endangered on June 27, 1985. The interior population was listed as endangered due to perceived low numbers and the loss of its primary breeding habitat - barren sandbars on the Mississippi, Missouri, Arkansas, Red, Ohio and Rio Grande River Systems. Stabilization of these river systems for navigation, flood control, hydropower generation and irrigation
eliminated sandbars and the remaining sandbars have been degraded by vegetation encroachment or are subject to frequent inundation.

It should be noted that the interior population of the least tern was listed as endangered and not the subspecies known as the interior least tern – *Sternula antillarum athalassos*. Because of the taxonomic uncertainty of least tern subspecies in North America, the U.S. Fish & Wildlife Service did not list the subspecies as endangered and instead designated those least terns occurring in interior North America as endangered.

### III.A.I. Recovery Criteria for Delisting

The recovery plan for the interior population was published by the U.S. Fish & Wildlife Service in September 1990. The recovery criteria set two goals:

1. Assure the protection of essential habitat by removal of current threats and habitat enhancement and establish agreed upon management plans.
2. Attain a population of 7,000 birds at the following levels:
   a. Adult birds in the Missouri River system will increase to 2,100 and remain stable for 10 years.
   b. Current numbers of adult birds (2,200-2,500) on the Lower Mississippi River will remain stable for 10 years.
   c. Adult birds in the Arkansas River system will increase to 1,600 and remain stable for 10 years.
   d. Adult birds in the Red River system will increase to 300 and remain stable for 10 years.
   e. Current number of adult birds in the Rio Grande River system (500) will remain stable for 10 years.

The recovery plan stated the following actions were needed for delisting:

1. Determine population trends and habitat requirements.
2. Protect, enhance and increase populations during breeding.
3. Manage reservoir and river water levels to the benefit of the species.
4. Develop public awareness and implement educational programs about the interior least tern.
5. Implement law enforcement actions at nesting areas in conflict with high public use.

### III.A.II. Population Assessment

#### III.A.II.1. Population Assessment throughout Entire Range

A population assessment is not done annually. In 2005 the first range wide census of the interior population on the breeding grounds was conducted with the final report prepared by the U.S. Army Corps of Engineers. The survey covered 4,700 river miles, 22 reservoirs, 62 sand pits, 12 industrial sites, 2 rooftop colonies and over 16,000 acres of salt flats. A total of 17,591 adult least terns were counted in 489 interior colonies. The table below shows the 2005 adult census results by recovery goal areas. Currently, an effort is not scheduled to complete another range wide adult census. A five year review of the interior population of the least tern was initiated by the USFWS in 2008.

<table>
<thead>
<tr>
<th>River System</th>
<th>2005 Census</th>
<th>Recovery Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missouri River</td>
<td>2,044</td>
<td>2,100</td>
</tr>
<tr>
<td>Ohio River</td>
<td>271</td>
<td>0</td>
</tr>
<tr>
<td>Arkansas River</td>
<td>2,129</td>
<td>1,600</td>
</tr>
<tr>
<td>Red River</td>
<td>1,821</td>
<td>300</td>
</tr>
<tr>
<td>Lower Mississippi River</td>
<td>10,960</td>
<td>2,200-2,500</td>
</tr>
<tr>
<td>Rio Grande River</td>
<td>138</td>
<td>500</td>
</tr>
<tr>
<td>Non-Coastal Texas</td>
<td>228</td>
<td>0</td>
</tr>
<tr>
<td>Entire Interior Range</td>
<td>17,591</td>
<td>7,000</td>
</tr>
</tbody>
</table>
III.A.II.2. Population Assessment on the Missouri River System

The 1990 recovery plan set a goal of 2,100 adults for the Missouri River System. The goals were set by state and in the case of South Dakota and Nebraska, the state goals were subdivided by river. This number includes tributaries such as the Platte, Niobrara and other rivers. The table below shows the 2005 range wide results and recovery plan goals:

<table>
<thead>
<tr>
<th>Region</th>
<th>2005 Census</th>
<th>Recovery Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>North Dakota</td>
<td>225</td>
<td>250</td>
</tr>
<tr>
<td>South Dakota</td>
<td>653</td>
<td>680</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1,038</td>
<td>1,120</td>
</tr>
<tr>
<td>Iowa</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Kansas</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2,011</td>
<td>2,100</td>
</tr>
</tbody>
</table>

Missouri River: The 1990 recovery plan essentially sets a Missouri River goal of 900 adults. This includes 50 from Montana (which is a state goal that would include the Yellowstone and Missouri Rivers), 250 from North Dakota (the state goal is essentially a Missouri River goal as least terns are found only on the Missouri in North Dakota) and 600 for South Dakota (divided into four subsections: Lake Oahe, the Missouri River below Fort Randall Dam, the Missouri River below Gavins Point Dam and Missouri River – Other.) The chart below shows the least tern adult census results for the Missouri River from 1986 through 2010.

Least Tern Adult Numbers on the Missouri River, 1986-2010

Figure 11: Least Tern Adult Numbers on the Missouri River, 1986-2010

Figure 12 shows that least tern adult numbers on the Missouri River for the past 25 years have exceeded the recovery plan goal of 900 only twice, in 2005 and 2007. The figure likewise shows that least tern adults on the Missouri River have decreased in each of the past three years. Adult surveys have been done on all
III.A.III. Least Tern 2010 Nesting Summary

In 2010, survey crews found 554 tern nests of which 299 were successful for a nest success of 58.6%. There were 660 adults enumerated in the adult census. These adults produced 338 fledglings. The fledge ratio for the entire Missouri River system in 2010 was 1.02 fledglings per adult pair, which is above the 2003 Amended BiOp goal of 0.94.

Least terns arriving on the Missouri River in mid May found two new constructed sandbar complexes on the Gavins Point Segment. These complexes were located at River Mile (RM) 781.5 and RM 781.0. Terns between the Fort Randall Dam and Ponca State Park nested almost exclusively on the constructed sandbars on the Gavins Point Segment and the constructed complex at RM 826.5 on Lewis & Clark Lake. The lone exception was one nest on the Fort Randall Segment. The nesting on Lewis & Clark Lake was disrupted in mid June by high inflow from the Niobrara River into the reservoir due to heavy rain. The inflow caused the lake to rise four feet and partially submerge the complex at RM 826.5. Eighteen nests were lost to this event. The same heavy rains in mid June caused the James River, Vermillion River and Bow Creek to send high flows into the Missouri below Gavins Point Dam. The high flows completely inundated the constructed sandbar complexes at RM 795.5, RM 775.0 and RM 774.0 and partially inundated the constructed sandbars at RM 791.5, RM 781.5, RM 781.0 and RM 777.7. A total of 54 nests were flooded from this event. The terns re-nested on the sandbars that were not inundated and ended up being successful with an overall Gavins Point segment of the Missouri River fledge ratio of 1.17.

Terns traveling up the Missouri found little habitat on Lake Oahe as the reservoir was already in its exclusive flood zone which eliminated shoreline habitat on the lake and had inundated sandbars that had previously been used by the birds in the upper lake. The higher than normal level of Lake Oahe however led to lower than normal releases out of Garrison Dam, which provided some sandbar habitat for the terns on the Missouri below the dam. The terns were successful below Garrison Dam with a fledge ratio of 1.36. There was very little use by the terns on Lake Sakakawea and on the Fort Peck Segment of the Missouri below Fort Peck Dam.

III.A.IV. Actions to Meet BiOp Requirements

III.A.IV.1. Least Tern Biological Opinion Requirements

Reasonable and Prudent Alternatives outlined in the 2003 Amended BiOp and Performance metrics are outlined below.

III.A.IV.1.a. RPA V.B. Least Tern

The 2003 Amended BiOp set fledge ratios, fledglings divided by adult pairs, as a measure of habitat quality on the Missouri River. The 2003 Amended BiOp set the fledge ratio of 0.94 as the minimum metric to be used. The 0.94 fledge ratio was the average fledge ratio for least terns on the Missouri River for the eleven year period of 1993-2003. The habitat quality metric would be based on a three year running average. For 2008-2010 the 3-year running average fledge ratio for least terns was 0.93 fledglings per adult pair (999 fledglings divided by (2,138 adults divided by 2)). This is just below the BiOp fledge ratio metric of 0.94. Figure 13 below shows the three year average fledge ratio for 1986-1988 through 2008-2010.
Figure 14 shows that after a steady decline from the peak of 1.39 for 1998-2000 to 0.83 for 2006-2008, the three year average has risen for the past two years. However in 2010, the three year average failed to meet the BiOp fledge ratio goal of 0.94 for a fourth consecutive year.

III.A. IV.1.b. Missouri River Least Tern Incidental Take and Reasonable & Prudent Measures (RPM)

Incidental Take is defined as take that results from a Federal action but is not the purpose of the action. This may be allowed when the Service approves it through an incidental take statement. The statement includes the amount or extent of anticipated take due to the Federal action, reasonable and prudent measures to minimize the take, and terms and conditions that must be observed when implementing those measures.

**Incidental Take 1.** Take of eggs and chicks by flooding on the river and reservoir reaches that result from the Corps’ operations of the water control system.

The 2003 Amended BiOp states, “…reinitiation of consultation will be required if the Corps’ actions result in take of more than 180 eggs in a 3-year consecutive period.” Table 3 shows the incidental take losses for the Missouri River for 2008-2010. The 3-year running total of 63 eggs and chicks for 2008-2010 was well below the 180 eggs (and chicks) trigger set forth in the 2003 Amended BiOp.

<table>
<thead>
<tr>
<th>Year</th>
<th>Eggs</th>
<th>Chicks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>32</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>2009</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>2010</td>
<td>22</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>3-Year Total</td>
<td>63</td>
<td>0</td>
<td>63</td>
</tr>
</tbody>
</table>
The loss of 11 nests and 22 eggs due to Corps operations in 2010 came from three events that are discussed below.

Lake Sakakawea Rise: Eight nests containing seventeen eggs were flooded as Lake Sakakawea rose to contain the snowpack runoff from the Rocky Mountains.

Lake Oahe Rise:
RM 1270 – Dredge Island

Nest 120: This 2 egg nest with 7 days inc. was found on June 24. The lake elevation was at 1617.5 ft on this date. (June 15 – lake elevation 1617.1) The nest was terminated on the next visit on July 1 when the nest bowl was found inundated. The lake rose to 1617.9 ft on June 27 & 28 and had returned to 1617.5 by July 1.

RM 1159.0 – South of Swiftbird Bay

Nest 007: This 1 egg nest with 0 days inc. was found on June 23 and listed at risk. The lake elevation was at 1617.5 ft on this date. The nest was terminated on the next visit on June 29 with the loss due to wave action. The lake rose to 1617.9 ft on June 27 & 28 and had declined to 1617.8 ft by June 29. The rising of the lake was partially responsible for the loss of the nest.

Gavins Point Dam Releases:
RM 795.4

Nest 220: This 2 egg nest with 0 days incubation was found on June 24 and was listed at risk. The Corps had dropped releases from 33,000 cubic feet per second (cfs) on June 21 to 15,000 cfs on June 22, which exposed the sandbar after it had been inundated by the higher releases. On June 24 releases out of Gavins were increased to 17,000 cfs, on June 25 - 22,500 cfs, on June 26 – 27,500 cfs and on June 27 – 33,000 cfs. On the next visit on July 1 the sandbar had again been inundated. The nest was lost to Corps operations.

Incidental Take 2. Take of eggs, chicks, and adults by factors influenced by but not directly attributable to the Corps.

The 2003 Amendment to the BiOp states “The Corps should reinitiate consultation if the running 5 year average fledge ratio is less than 0.94.” In 2010, the 5-year running fledge ratio (2006-2010) was 0.86 fledglings per adult pair [1,691 fledglings/ (3,950 adults/2)]. Figure 14 below shows the five year running average for 1986-2000 to 2006-2010. The figure also shows that the Corps did not meet this incidental take measure for the fourth consecutive year.

![Figure 14: Least Tern Fledge Ratio – 5 Year Running Average](image-url)
III.A. IV.1.c. Least Tern Reasonable and Prudent Measures (RPM)

III.A. IV.1.c.i. RPM 1 – Survey and Monitor Least Terns, Mortality, and Incidental Take

RPM 1.1 – Annual Least Tern Monitoring Program
In 2010, adult census and productivity monitoring was conducted for least terns on the Missouri River. The adult census was 660. In 2010, 564 least tern nests and broods (554 nests and 10 broods) were found on the Missouri River. Of the 554 nests found, 299 nests were successful, for an apparent nest success of 58.6%. In 2010, 338 least tern chicks fledged. The fledge ratio for 2010 was 1.02 fledglings per adult pair. Table 4 below summarizes least tern adult census and productivity by segment in 2010.

Table 4: Adult Census and Productivity Monitoring of the Interior Population of Least Terns by Missouri River Segment, 2010

<table>
<thead>
<tr>
<th>Segment</th>
<th>Census</th>
<th>Nests</th>
<th>Broods</th>
<th>Fate</th>
<th>% Nest Success</th>
<th>Number Hatched</th>
<th>Number of Eggs</th>
<th>Number of Chicks</th>
<th>Fledged</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Peck Lake</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Fort Peck River</td>
<td>26</td>
<td>26</td>
<td>2</td>
<td>1</td>
<td>60.0</td>
<td>57</td>
<td>33</td>
<td>13</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Lake Sakakawea</td>
<td>11</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Garrison River</td>
<td>134</td>
<td>109</td>
<td>5</td>
<td>12</td>
<td>72.2</td>
<td>261</td>
<td>177</td>
<td>91</td>
<td>1.36</td>
<td></td>
</tr>
<tr>
<td>Lake Oahe</td>
<td>46</td>
<td>38</td>
<td>1</td>
<td>4</td>
<td>8.8</td>
<td>82</td>
<td>9</td>
<td>4</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Lake Sharpe</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Fort Randall River</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Lewis and Clark Lake</td>
<td>272</td>
<td>203</td>
<td>1</td>
<td>22</td>
<td>70.7</td>
<td>538</td>
<td>338</td>
<td>137</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>Gavins Point River</td>
<td>159</td>
<td>163</td>
<td>1</td>
<td>5</td>
<td>52.5</td>
<td>410</td>
<td>203</td>
<td>93</td>
<td>1.17</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>650</td>
<td>554</td>
<td>10</td>
<td>44</td>
<td>58.6</td>
<td>1,379</td>
<td>760</td>
<td>338</td>
<td>1.02</td>
<td></td>
</tr>
</tbody>
</table>

(a) % Nest Success = (NH/ (N-U))*100, where NH = nests hatched, N = number of nests, and U = undetermined fate.
(b) Includes 15 eggs and 15 chicks from the 10 broods
(c) Fledge Ratio = number of chicks fledged per pair of adult birds (adult census/2).

RPM 1.2 – Information on Mortality, Injury, and Productivity

RPM 1.2a - Nest Fates: In 2010, 554 least tern nests were found on the Missouri River. Of these nests, 299 were successful (at least one egg hatched from the nest). In addition to these successful nests, there were 10 least tern broods that were found that could not be associated with any previously known nest (The nest was not found before the chicks hatched.). The apparent nest success was 58.6%. There were 44 nests where the fate was undetermined (See 12 Fate Undetermined below for further discussion.). For the 211 failed nests, the nest losses are categorized below.

1. Flooded (Non-Corps Operations) – 74 nests: These were nests that were flooded due to increased tributaries inflows into the Missouri River.
2. Flooded (Corps Operations) – 6 nests: These nests were flooded due to the Corps’ operation of the Missouri River dams.
3. Weather (Non-Corps Operations) – 25: These nests were lost to weather events such as rain, hail, wind, and wave action.
4. Weather (Corps Operations) – 5: These were nests that were lost to wave action as the reservoirs were rising as a part of Corps’ operation of the dams.
5. Predation – 13: These nests were lost to predators, including mink, raccoons, coyotes, owls, gulls, crows, and other mammal and avian species.
6. Livestock – 6: These nests were destroyed by livestock stepping on them.
7. Bank Erosion – 3: These nests were lost due to the river eroding away the nest site.
8. Wildlife – 0: There were no nests destroyed by wildlife.
9. Human Disturbance – 0: There were no nests lost to human activity in 2010.
10. Destroyed, No Evidence – 70: These were nests that were destroyed before the eggs could have hatched for which no cause could be determined by the survey crew.
11. Abandoned – 9: These were nests that were abandoned by the adults.
12. Fate Undetermined – 44 nests: These were nests where the egg incubation was far enough along that the eggs could have hatched between site visits. However, the crew could find neither evidence of egg hatching nor evidence that the nest had been destroyed prior to the subsequent nest visit.

RPM 1.2b - Adult and Chick Mortality: Survey crews were instructed to try to determine a cause of death for least tern adults and chicks found on site. If a cause of death could not be determined and the specimen was fresh (little to no decomposition), the specimen was sent to the National Wildlife Health Center (NWHC) in Madison, Wisconsin for analysis. In 2010, the remains of one fledgling and seven adults were found by survey crews. The specimens are listed by segment and date.

Garrison River Segment (one fledgling)

August 4, 2010: The approximately 18 day old fledgling was found dead on a sandbar located at RM 1334.2. The remains were sent to the NWHC for necropsy. The NWHC reported that the fledgling was emaciated and died from systemic salmonellosis.

Lewis and Clark Lake Segment (four adults):

August 3, 2010: Entrails and feathers from three adults were found on the constructed sandbar at RM 826.3.

August 17, 2010: Entrails and feathers from one adult were found on the constructed sandbar at RM 826.3.

Gavins Point River Segment (three adults)

August 4, 2010: Two feather piles from adult terns were found on the constructed sandbar at RM 777.7

August 5, 2010: One feather pile from an adult tern with a strike mark in sand near the feather pile was found on the constructed sandbar at RM 791.5.

RPM 1.2c – Measures taken to reduce mortality: The Corps undertook two actions in 2010 to reduce mortality for least terns. These were predator management and nest moving and relocation.

Predator Management: Predator management for least terns focused on two species: Mink and Great Horned Owls though a third species – Raccoon was captured. These are discussed below.

Mink: Mink tracks and predated nests were observed several times on the RM 826.5 constructed sandbar complex on Lewis & Clark Lake. On May 19 a fence was constructed on the North Sandbar separating the vegetated northern part of the sandbar from the nesting sites on the southern part. The fence had eleven openings that would funnel the passing mink to a conibear trap. Two adult mink were captured during this effort before rising lake levels destroyed the fence on June 14. Trappers from USDA Wildlife Services set four leg-hold traps and six conibear traps for mink on June 20 on the shoreline adjacent to the South Sandbar of the RM 826.5 complex where numerous signs of mink activity were found. Three mink were captured during this effort. These traps were stolen by a member of the public over the July 4 holiday. The combined effort for mink trapping was approximately 226 trap nights.

On June 24 & 25, a trapper from the USDA attempted to spotlight and shoot mink on the North Sandbar. This effort took place during night while mink are normally active. No mink were located during this effort.
**Raccoon:** No raccoons were targeted for removal during the 2010 nesting season. One raccoon however was trapped and removed from the shoreline adjacent to the South Sandbar of the RM 826.5 complex while targeting mink.

**Great Horned Owl:** Great horned owls were targeted for removal on the RM 826.5 complex on Lewis & Clark Lake and at constructed sites RM 795.5, 791.5, 781.5, 777.7, 775.0 and 774.0 below Gavins Point Dam. Prior to and during trapping the Corps’ survey crews had reported eighteen incidences of predator activity that was or may have been done by a great horned owl. The Corps contracted with the USDA Wildlife Services to trap great horned owls during the 2010 nesting season. Two modified pole traps were set on each of the North and South Sandbars of the RM 826.5 complex on Lewis and Clark Lake sites on June 15 and removed on July 23 for a total of 152 trap nights. In addition to these four standard pole traps, a test pole trap using a metal pole was set up next to each trap. These test traps were removed on June 29 due to an inability to withstand high winds at these sites. Two modified pole traps each were set up on two of the Gavins Point River constructed complexes, RM 791.5 and 781.5, on June 18 and were removed on July 23 for a total of 140 trap nights. Two modified pole traps were set at RM 777.7 on June 29 and were removed on July 23 for a total of 48 trap nights. Modified pole traps were not set up at the constructed complex at RM 781.0 due to its close proximity to the constructed complex at RM 781.5. A total of 396 trap nights (including 56 trap nights using test traps) were used in the effort to remove great horned owls. The traps were set and maintained by USDA – Wildlife Services personnel.

During the trapping period, nine great horned owls were captured. One was captured on the North Sandbar of RM 826.5 (July 4), two at the South Sandbar of RM 826.5 (July 8, July 23), two at RM 791.5 (July 2, July 5), three at RM 781.5 (June 29, July 1, July 6) and one at RM 777.7 (June 30). All nine owls were adults. None of the owls had a leg band, indicating they had not been previously captured on the Missouri River below Gavins Point Dam. The nine owls were released at locations around Lincoln, Nebraska. No non-targeted species were captured during the trapping operation.

**Nest Moving and Raising:** To prevent the loss of least tern nests to rising lake levels and increased releases from dams, nests were moved to a higher location or raised by building nest mounds. The results are shown below in Table 5. The results show that, after the action, a little more than a quarter of the nests were subsequently successful. Flooding and weather events, with three each, were the primary causes for the loss of unsuccessful nests.

<table>
<thead>
<tr>
<th>Type</th>
<th>Nests</th>
<th>Success</th>
<th>Undeter.</th>
<th>% Nest Success</th>
<th>Flooded</th>
<th>Weather</th>
<th>Predation</th>
<th>Abandoned</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moved</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Raised</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>27.2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*% Nest Success = Successful Nests/(Total Nests – Undetermined Fate Nests)

**RPM 2 – Monitor, Evaluate, and Adjust Operations to Minimize Take of Least Terns**

**RPM 2.2 - Water Management Coordination**

Throughout the nesting season representatives of the Corps’ Missouri River Basin Water Management Division and Threatened & Endangered Species Section held conference calls with the USFWS every Monday, Wednesday, and Friday to discuss water releases from the Missouri River dams and their effects on least terns. These calls were used to discuss impending changes to water release schedules relative to nests and sandbars that have been identified as “at risk” due to Corps operations, to assess risk, to discuss
reactions to tributaries flooding and to discuss alternatives to proposed actions. The calls provided timely information throughout the 2010 nesting season and helped to minimize incidental take by Corps operations.

RPM 4 – Monitor, Evaluate, and Modify Created and Rehabilitated Sandbars

RPM 4.1 – Constructed Sandbars

In 2004, the Corps began constructing sandbars in the Gavins Point River Segment to provide nesting habitat for least terns. In that year, a sandbar complex was completed at RM 755.0. This complex was augmented by two new complexes at RM 770.0 and RM 761.3, which were completed in time for the 2005 nesting season. In the fall of 2007, three new complexes were constructed at RM 791.5, RM 777.7, and RM 775.0 for the 2008 nesting season. In the fall of 2008, two complexes were constructed at RM 795.5 and RM 774.0 for the 2009 nesting season. In the fall of 2009, two complexes were constructed at RM 781.5 and RM 781.0 for the 2010 nesting season.

In the fall of 2006 and the spring of 2007, construction on a sandbar complex in the Lewis and Clark Lake Segment at RM 826.5 was begun. Work continued on this complex in the fall of 2007 and the complex was completed in the fall of 2008.

In 2010, due to the role of high water and vegetation succession, least terns nested only on the constructed sandbar complex on Lewis & Clark Lake and only on the constructed sandbars below Gavins Point Dam. No tern nests were found on natural sandbars on these two segments. See Table 6 and Table 7 below for more information.

Table 6: Least Tern Nest Success on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Total Nests</th>
<th>Successful</th>
<th>Not Successful</th>
<th>Not Determined</th>
<th>% Nest Success*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>203</td>
<td>128</td>
<td>53</td>
<td>22</td>
<td>70.7</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>203</td>
<td>128</td>
<td>53</td>
<td>22</td>
<td>70.7</td>
</tr>
</tbody>
</table>

* % Nest Success = Successful Nests/(Total Nests – Not Determined Nests)

Table 7: Least Tern Nest Success on Constructed vs. Non-Constructed Sandbars - Gavins Point River Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Total Nests</th>
<th>Successful</th>
<th>Not Successful</th>
<th>Not Determined</th>
<th>% Nest Success*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>163</td>
<td>83</td>
<td>75</td>
<td>5</td>
<td>52.5</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>163</td>
<td>83</td>
<td>75</td>
<td>5</td>
<td>52.5</td>
</tr>
</tbody>
</table>

* % Nest Success = Successful Nests/(Total Nests – Not Determined Nests)

Table 7 and Table 8 show the number of adults, percent of total adults, number of fledglings, percent of total fledglings, and fledge ratios for constructed versus non-constructed sandbars for the same two segments. The tables show that the overwhelming majority of the least tern adults were found on the constructed sandbars for the two segments. All of the fledglings were found on the constructed sandbars. For Lewis & Clark Lake the fledge ratio on the constructed sandbar complex was 1.05 fledglings per adult pair. This is above the BiOp goal of 0.94. The fledge ratio for the constructed sandbars on the Gavins Point
Segment was 1.19, which likewise is above the 0.94 habitat goal. On the two segments for the natural sandbars, the fledge ratio was 0.00.

### Table 8: Least Tern Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Adults % of Total</th>
<th>Adults</th>
<th>Fledglings % of Total</th>
<th>Fledglings</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>264</td>
<td>97.1</td>
<td>137</td>
<td>100</td>
<td>1.04</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>8</td>
<td>2.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>272</td>
<td>100</td>
<td>137</td>
<td>100</td>
<td>1.01</td>
</tr>
</tbody>
</table>

### Table 9: Least Tern Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructive Sandbars - Gavins Point River Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Adults % of Total</th>
<th>Adults</th>
<th>Fledglings % of Total</th>
<th>Fledglings</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>156</td>
<td>98.1</td>
<td>93</td>
<td>100</td>
<td>1.19</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>3</td>
<td>1.9</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>159</td>
<td>100</td>
<td>93</td>
<td>100</td>
<td>1.17</td>
</tr>
</tbody>
</table>

**RPM 4.3 – Rehabilitated Sandbars**

The Corps has conducted vegetation modification on existing sandbars on the Lake Oahe, Fort Randall River, Lewis and Clark Lake, and Gavins Point River Segments. Vegetation modification includes the herbicide spraying of vegetation or herbicide spraying followed by the mowing of the vegetation. However, no vegetation spraying has been done since 2006 on Lake Oahe and since 2005 on the other three segments. The last mowing was done in the spring of 2007 on the four segments. In the three years since then, vegetation has grown up on the treated sites leaving them little different than non-treated sites; therefore, no analysis of rehabilitated sites was completed in 2010.

**RPM 6 – Reduce Human Disturbance of Least Terns and Conduct Outreach and Education**

### RPM 6.1 – Human Restriction Measures

To deter human disturbance and increase awareness of endangered species, restriction signs were placed around least tern nesting sites. See Figure 16 for an example of a restrictive sign place on sandbar. Listed below are the sites where restrictions were posted.

**Lake Sakakawea Segment:** Restriction signs were placed at Westcott Point.

**Garrison River Segment:** Restriction signs were placed around nesting sites on the sandbars at RM 1374.5, RM 1358.0, RM 1357.1, RM 1334.2, RM 1325.8, RM 1319.9 (Heskett), RM 1318.5 (Stacks), RM 1311.0 (Fort Lincoln) RM 1310.1 (Trestle) and RM 1310.0 (Trestle). In addition to the federal signs, North Dakota State Water Commission No Trespassing signs were placed at the above sites with the exception of RM 1319.9, RM 1318.5, RM 1311.0, RM 1310.1 and RM 1310.0.

**Lake Oahe Segment:** Restriction signs were placed around nesting sites at RM 1302.5 (Little Heart) and RM 1270.0 (Dredge Island).

**Lake Sharpe Segment:** Restriction signs were placed at Diver’s Point at RM 1070.2
Lewis and Clark Lake Segment: The constructed sandbars at the RM 826.5 complex were posted with restriction signs.

Gavins Point River Segment: Restriction signs were placed around nesting sites on sandbars at the RM 795.5 complex, RM 791.5, RM 781.5 complex, RM 781.0 complex, RM 777.7, RM 775.0 complex, RM 774.0 complex, RM 761.3, and RM 755.0.

Protection of least tern nesting sites was coordinated with law enforcement officers from the USFWS. Special Agent Rich Grosz of the USFWS conducted surveillance on the Garrison River Segment while Special Agent Brad Merrill of the USFWS conducted surveillance on the Lewis and Clark Lake and Gavins Point River Segments. Corps of Engineers survey crews from the Garrison, Fort Randall and Gavins Point Projects conducted surveillance patrols on the Missouri River during the July 4, 2010 holiday. In 2010, no least tern nests were documented as lost due to human disturbance.

RPM 6.4 – Outreach and Education

Several outreach and education efforts were conducted in 2010 to inform the public about least tern nesting and endangered species issues. These are highlighted below.

Corps and U.S. Fish & Wildlife Service personnel visited homes adjacent to the Missouri River north of Mandan, North Dakota to tell the homeowners of restrictions involving sandbars that were harboring nesting least terns and piping plovers. Corps and U.S. Fish & Wildlife Service personnel were interviewed on a Missouri River sandbar by KFYR-TV, Bismarck ND. The purpose of the interview was to inform the public of the need to restrict access to sandbars used by nesting least terns and piping plovers. Corps personnel handed out least tern and piping plover information cards developed by the U.S. Fish & Wildlife Service at boat ramps along the Missouri River in North Dakota.

The Gavins Point Project provided a press release to the Yankton Press & Dakotan newspaper on the nesting of least terns and piping plovers on Lewis & Clark Lake and the Missouri River below Gavins Point Dam.

Survey crews from Montana to Nebraska had interactions with the public informing them of the importance of staying away from sandbars and shorelines used by nesting least terns and piping plovers.

Corps personnel gave a presentation on least tern and piping plover habitat creation at the 2010 Missouri River Institute Symposium at the University of South Dakota.

The Corps contracted with an outreach specialist who in 2010 gave presentations on endangered species to thirty K-12 schools, two university classes, four summer library programs, one civic group and three water festival events. Presentations were given at the Nebraska, North Dakota and South Dakota State Science Teachers Conferences and the National Watchable Wildlife Conference. A total of 149 presentations were done, which reached nearly 3,000 students, teachers and members of the public. All audiences received a Missouri River Recovery Program (MRRP) pencil, MRRP book mark, and an “Endangered Species of the Missouri River” flyer. Teachers, university students, and adults were provided with a MRRP booklet containing the MRRP brochure and MRRP Fact Sheets.

III.A. IV.1.c. Kansas River Least Tern Incidental Take and RPMs

Incidental Take

There was no known incidental take on the Kansas River in 2010.

RPM 1 – Survey and Monitor Least Terns, Mortality, and Incidental Take

RPM 1.1 – Annual Least Tern Monitoring Program
In 2010 high flows on the Kansas River throughout the nesting season inundated sandbars that have been used by least terns in the past. One survey was conducted in July after reduced flows exposed the sandbars. No least terns were observed on this survey. Higher flows on the Kansas again inundated the sandbars and no further surveys were conducted.

RPM 1.2 – Collect Information on Mortality, Injury, and Productivity

RPM 1.2a - Nest Fates: No nests were found in 2010.

RPM 1.2b - Adult and Chick Mortality: Survey personnel did not find any dead adults or chicks in 2010.

RPM 1.2c – Measures taken to reduce mortality: There were no activities undertaken to reduce mortality.

RPM 2 – Monitor, Evaluate, and Adjust Operations to Minimize Take of Least Terns

RPM 2.2 - Water Management Coordination

Due to the lack of nesting by least terns on the Kansas River, water management coordination with the Kansas City District was not done in 2010.

III.B. Piping Plover

The Northern Great Plains population of the piping plover (Figure 15) was listed as threatened on December 12, 1985 due to habitat alteration and destruction. On the northern Great Plains piping plovers nest and raise young on sandbars of rivers, shoreline beaches of reservoirs and the shores of alkali wetlands. These habitats have been eliminated or degraded through river channelization, dam construction, flow modifications, changing patterns in land use and energy development.

![Figure 16: Piping plover with chick](image)

Figure 16: Piping plover with chick

III.B.I. Recovery Criteria for Delisting

The recovery plan for the Northern Great Plains population was published by the U.S. Fish & Wildlife Service in May 1988. The recovery criteria set the following goal - assure that piping plovers attain the following stable population levels which will insure long term stability and survival leading to their removal from the endangered species list:

Birds in the northern Great Plains (United States) increase to 1,300 pairs and remain stable for fifteen years, distributed as follows:

- Montana: 60 pairs
- North Dakota: 650 pairs
- South Dakota: 350 pairs (including 250 pairs shared with Nebraska on the Missouri River)
- Nebraska: 465 pairs (including 250 pairs shared with South Dakota on the Missouri River)
- Minnesota: 25 pairs

Total 1,300 pairs

The recovery plan also set Missouri River goals for northern Great Plains. They are as follows:

- Montana: 0 pairs
- North Dakota: 100 pairs
- South Dakota: 325 pairs (including 250 pairs shared with Nebraska)
- Nebraska: 250 pairs (including 250 pairs shared with South Dakota)
- Total 425 pairs
In addition to the above, the recovery plan states that to be considered for delisting “essential breeding and wintering habitat be protected” and that “the Canadian Recovery Objective of 2,500 birds for the prairie region be attained.”

The recovery plan stated the following actions were needed for delisting:

1. Determine the current distribution and population trends of the piping plover.
2. Determine current habitat requirements and status.
3. Protect, enhance and increase piping plover populations.
4. Preserve and enhance habitat.
5. Develop and implement an education program that publicizes information about the piping plover.
6. Coordinate recovery efforts.

III.B.II. Population Assessment

III.B.II.1. Population Assessment throughout Entire Range

Beginning in 1991, every five years, the International Piping Plover Adult Census has been conducted on the breeding grounds. Table 10 below shows the number of adults counted for Canada, the number of adults and pairs counted (in parentheses) by state and the recovery plan goals.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>1,437</td>
<td>1,687</td>
<td>972</td>
<td>1,703</td>
<td>2,500 adults</td>
</tr>
<tr>
<td>Minnesota</td>
<td>13 (6)</td>
<td>10 (5)</td>
<td>7 (3)</td>
<td>4 (2)</td>
<td>25 pr</td>
</tr>
<tr>
<td>Montana</td>
<td>308 (105)</td>
<td>153 (59)</td>
<td>137 (57)</td>
<td>130 (46)</td>
<td>60 pr</td>
</tr>
<tr>
<td>North Dakota</td>
<td>992 (496)</td>
<td>1,004 (339)</td>
<td>1,112 (522)</td>
<td>1,508 (646)</td>
<td>650 pr</td>
</tr>
<tr>
<td>South Dakota</td>
<td>295 (142)</td>
<td>29 (10)</td>
<td>390 (172)</td>
<td>375 (171)</td>
<td>100 pr *</td>
</tr>
<tr>
<td>Nebraska</td>
<td>398 (139)</td>
<td>375 (159)</td>
<td>308 (133)</td>
<td>909 (341)</td>
<td>465 pr</td>
</tr>
<tr>
<td>Other (KS IA CO)</td>
<td>26 (9)</td>
<td>28 (11)</td>
<td>27 (12)</td>
<td>33 (14)</td>
<td>0 pr</td>
</tr>
<tr>
<td>U.S. Total</td>
<td>2,032 (897)</td>
<td>1,599 (586)</td>
<td>1,981 (899)</td>
<td>2,959 (1,220)</td>
<td>1,300 pr</td>
</tr>
<tr>
<td>NGP Total</td>
<td>3,469</td>
<td>3,286</td>
<td>2,953</td>
<td>4,662</td>
<td></td>
</tr>
</tbody>
</table>

*The 250 pairs shared with Nebraska on the Missouri River are shown only in the Nebraska box.


III.B.II.2. Population Assessment on the Missouri River System

The 1988 recovery plan set specific Missouri River goals of 100 pairs for North Dakota, 75 pairs for South Dakota and 250 pairs shared between South Dakota and Nebraska for 425 pairs. The Corps of Engineers in conducting the adult census on the Missouri River does not count pairs, but counts individual adults. Figure 17 below shows the piping plover census results for 1986 through 2010.
III.B.III. Piping Plover 2010 Nesting Summary

In 2010, survey crews found 493 plover nests of which 202 were successful for a nest success of 44.8%. There were 604 adults enumerated in the adult census. These adults produced 304 fledglings. The fledge ratio for 2010 was 1.01 fledglings per adult pair, which was below the minimum Biological Opinion goal of 1.22.

Two new sandbar complexes constructed by the Corps of Engineers on the Gavins Point Segment were available to piping plovers when the birds arrived on the Missouri River in mid-April, 2010. These complexes were located at River Mile (RM) 781.5 and RM 781.0. Plovers nested almost exclusively on the constructed sandbars on the Gavins Point Segment and the constructed complex at RM 826.5 on Lewis & Clark Lake. The constructed sandbars accounted for 97% of the plovers’ nesting within this segment. The nesting on Lewis & Clark Lake was disrupted in mid June by high inflow from the Niobrara River into the reservoir due to heavy rain. The inflow caused the lake to rise four feet and partially submerge the complex at RM 826.5. 22 nests were lost to this event. The same heavy rains in mid June caused the James River, Vermillion River and Bow Creek to send high flows into the Missouri below Gavins Point Dam. The high flows completely inundated the constructed sandbar complexes at RM 795.5, RM 775.0 and RM 774.0 and partially inundated the constructed sandbars at RM 791.5, RM 781.5, RM 781.0 and RM 777.7. A total of 62 nests were flooded from this event. Unlike the terns, the plovers on Lewis & Clark Lake and below Gavins Point Dam did not re-nest in large numbers after the flooding. Despite the flooding, productivity was good on Lewis & Clark Lake with a fledge ratio of 1.25, which is above the minimum BiOp Goal of 1.22. On the Gavins Point Segment productivity was 1.86.

There was little habitat available for piping plovers on Lake Oahe in 2010. At the start of the breeding season the reservoir was already in its exclusive flood zone which eliminated shoreline habitat on the lake.
and inundated sandbars that had previously been used by the birds in the upper lake. In 2010 only 41 plovers were counted on Lake Oahe compared to 158 in 2009 and 382 in 2004. The higher than normal level of Lake Oahe however led to lower than normal releases out of Garrison Dam, which provided some sandbar habitat for the plovers. A record 287 plovers were counted in the Garrison Segment. Lake Sakakawea too went into its exclusive flood zone in 2010 which eliminated the shoreline beach habitat previously used by plovers. In 2010 only 38 plovers were counted on the reservoir while in 2005 746 were counted. There was very little use of Fort Peck Lake with only 3 plovers counted.

III.B.III.1. Piping Plover Biological Opinion Requirements

Reasonable and Prudent Alternatives (RPA) requirements from 2003 amended BiOp and Performance Analysis.

III.B.III.1.a. RPA V.B. Piping Plover

The 2003 Amended BiOp set fledge ratios (fledgling divided by adult pair) as a measure of habitat quality on the Missouri River. The 2003 Amended BiOp set the fledge ratio of 1.22 as the goal to be used. The 1.22 fledge ratio is the lower 10% variance of the 1.36 average fledge ratio for piping plovers on the Missouri River for the eleven year period of 1993-2003. The habitat quality goal would be based on a three year running average. For 2008-2010 the 3-year running average fledge ratio for piping plovers was 1.01 fledglings per adult pair (1,404 fledglings divided by (2,793 adults divided by 2)). Figure 19 below shows the three year average fledge ratio for 1986-1988 through 2008-2010.

Figure 19: Piping Plover Fledge Ratio - 3 Year Running Average

Figure 19 also shows the fledge ratio goal for piping plovers has not been met for five consecutive years. However, the three year average has risen for the last two consecutive years.

III.B.III.1.b. Missouri River Piping Plover Incidental Take and Reasonable and Prudent Measures (RPM)

Incidental Take

In its 2003 Amended BiOp, the USFWS listed six categories in which incidental take for the Piping Plover was expected to occur. Listed below are the six incidental take categories and the results for 2010.
1. Take (killing) of eggs and chicks by flooding on the river and reservoir reaches that result from the Corps' operation of the water control system

In the 2003 Amended BiOp, the Service set two standards of incidental take in regard to Corps water control system operations:

a. Incidental take should not exceed by more than 10% of a 10-year running average of 8.4% of all eggs (The 8.4% is the amount of incidental take of eggs that occurred due to Corps operations from 1993-2003.). The 10% variance results in a lower limit of 7.6% and an upper limit of 9.2%. The 10% variance allows accounts for the degree of uncertainty that accompanies the incidental take data collection and reporting process.

b. Take should not exceed that observed from 1993-2003 in any single year. This was quantified as the lesser of 294 eggs in one year (1995) or 46% of all eggs (1996).

In 2010, the 10-year running average of plover eggs lost to Corps operations (2001-2010) was 4.7% (1,094/23,486). This is below the 7.6% lower limit of losses set by the USFWS in the 2003 Amended BiOp. In 2010, 43 eggs were lost due to Corps water control system operations. This represents 2.5% of the 1,703 of the known piping plover eggs on the Missouri River in 2010. This is below both the 294 eggs in one year and the 46% of all eggs standards set forth in the 2003 Amended BiOp.

2. Take (harm) of eggs, chick, or adults by predation

In the 2003 Amended BiOp, the USFWS noted that 4.0% of monitored nests were lost to predation from 1993-2003. The USFWS expected that take could be quantified as being outside of a 10% variance of that 4.0% loss and set loss from predation as being from 3.6% to 4.4% as a 10-year running average. In 2010, 12 of 493 plover nests were lost to predation for a loss rate of 2.4%. The 10-year running average (2001-2010) was 4.3% (285/6,676), which is below the upper limit of the 3.6%-4.4% tolerance set forth in the 2003 Amended BiOp.

3. Take (harm) of eggs, chicks, or adults by human disturbance

In the 2003 Amended BiOp, the USFWS did not consider take from human disturbance on the reservoir segments and quantified take only on the riverine segments. The USFWS noted that 1.5% of monitored nests on the riverine segments were lost to human disturbance from 1993-2003. The USFWS expected take could be quantified as being outside of a 10% variance of that 1.5% loss and set loss from human disturbance as being from 1.4% to 1.7% as a 10-year running average. In 2010, 3 of 285 plover nests on the riverine segments were lost to human disturbance for a loss rate of 1.1%. The 10-year running average (2001-2010) was 1.1% (32/3,003), which is below the 1.4%-1.7% tolerance set forth in the 2003 Amended BiOp.

4. Take (harm) of chicks as a result of insufficient forage in river reaches affected by hypolimnetic releases

In the 2003 Amended BiOp, the USFWS noted that hypolimnetic hydropower releases from Fort Peck, Garrison, and Fort Randall Dams would continue to provide unsuitable water temperatures below the dams and negatively impact production at all trophic levels. The USFWS quantified take in the form of fledge ratios for these three segments with a variance of not to exceed by more than 10% the fledge ratios on these segments for 1993-2003. The 1993-2003 fledge ratio for below Fort Peck Dam was 1.33 (1.20-1.46 variance), for below Garrison Dam was 1.18 (1.06-1.30 variance), and for below Fort Randall Dam was 0.92 (0.83-1.01 variance).

The USFWS made no mention of a 10-year running average for these fledge ratios. Since 10-year running averages were used for the other five measures of take, the Corps interpreted that this was an omission on the part of the USFWS and has included the 10-year running average along with the 2010 fledge ratios. For the Fort Peck River Segment, the 2010 fledge ratio was 0.00, while the 10-year running average for 2001-2010 was 1.67 [15 fledglings divided by (18 adults divided by 2)]. This is above the 1.20 lower limit fledge ratio set forth in the 2003 Amended BiOp.
For the Garrison River Segment, the 2010 fledge ratio was 0.84, while the 10-year running average for 2001-2010 was 1.12 (1087 fledglings/1,934 adults/2). This is above the 1.06 lower limit fledge ratio set forth in the 2003 Amended BiOp.

For the Fort Randall River Segment, the 2010 fledge ratio was 0.00, while the 10-year running average for 2001-2010 was 0.80 [122 fledglings divided by (304 adults divided by 2)]. This is below the 0.83 lower limit fledge ratio set forth in the 2003 Amended BiOp.

5. Take (harm) of eggs in nests assigned fates of destroyed-unknown, nest abandonment, sandbar erosion, and unknown fates
The USFWS, in the 2003 Amended BiOp, noted that the 1993-2003 fledge ratio for piping plovers on the Missouri River system was 1.36 fledglings per adult pair. The USFWS quantified take for nests assigned fates of destroyed – no evidence, nest abandonment, sandbar erosion, and undetermined fates as being greater than 10% variance from that fledge ratio (1.22-1.47) for a 10-year running average. The 10-year running average for 2000 to 2010 was 1.20 [7,343 fledglings/ (12,203 adults/2)], which is below the 10% variance set by the USFWS. Figure 20 below shows the ten year running average from 1986-1995 through 2001-2010.

6. Take (harm) of chicks as a result of insufficient forage on created habitats
In the 2003 Amended BiOp, the USFWS noted that piping plover chicks may starve on created habitats due to insufficient forage. The USFWS anticipated that fledge ratios in the created habitats would approximate those observed from 1993-2003 – 1.36 fledglings per pair. The USFWS, in the 2003 Amended BiOp, stated that there may be a variance of as much as 10% from the 1.36 fledge ratio; therefore, it set a range of 1.22-1.47 fledge ratios, based on a 10-year running average, for take compliance. The Corps’ habitat creation efforts in the early 1990s were destroyed by high releases from the Garrison, Fort Randall and Gavins Point Dams in 1995, 1996, and 1997. Habitat has been created at ten sites on the Gavins Point River Segment; at RM 755.0 in 2004; at RM 770.0 and 761.3 in 2004-2005; at RM 791.5, RM 777.7, and RM 775.0 in 2007-2008; at RM 774.0 & RM 795.5 in 2008 and RM 781.5 & RM 781.0 in 2009. On the Lewis and Clark Lake Segment, habitat was created at RM 826.5 in 2006-2008. The fledge ratio for these created habitat sites is, therefore, based on the past seven years of habitat creation (2004-2010) and not the 10-year running average. For 2004-2010, the fledge ratio for created habitat was 1.42 fledglings per adult.

Figure 20 also shows that for the first time in nine years, the ten year running average fell below the fledge ratio goal of 1.22.

6. Take (harm) of chicks as a result of insufficient forage on created habitats
In the 2003 Amended BiOp, the USFWS noted that piping plover chicks may starve on created habitats due to insufficient forage. The USFWS anticipated that fledge ratios in the created habitats would approximate those observed from 1993-2003 – 1.36 fledglings per pair. The USFWS, in the 2003 Amended BiOp, stated that there may be a variance of as much as 10% from the 1.36 fledge ratio; therefore, it set a range of 1.22-1.47 fledge ratios, based on a 10-year running average, for take compliance. The Corps’ habitat creation efforts in the early 1990s were destroyed by high releases from the Garrison, Fort Randall and Gavins Point Dams in 1995, 1996, and 1997. Habitat has been created at ten sites on the Gavins Point River Segment; at RM 755.0 in 2004; at RM 770.0 and 761.3 in 2004-2005; at RM 791.5, RM 777.7, and RM 775.0 in 2007-2008; at RM 774.0 & RM 795.5 in 2008 and RM 781.5 & RM 781.0 in 2009. On the Lewis and Clark Lake Segment, habitat was created at RM 826.5 in 2006-2008. The fledge ratio for these created habitat sites is, therefore, based on the past seven years of habitat creation (2004-2010) and not the 10-year running average. For 2004-2010, the fledge ratio for created habitat was 1.42 fledglings per adult.
pair [890 fledglings/ (1,257 adults/2)], which is within the 1.22-1.47 fledge ratios set forth in the 2003 Amended BiOp.

RPM 1 – “The Corps shall survey and monitor all plover sites on the Missouri and Kansas Rivers…”

RPM 1.1 – Summary of Monitoring Data

In 2010, an adult census and productivity monitoring were conducted for piping plovers on the Missouri River. The adult census was 604. In 2010, 502 piping plover nests and broods (493 nests and 9 broods) were found on the Missouri River. Of the 493 nests found, 202 nests were successful, for an apparent nest success of 44.8%. In 2010, 304 piping plover chicks fledged. The fledge ratio for 2010 was, therefore, 1.01 fledglings per adult pair. Table 11 summarizes piping plover adult census and productivity by segment in 2010.

Table 11: Adult Census and Productivity Monitoring of the Piping Plover on the Missouri River, 2010

<table>
<thead>
<tr>
<th>Segment</th>
<th>Adult Census of Nests</th>
<th>% Nest Success of Eggs</th>
<th>Number of Chicks Fledged</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Peck Lake</td>
<td>3</td>
<td>0.7</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Fort Peck River</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Lake Sakakawea</td>
<td>38</td>
<td>0.89</td>
<td>39</td>
<td>0.89</td>
</tr>
<tr>
<td>Garrison River</td>
<td>287</td>
<td>0.84</td>
<td>121</td>
<td>0.84</td>
</tr>
<tr>
<td>Lake Oahe</td>
<td>41</td>
<td>0.10</td>
<td>2</td>
<td>0.10</td>
</tr>
<tr>
<td>Lake Sharpe</td>
<td>3</td>
<td>0.0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Fort Randall River</td>
<td>6</td>
<td>0.0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Lewis and Clark Lake</td>
<td>152</td>
<td>1.25</td>
<td>95</td>
<td>1.25</td>
</tr>
<tr>
<td>Gavins Point River</td>
<td>74</td>
<td>1.86</td>
<td>69</td>
<td>1.86</td>
</tr>
<tr>
<td>Total</td>
<td>604</td>
<td>1.01</td>
<td>304</td>
<td>1.01</td>
</tr>
</tbody>
</table>

(a) % Nest Success = ((NH/(N-U))*100, where NH = nests hatched, N = number of nests and U = undetermined fate
(b) Includes 29 eggs and 29 chicks from the 9 broods
(c) Fledge Ratio = number of chicks fledged per pair of adult birds (adult census/2)

RPM 1.2 – Survival and Take Information

Under this RPM, the USFWS requests a “quantification of take, including loss of eggs, chicks, adults, and habitat that occurred … along with the reasons or causes for take and any actions the Corps may have taken to avoid take.” In 2010, piping plover take totaled at least 993 eggs (1,732 eggs – 739 chicks) and 435 chicks (739 chicks – 304 fledglings). Take of chicks and eggs occurred from a variety of events. Determining the exact cause of take for chicks is difficult because, generally, there is very little evidence. In 2010, survey crews found the remains of three chicks. Action taken by the Corps to avoid take include management of water releases from the dams to minimize flood events, use of predator cages to protect nests, predator management, placement of restriction signs around nesting and brooding areas to deter human disturbance, and the raising and moving of nests to avoid inundation.

Habitat losses have not been quantified at the time this report was written, but habitat was lost due to high tributaries flows into the Missouri River which inundated some sandbars and eroded others. The rising of the reservoirs eliminated shoreline habitat. Vegetation encroachment on the shoreline beaches and sandbars likewise eliminated or degraded habitat.

RPM 1.3 Nest and Egg Losses

Nest Fates: In 2010 there were 493 piping plover nests found on the Missouri River. Of these, 202 were successful (at least one egg hatched from the nest). In addition to these successful nests, 9 piping plover broods were found that could not be associated with any previously known nest (the nest was not found
before the chicks hatched). The nest success was at 44.8%. For nests where the cause could be determined, the highest losses were due to flooding – 93 nests, weather events – 40 nests, nest predation – 12, and abandonment – 8 nests. A total of 42 nests had a fate that was undetermined (see below at Nest Fate Line 13 for further discussion.). For the 249 non-successful nests, the nest losses are categorized below. Included in the list of nest losses is an estimate of egg losses as per RPM 1.3. RPM 1.3 states, “Methods of analysis that accurately estimate the number of eggs in destroyed nests at the time of their destruction shall be used. For example, a nest is visited during the laying period before a full modal clutch size of four (Haig 1992) had been laid. On the next visit, seven days later, the nest has been destroyed. The estimate should be based on the number of eggs observed plus an assumption that the following eggs were laid at a rate of 1 egg per 1.5 days.”

1. Flooded (Non-Corps Operations) – 85 nests (317 eggs known, 333 eggs maximum): These nests were lost to rising river levels as a result of rain storms in the area.
2. Flooded (Corps Operations) – 8 nests (26 eggs known, 30 maximum): These nests were lost due to the Corps’ operation of the Missouri River dams.
3. Weather (Non-Corps Operations) – 34 nests (105 eggs known, 120 eggs maximum): These are nests lost to weather events such as rain, hail, wave action, and wind.
4. Weather (Corps Operations) – 6 nests (17 eggs known, 24 maximum): These nests were lost to wave action as a result of Corps operations involving Fort Peck Lake and Lake Sakakawea.
5. Predation – 12 nests (39 eggs known, 44 eggs maximum): Predators include mink, raccoons, coyotes, owls, gulls, crows, and other mammal and avian species.
6. Livestock – 1 nest (4 eggs known, 4 eggs maximum)
7. Bank Erosion – 2 nests (7 eggs known, 7 eggs maximum): These nests were lost due to the river eroding away the nest site.
8. Wildlife – 0 nests
9. Human Disturbance – 3 nests (9 eggs known, 12 eggs maximum): These nests were lost to human activity.
10. Researcher – 0 nests: No nests were destroyed by a researcher.
11. Destroyed, No Evidence – 90 nests (248 eggs known, 333 eggs maximum): These were nests that were destroyed before the eggs could have hatched, but for which no cause could be determined by the survey crew.
12. Abandoned – 8 nests (19 eggs known, 19 eggs maximum): These are nests that were abandoned by the adults;
13. Fate Undetermined – 42 nests (152 eggs known, 152 eggs maximum): These were nests where the egg incubation was far enough along whereby the eggs could have hatched between site visits. However, the crew could find neither evidence of egg hatching nor evidence that the nest had been destroyed prior to the subsequent nest visit. Therefore, the clutch was complete and no more eggs would have been laid between site visits.

RPM 1.4 – Habitat Mapping

The Corps contracted with the USGS-Northern Plains Wildlife Research Center (NPWRC) to develop and evaluate methods to inventory, monitor, and estimate least tern and piping plover habitats using Quickbird and Ikonos imagery. In 2010, Quickbird imagery was captured for the Garrison River and the Gavins Point River Segments. Ikonos imagery was captured for the Fort Randall River Segment and upper Lewis and Clark Lake. See Table 12 below for measured ESH habitat available from 2005 to 2010.

ESH area was estimated using habitat delineations from aerial and/or satellite imagery. Flow corrections were applied to data when needed. Flow correction is needed due to the following factors:

1. Satellite imagery is generally taken at different times for different reaches within river segments, and in most cases the flow at the time of imagery is different. Totaling acres for a reach from imagery at different times would give an inaccurate result and may not represent conditions experienced by birds during the nesting season.
2. Even if all imagery were taken at the same flow, it may not be the flow that is most significant for the birds. The ESH PDT agreed that the maximum July flows are the most limiting to bird productivity, so area is corrected to the maximum July flow each year.

3. The maximum July flows may differ greatly from year to year. Flow correction to a baseline acreage allows tracking of the physical structure of ESH over time, reducing uncertainties associated with rates of erosion and vegetation encroachment.

The 2005 acreage below is from the habitat delineation conducted for the ESH PEIS. 2006-2009 acreage estimates are based on delineations conducted by USGS which have corrected to baseline reservoir outflows and maximum July reservoir outflows in the designated years. Baseline reservoir outflows are derived from historical conditions, specifically the average of maximum July flows among those years where Gavins is at or near full navigation (33-37 kcfs). For baseline measurements, the same flows are used each year in order to compare the change in ESH structure over time. Acreage is corrected to July flows in order to estimate the amount of nesting habitat for terns and plovers and foraging habitat for plovers available each year. Acres for 2010 are modeled based on assumed loss rates and flow corrected.

### Table 12: ESH baseline area (acres) estimates for 2005-2010. Baseline flows are 10.6 kcfs for Ft Peck, 22.1 for Garrison, 33.5 for Ft. Randall, and 35 for Gavins

<table>
<thead>
<tr>
<th>Segment</th>
<th>Target (Alt 5)</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010¹</th>
<th>2010 Variance from Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gavins Point (35.0 kcfs)</td>
<td>570</td>
<td>298</td>
<td>419</td>
<td>274</td>
<td>563</td>
<td>219</td>
<td>268</td>
<td>-302</td>
</tr>
<tr>
<td>Lewis and Clark Lake</td>
<td>80</td>
<td>142</td>
<td>18</td>
<td>510</td>
<td>129</td>
<td>236</td>
<td>110</td>
<td>30</td>
</tr>
<tr>
<td>Fort Randall (33.5 kcfs)</td>
<td>135</td>
<td>14</td>
<td>125</td>
<td>134</td>
<td>64</td>
<td>13*</td>
<td>41</td>
<td>-94</td>
</tr>
<tr>
<td>Garrison (22.1 kcfs)</td>
<td>500</td>
<td>145</td>
<td>349</td>
<td>242</td>
<td>171</td>
<td>227</td>
<td>204</td>
<td>-296</td>
</tr>
<tr>
<td>Fort Peck (10.6 kcfs)</td>
<td>30</td>
<td>193</td>
<td>87</td>
<td>143</td>
<td>95*</td>
<td>44*</td>
<td>37</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total (acres)</strong></td>
<td><strong>1315</strong></td>
<td>793</td>
<td>997</td>
<td>1304</td>
<td>1024</td>
<td>739</td>
<td>660</td>
<td><strong>-655</strong></td>
</tr>
</tbody>
</table>

¹ Acreage measurements for 2010 were not available; this number represents a projection of acreage available due to measured flows and assumed loss rates.

* Imagery was incomplete for this reach and year, thus reported acreages are likely underestimates of actual acreage.

Baseline ESH acreage in 2010 continues a trend of decreasing over time, as loss of habitat to vegetation and erosion outweighs the amount of habitat created in recent years. Habitat estimates for 2008 and 2009 may be underestimates due to incomplete imagery in Fort Peck and Fort Randall reaches. Additional uncertainty in baseline habitat estimates is due to the inherent uncertainty in current flow correction curves, which are outdated in many segments, and the fact that the imagery used for habitat delineations was taken during a wide range of flows.

### Table 13: Flows for Available Acreage (2005: flows for habitat delineation; 2006-2010; July maximum outflows from upstream reservoir)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gavins Point</td>
<td>21,000</td>
<td>31,300</td>
<td>24,500</td>
<td>19,000</td>
<td>27,500</td>
<td>38,000</td>
</tr>
<tr>
<td>Ft Randall</td>
<td>14,700</td>
<td>32,700</td>
<td>23,100</td>
<td>18,800</td>
<td>26,100</td>
<td>36,400</td>
</tr>
<tr>
<td>Garrison</td>
<td>15,150</td>
<td>21,200</td>
<td>16,500</td>
<td>14,500</td>
<td>16,300</td>
<td>16,300</td>
</tr>
<tr>
<td>Ft Peck</td>
<td>5,500</td>
<td>8,800</td>
<td>7,500</td>
<td>7,500</td>
<td>6,900</td>
<td>7,100</td>
</tr>
</tbody>
</table>
Table 14: ESH available area estimates for 2005 - 2010 based on habitat measurements, corrected to maximum July flows. Bold numbers indicate years where ESH area was above targets.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Target (Alt 5)</th>
<th>2005</th>
<th>2006¹</th>
<th>2007¹</th>
<th>2008¹</th>
<th>2009¹</th>
<th>2010²</th>
<th>2010 Variance from Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gavins Point</td>
<td>570</td>
<td>880</td>
<td>409</td>
<td>454</td>
<td>1207</td>
<td>314</td>
<td>231</td>
<td>-339</td>
</tr>
<tr>
<td>Lewis and Clark Lake</td>
<td>80</td>
<td>142</td>
<td>17</td>
<td>487</td>
<td>125</td>
<td>220</td>
<td>110</td>
<td>30</td>
</tr>
<tr>
<td>Fort Randall</td>
<td>135</td>
<td>128</td>
<td>137</td>
<td>444</td>
<td>346</td>
<td>30*</td>
<td>22</td>
<td>-113</td>
</tr>
<tr>
<td>Garrison</td>
<td>500</td>
<td>588</td>
<td>409</td>
<td>725</td>
<td>763</td>
<td>707</td>
<td>544</td>
<td>44</td>
</tr>
<tr>
<td>Fort Peck</td>
<td>30</td>
<td>247</td>
<td>184</td>
<td>522</td>
<td>346*</td>
<td>206*</td>
<td>282</td>
<td>252</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1315</strong></td>
<td><strong>1985</strong></td>
<td><strong>1156</strong></td>
<td><strong>2632</strong></td>
<td><strong>2787</strong></td>
<td><strong>1477</strong></td>
<td><strong>1189</strong></td>
<td><strong>-126</strong></td>
</tr>
</tbody>
</table>

¹ Acreages for 2006 through 2009 were flow corrected to compensate for differences flows at the time of data collection
² Acreage measurements for 2010 were not available; this number represents a projection of acreage available due to measured flows and assumed loss rates.
* Imagery was incomplete for this reach and year, thus reported acreages are likely underestimates of actual acreage.

ESH acreage available for nesting on the system is estimated to have declined by approximately 288 acres between 2009 and 2010. This change may be partly attributed to losses from erosion and vegetation, but is believed to be largely due to increased releases from the Gavins Point and Ft. Randall reservoirs associated with increased runoff in the basin. Conversely, the higher acreage estimates in 2008 are largely associated with decreased releases in the Gavins Point, Ft. Randall, and Garrison segments required to alleviate downstream flooding in that year. Additionally, the amount of tern and plover reservoir habitat is estimated to have declined on all major reservoirs (Lake Oahe, Lake Sakakawea and Fort Peck Lake) due to increases in reservoir levels from 2009 to 2010.

RPM 2 – Documenting Take of Piping Plovers

RPM 2.1 – Incidental Take

The USFWS requires that Corps document incidental take that occurs due to operation of the Missouri River Mainstem Reservoir System. In 2010, Corps operations were responsible for the loss of 43 Piping Plover eggs from 14 nests. The losses are listed by segment where incidental take occurred.

**Lake Sakakawea Rise:** On May 1, 2010, Lake Sakakawea stood at 1839.1 ft msl. The lake peaked at 1851.4 ft. msl on July 30, 2010, a rise of 12.3 feet. The peak was the fourth highest for the lake since 1967. The rising of the reservoir during the plovers’ nesting season is a part of the Corps’ reservoir operation to capture mountain snowpack runoff from the northern Rockies and therefore any loss of nests would be considered incidental take. During this time period 9 nests containing 32 eggs were lost; 6 nests with 20 eggs were inundated and 3 nests with 12 eggs were lost to wave action associated with the rising of the reservoir.

**Lake Oahe Rise:** In 2010, three plover nests containing five eggs were lost to wave action associated with the rising of the reservoir.

**Gavins Point Dam Flow Increase:** On April 29, 2010 releases out of Gavins Point Dam averaged 15,000 cubic feet per second (cfs). It was decided that releases would be increased to inundate low sandbars between the dam and the James River confluence to prevent nesting by piping plovers, as it was expected that these sandbars would be inundated during the spring pulse scheduled for later in May, 2010. On April 30, 2010, the river between the dam and the confluence was surveyed and 2 plover nests with 6 eggs were found. On April 30 releases out of the dam were increased to 18,000 cfs and on May 1 releases were increased to 22,000 cfs. A survey on May 1 found the two nests had been inundated.
RPM 2.2 - Adult and Chick Mortality

As per RPM 2.2, survey crews were instructed to try and determine a cause of death for piping plover adults and chicks found on site. If a cause of death could not be determined and the specimen was fresh (little to no decomposition), the specimen was then sent to the NWHC in Madison, Wisconsin for analysis. In 2010, the remains of three piping plover chicks were found by survey crews. The specimens are listed by segment and date.

Lake Sakakawea Segment (1 chick)

July 7, 2010: A gull was observed taking a one day old chick at the Van Hook Recreation Area parking lot.

Garrison River Segment (1 chick)

August 5, 2010: A chick was found dead on a sandbar located at RM 1310.1. The chick was collected and sent to the NWHC for necropsy. The NWHC could not determine a cause of death for the chick.

Gavins Point River (1 chick)

June 30, 2010: A 1-5 day old chick was found dead on the constructed sandbar at RM 777.7. It was determined the chick was too decomposed for necropsy and it was disposed of on site.

RPM 3 – The Corps shall coordinate regularly with the USFWS to ensure that operations minimize take

Throughout the nesting season representatives of the Corps’ Missouri River Basin Water Management Division and Threatened & Endangered Species Section and Service held conference calls with the USFWS every Monday, Wednesday, and Friday to discuss water releases from the Missouri River dams and their effects on Least Terns. These calls were used to discuss impending changes to water release schedules relative to nests and sandbars that have been identified as “at risk” due to Corps operations, to discuss reactions to tributaries flooding, to assess risk, and to discuss alternatives to proposed actions. The calls provided timely information throughout the 2010 nesting season and helped to minimize incidental take by Corps operations.

RPM 4 – Moving eggs to higher elevations to avoid flooding

In 2010, eight plover nests were moved to a higher location to avoid loss by flooding and three nests were raised in place to provide a higher elevation. Of the eight nests that were moved, one was successful and of the three nests that were raised, one was successful for an overall success rate of 18%. The greatest loss of nests was due to flooding – four (36%). Other losses included two to weather and three that were destroyed but without enough evidence to determine a cause. It needs to be noted that the one moved nest that was successful was moved six times over a seventeen day period. This was performed by the Williston crew for a nest on Lake Sakakawea at Westcott Point. Table 15 shows the results of these two actions.

<table>
<thead>
<tr>
<th>Unsuccessful Nests by Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Moved</td>
</tr>
<tr>
<td>Raised</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*% Nest Success = Successful Nests/(Total Nests – Undetermined Fate Nests)
RPM 5 – The Corps shall implement public information and education programs to increase public awareness to reduce take of nesting piping plovers

See Section III.A.IV.1.c.i. RPM 6.4 for pertinent information applying to public awareness for tern and plovers along the Missouri River.

RPM 5.3 – Human Restriction Measures

See Section III.A.IV.1.c.i. RPM 6.1 for pertinent information applying to imposed human restriction measures along the Missouri River.

RPM 6 – The Corps shall implement appropriate predator management techniques

RPM 6.1 - Predator Trapping

In 2010 predator management efforts undertaken on Lewis & Clark Lake and the Gavins Point River Segment to benefit piping plovers is covered under the least tern RPM 1.2c. Please see that section for further information.

Lake Sakakawea: On May 19 & 20 a USDA-WS trapper accompanied the Garrison Project survey crew on a survey of islands in the Van Hook Arm. Coyote tracks, but no coyotes, were observed on Gull Island. An adult coyote, coyote scat, tracks and a den, which may have been occupied by pups, were observed on Fox Island. Both islands had active piping plover nests. On May 26 the trapper returned with the crew to the Fox Island along with a service dog trained to locate targeted species and their dens. The trapper, with assistance from his service dog, was able to locate and destroy two adult coyotes. The den was again relocated and gassed. No coyotes were ever observed on Gull Island.

Garrison River Segment: One adult coyote was observed on the sandbar at RM 1380.0 by the Garrison Project survey crew in May 2010. The USDA trapper accompanied the crew to the sandbar on June 2 and July 15 and did not find a coyote on site on either date. Members of the public later reported observing a coyote swimming to and from the sandbar.

RPM 6.2 - Predator Enclosures

Wire-mesh cages were used in 2010 to protect piping plover nests from mammalian and avian predators. The cages consist of 3-foot by 3-foot by 3-foot wire mesh containing 2-by-4-inch openings. The cages were placed over the piping plover nest and anchored into the substrate with metal stakes at the four corners. After placing the cage, the surveyors retreat and watch the cage to ensure that the piping plover returns to the nest inside the cage. If the piping plover refuses to enter the cage, the cage is removed. When a nest is terminated the cage is removed.

As a general rule, cages were placed over piping plover nests located on riverine segments; however, for nests on the reservoirs, the survey crew exercises its judgment whether or not to place cages. The rationale for not placing cages over nests on reservoirs is that most piping plover nests on reservoirs are in remote, spread out locations and may not be subject to predator pressure. Table 16 shows by segment the number of caged nests, the number successful nests that were caged, percent success, the number of nests that were not caged, the number of successful nests that were not caged and percent success. In 2010, 51.9% (256/493) of all piping plover nests were caged. Overall, nest success was higher for caged piping plover nests at 54.3% compared to 34.8% for non-caged nests. However, the role predation, the reason for caging nests, played in nest success is unknown.
### Table 16: Piping Plover Caged vs. Non-Caged Nests by Segment, 2010

<table>
<thead>
<tr>
<th>Segment</th>
<th>Caged Nests</th>
<th>Non-Caged Nests</th>
<th>Caged Nests</th>
<th>Non-Caged Nests</th>
<th>Caged Nests</th>
<th>Non-Caged Nests</th>
<th>Caged Nests</th>
<th>Non-Caged Nests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Peck Lake</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Lake Sakakawea</td>
<td>4</td>
<td>31</td>
<td>9</td>
<td>3</td>
<td>13.3</td>
<td>72.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garrison River</td>
<td>116</td>
<td>44</td>
<td>9</td>
<td>2</td>
<td>32.1</td>
<td>72.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Oahe</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>7.1</td>
<td>50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fort Randall River</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lewis and Clark Lake</td>
<td>18</td>
<td>113</td>
<td>9</td>
<td>9</td>
<td>53.8</td>
<td>13.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gavins Point River</td>
<td>103</td>
<td>32</td>
<td>2</td>
<td>0</td>
<td>6.3</td>
<td>76.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>256</td>
<td>237</td>
<td>16</td>
<td>16</td>
<td>34.8</td>
<td>51.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*% Successful = Successful Nests/(Total Nests – Undetermined Fate Nests)

**Not included in the non-caged nests and successful non-caged nests are the 9 piping plover broods that were never found as nests.

The causes for nest losses for caged vs. non-caged nests are shown in Table 14. Predation was the cause of loss for 2.0% (5/256) of the caged nests and for 3.0% (7/237) of the losses for non-caged nests. The highest percent of nest losses for caged nests were due to flooding (24.2%), where there was not enough evidence to determine the cause of the nest loss (9.0%) and weather (3.9%). In addition to the above, for 10.2% of the caged nests a nest fate could not be determined. For non-caged nests, the highest losses were where there was not enough evidence to determine the cause of the nest loss (28.3%), flooding (13.1%), and weather (12.7%).

### Table 17: Piping Plover Caged vs. Non-Caged Nests by Cause of Non-Success, 2010

<table>
<thead>
<tr>
<th>Cause</th>
<th>Caged Nests (Number (%))</th>
<th>Non-Caged Nests (Number (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding</td>
<td>62 (24.2)</td>
<td>31 (13.1)</td>
</tr>
<tr>
<td>Weather</td>
<td>10 (3.9)</td>
<td>30 (12.7)</td>
</tr>
<tr>
<td>Predation</td>
<td>5 (2.0)</td>
<td>7 (3.0)</td>
</tr>
<tr>
<td>Bank Erosion</td>
<td>1 (0.4)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Human Disturbance</td>
<td>2 (0.8)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Livestock</td>
<td>1 (0.4)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Wildlife</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>No Evidence</td>
<td>23 (9.0)</td>
<td>67 (28.3)</td>
</tr>
<tr>
<td>Abandoned</td>
<td>1 (0.4)</td>
<td>7 (3.0)</td>
</tr>
<tr>
<td>Undetermined Fate</td>
<td>26 (10.2)</td>
<td>16 (6.8)</td>
</tr>
</tbody>
</table>

RPM 8 – The Corps shall develop and implement a program to monitor and evaluate the effectiveness of constructed sandbars as nesting habitat for piping plovers...The Corps will monitor and evaluate its actions relating to the rehabilitation of existing sandbars...

**Constructed Sandbars**

In 2004, the Corps began constructing sandbars in the Gavins Point River Segment to provide nesting habitat for piping plovers. In 2004, a sandbar complex was completed at RM 755.0. This complex was...
augmented by two new complexes at RM 770.0 and RM 761.3, which were completed in time for the 2005 nesting season. In the fall of 2007, three new complexes were constructed at RM 791.5, RM 777.7, and RM 775.0 for the 2008 nesting season. In the fall of 2008, two more complexes were constructed at RM 795.5 and RM 774.0 for the 2009 nesting season. In the fall of 2009, two more complexes were constructed at RM 781.5 and RM 781.0 for the 2010 nesting season.

In the fall of 2006 and the spring of 2007, construction on a sandbar complex in the Lewis and Clark Lake Segment at RM 826.5 was begun. Work continued on this complex in between nesting seasons in the fall of 2007 and the fall of 2008.

Piping plovers used all nine constructed sandbar complexes in 2010. (It should be noted that erosion had greatly reduced the size of the constructed sandbars at RM 770. and 755.0.) Table 18 and 19 present data detailing nest success on the constructed sandbars versus the non-constructed sandbars on the Lewis and Clark Lake and the Gavins Point River Segments. Table 18 shows that all of the plover nests for the Lewis and Clark Lake Segment were found on the constructed sandbar complex and that they had a nest success of over 50%. Table 19 shows that almost 95% of the nests on the Gavins Point Segment were found on the constructed sandbars. The non-constructed sandbars had a slightly higher nest success at 28.6% compared to the constructed sandbars' nest success of 27.2%.

**Table 18: Piping Plover Nest Success on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010**

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Total</th>
<th>Nests</th>
<th>Successful</th>
<th>Not</th>
<th>Undetermined</th>
<th>%</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>131</td>
<td>65</td>
<td>57</td>
<td>9</td>
<td>9</td>
<td>53.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>65</td>
<td>57</td>
<td>9</td>
<td>9</td>
<td>53.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*% Successful = Successful Nests/(Total Nests – Undetermined Fate Nests)*

**Table 19: Piping Plover Nest Success on Constructed vs.: Non-Constructed Sandbars - Gavins Point River Segment, 2010**

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Total</th>
<th>Nests</th>
<th>Successful</th>
<th>Not</th>
<th>Undetermined</th>
<th>%</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>128</td>
<td>34</td>
<td>91</td>
<td>3</td>
<td>3</td>
<td>27.2</td>
<td>94.8</td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>28.6</td>
<td>5.2</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>36</td>
<td>96</td>
<td>3</td>
<td>3</td>
<td>27.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*% Successful = Successful Nests/(Total Nests – Undetermined Fate Nests)*

Table 20 and Table 21 show the number of adults, percent of total adults, number of fledglings, percent of total fledglings, and fledge ratios for constructed versus non-constructed sandbars for the two segments. Table 20 shows that all of the adults and fledglings were on the constructed sandbars on the Lewis and Clark Lake Segment. The constructed sandbars had a fledge ratio of 1.25 fledglings per adult pair, which is slightly above the BiOp fledge ratio goal of 1.22 for piping plovers. On the Gavins Point River Segment, over 97% of the adults and all the fledglings were on the constructed sandbars. The fledge ratio on the constructed sandbars of 1.92 was far above the BiOp goal of 1.22. On the non-constructed sandbars, the fledge ratio was 0.00.
Table 20: Piping Plover Adults, Fledglings and Fledge Ratios on Constructed vs. Non-Constructed Sandbars - Lewis and Clark Lake Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Adults</th>
<th>% of Total</th>
<th>Adults</th>
<th>Fledglings</th>
<th>% of Total</th>
<th>Fledglings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>152</td>
<td>100.0</td>
<td>95</td>
<td>100.0</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>100.0</td>
<td>95</td>
<td>100.0</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21: Piping Plover Adults, Fledglings, and Fledge Ratios on Constructed vs. Non-Constructed Sandbars - Gavins Point River Segment, 2010

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Adults</th>
<th>% of Total</th>
<th>Adults</th>
<th>Fledglings</th>
<th>% of Total</th>
<th>Fledglings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed</td>
<td>72</td>
<td>97.3</td>
<td>69</td>
<td>100.0</td>
<td>1.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Constructed</td>
<td>2</td>
<td>2.7</td>
<td>0</td>
<td>0.0</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>100.0</td>
<td>69</td>
<td>100.0</td>
<td>1.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rehabilitated Sandbars

The Corps conducted vegetation modification in previous years on existing sandbars on the Lake Oahe, Fort Randall River, Lewis and Clark Lake, and Gavins Point River Segments. Vegetation modification includes the herbicide spraying of vegetation or herbicide spraying followed by the mowing of the vegetation. However, no vegetation spraying has been done since 2006 on the Lake Oahe Segment and since 2005 on the other three segments. The last mowing was done in the spring of 2007 on all four segments. In the three years following 2007, vegetation has grown up on the treated sites leaving little difference between the treated and non-treated sites. Therefore, no analysis of rehabilitated sites was done in 2010.

III.B.III.1.c. Kansas River Piping Plover Incidental Take and RPMs

Incidental Take
No piping plover adults, chicks, or eggs were lost on the Kansas River in 2010 due to Corps’ operations.

RPM 1 – Survey and Monitor Piping Plovers, Mortality and Incidental Take

RPM 1.1 – Summary of Monitoring Results
In 2010, the Kansas River Segment was surveyed one time in July when reduced flows exposed sandbars previously used by piping plovers. No plovers were observed during the survey.

III.B.IV. Actions to Meet BiOp Requirements

III.B.IV.a. Tasks Accomplished under the MRRP

III. B.IV.a.i. ESH Construction

ESH serves as the primary nesting and foraging areas for the least terns and piping plovers. The critical feature of this habitat is that it is bare sand. There are several methods utilized to create ESH. One method is to remove vegetation from existing sandbars and another method is to use mechanical methods/dredging to elevate existing submerged sandbars. See Figure 22 below for a map depicting all ESH construction locations.
Figure 22: Constructed ESH sites on the Missouri River

III. B.IV.a.ii. ESH Vegetation Removal

Vegetation removal may be accomplished chemically, mechanically, or a combination of both. The multi-agency Vegetation Management Product Delivery Team performed a study beginning in 2008. The study looked at various vegetation removal methods in an attempt to discern the most effective manner. The study is scheduled to be completed during 2011 following monitoring of vegetation removal. Preliminary information was presented at the MRNRC Conference in Nebraska City, NE, during March 2010 (J. Stirling, unpublished presentation), demonstrating that several alternative techniques for vegetation removal were successful in the short term. Due to high releases on the system, many of the test plots were inundated which did not allow for additional data collection or treatments in 2010.

Also, plans for this year are to test vegetation removal techniques on full bars in Bismarck and undertake a similar vegetation study to test vegetation modification methods to maintain bare sand habitat following removal of vegetation.

III. B.IV.a.iii. ESH Reservoir Habitat Study

In accordance with the BiOp, a reservoir habitat study was initiated this year. The purpose of the study is to identify areas in the mainstem reservoirs that appear to be suitable for ESH construction. The PDT will continue to study during 2011 and seek to identify locations and methods to create viable habitat.

III. B.IV.a.iv. Efforts to Reduce Take

To the extent possible, the flows of the river were controlled to reduce take of the birds. However, due to abnormally high flows during the spring, summer and fall of 2010, the control of the river was necessarily focused on flood control.
III. B.IV.b. 2010 Accomplishments

Four projects were completed this year to produce much needed habitat on the river. None of the projects produced usable habitat for the current year due to challenges stemming from the high river flows and timing of construction; however, all of the projects should be usable in the spring of 2011. The projects were located at river miles 757, 759, 789.6 and 842. The projects at 757, 759 and 789.6 were initially to be constructed using traditional mechanical means, however due to abnormally high river flows; this method was deemed not practical. In an effort to construct the habitat, alternative construction methods were investigated. All of the methods considered included placing something in the river to allow the velocities to slow and encourage the sand/sediment load to fall out behind the structures, thus creating sandbars. Materials considered included hay bales, sheet piling of various materials, and several types of large geosynthetic sandbags. In the end, it was determined to use Geotubes, a type of geosynthetic sandbag, placed in strategic locations in the river to trap sand.

Overall, the projects were successful, however, not as successful as was initially hoped. The following provides the results of the projects. The actual extent of sand deposition will likely not be known until spring 2011. The geotubes will have to be removed during the fall of 2011. See Figure 22 for a map of the 2010 ESH locations and Figure 23 below for a view of the geotubes.

1. RM 757. This project planned to install approximately 1,385-feet of geotube; 671-feet were deployed.

2. RM 759. No geotubes were installed. Due to scheduling delays with the other two sites, the time necessary for the tubes to be in the high flows was not sufficient to produce the desired results. However, to utilize the contract and to create sandbars, dredging in the area was used to make habitat. Approximately 5.5 acres of habitat was created.
3. RM 789.6. This was the first site for the geotube installations. This area experienced difficulties primarily associated with high river velocities and the learning curve associated with using a new method to create sandbars. The intent was to place 2,448-feet of geotube in the river, but ultimately, 1,110-feet were eventually deployed.

4. RM 842. This project was a conventional dredging project awarded in FY 09 with ARRA funding. Due to high river flows and the subsequent flooding of the project staging area, this project was delayed pending an area suitable for staging. An area was found in October 2010 and dredging commenced until the contractor had to demobilize in December 2010 due to icing conditions in the river. An area of approximately 300’ x 300’ with a height between 2-3 feet was created. This project will resume in the spring of 2011.

Figure 24: Photograph showing a geotube during the installation process near river mile 757.

III.C. Least Tern & Piping Plover Adaptive Management / Future Projects / Vision Forward

III. C.I. Status of Adaptive Management Strategy

The draft ESH AM Strategy was developed in conjunction with the ESH Programmatic Environmental Impact Statement and is under public review along with that document until February 22, 2011. The AM Strategy will be updated based on the comments received and is anticipated to be finalized in FY 2011.

III. C.II. Progress towards Objectives (Report Card)

The goal of the ESH sub-program is to provide sufficient habitat throughout the Missouri River Mainstem System (MRMS) to support self-sustaining populations of terns and plovers. “Self-sustaining” means that the population has a high probability of meeting population recovery targets as specified in the current Recovery Plan (USFWS 2000, 2003). This review evaluates the ESH Program against five objectives designed to support population recovery. The first two objectives relate to the biological responses of terns and plovers to habitat creation. Objectives 3 and 4 relate to construction activities, including minimizing potentially negative effects of ESH program actions. The fifth objective is a learning objective, designed to improve knowledge of the system for informed decision-making. Each objective is presented with the following information, which is used to evaluate its status:
• Performance metric(s) - qualitative or quantitative metric used to target how an objective will be assessed.
• Measurement - the way in which data are collected for an individual objective.
• Target - the value of metric(s) used to trigger a decision.

For objectives and performance metrics associated with construction (objectives 3 and 4), initial targets for implementation are set at the levels associated with Alternative 5 in the ESH Programmatic Environmental Impacts Statement (PEIS). This is consistent with the Adaptive Management Implementation Process for progressively implementing greater alternative acreages outlined in the draft PEIS.

**Objective 1: Meet or exceed tern and plover productivity targets**

*Performance Metric:* Annual and 3-year running average fledge ratios  
*Measurement:* Count of chicks fledged divided by the number of breeding pairs. The number of breeding pairs is estimated to be the number of adults counted divided by 2  
*Target:* Increasing tern and plover fledge ratios with ultimate targets of 0.94 and 1.22, respectively (3-year running average)

**Objective 2: Increase and subsequently stabilize tern and plover populations**

*Performance Metric:* Annual population growth rate, $\lambda$  
*Measurement:* The growth rate for year $t$ is the population size at year $t + 1$ divided by the population size at year $t$  
*Target:* When the population size is below target, $\lambda > 1$ indicates a growing population, and therefore a population that is on track to reach the population size target

**Objective 3: Meet ESH acreage targets**

*Performance Metric:* Area of ESH  
*Measurement:* Aerial and satellite imagery  
*Target:* 1,315 acres (may be adjusted over time through implementation of the AM Strategy)

**Objective 4: Minimize negative impacts due to ESH construction activities**

*Performance Metric:* Area affected by mechanical construction of ESH  
*Measurement:* Cubic yards of sand moved  
*Target:* < 960,712 cubic yards (may be adjusted over time through implementation of the AM Strategy)

**Objective 5: Reduce uncertainty to improve model projections**

*Performance Metric:* Coefficient of Variation (CV) of projected or monitored performance metrics of Objectives 1-4.  
*Target:* Reduce CV over time

Monitoring data from 2010 indicate that population sizes for both the plover and tern were below BiOp targets and decreased 33% and 5% respectively from 2009 population numbers (Table 19). Fledge ratios for plovers remained below target but increased slightly (7%) from 2009. Fledge ratios for terns were above target in 2010 and increased significantly (29%) from 2009. ESH area was below the target associated with Alternative 5 of the ESH PEIS and is estimated to have declined 19% between 2009 and 2010. In addition there was also an overall decline in reservoir habitat.

During 2004–2010, the total amount of completed and planned construction of ESH was 847 acres or an average construction rate of 169 acres/year in years where construction took place (Table 22). Construction of new ESH for the 2010 nesting season amounted to approximately 104 acres and was below the target associated with Alternative 5 of the PEIS. Table 22 below shows the total acres of ESH on the system and further breaks that number down into constructed versus naturally created bars.
Table 23 below contains a summary of the 2010 monitoring data and comparison against the performance metrics identified in the draft ESH AM Strategy. The values in the table are color coded as to the extent to which the metric is being achieved. Green indicates that the metric is being achieved, yellow indicates that the metric is close to being achieved (less than 10% below the target), and red indicates that the metric is not being achieved (greater than 10% below target).

### Table 23: Comparison of target and observed (from monitoring data) values for performance metrics from the draft ESH AM Strategy

<table>
<thead>
<tr>
<th>Objective</th>
<th>Performance Metric</th>
<th>Target</th>
<th>2010 Value</th>
<th>Change from Previous Year</th>
<th>3-Year Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plover Fledge Ratio</td>
<td>1.22</td>
<td><strong>1.01</strong></td>
<td>7%</td>
<td><strong>1.01</strong></td>
</tr>
<tr>
<td>1</td>
<td>Tern Fledge Ratio</td>
<td>0.94</td>
<td><strong>1.03</strong></td>
<td>29%</td>
<td>0.94</td>
</tr>
<tr>
<td>2</td>
<td>Plover Population Growth Rate λ &gt; 1</td>
<td>1</td>
<td><strong>0.67</strong></td>
<td>−17%</td>
<td><strong>0.80</strong></td>
</tr>
<tr>
<td>2</td>
<td>Tern Population Growth Rate λ &gt; 1</td>
<td>1</td>
<td><strong>0.95</strong></td>
<td>−26%</td>
<td><strong>0.87</strong></td>
</tr>
<tr>
<td>2</td>
<td>Plover Population Size</td>
<td>1,139</td>
<td><strong>604</strong></td>
<td>−33%</td>
<td>930</td>
</tr>
<tr>
<td>2</td>
<td>Tern Population Size</td>
<td>900</td>
<td><strong>658</strong></td>
<td>−5%</td>
<td>692</td>
</tr>
<tr>
<td>3</td>
<td>Amount of ESH (acres)</td>
<td>1,315</td>
<td><strong>1,189</strong></td>
<td>−19%</td>
<td><strong>1,821</strong></td>
</tr>
<tr>
<td>4</td>
<td>Area affected by construction</td>
<td>&lt;960,712</td>
<td><strong>290,000</strong></td>
<td>−74%</td>
<td><strong>1,140,290</strong></td>
</tr>
<tr>
<td>5</td>
<td>Reduce uncertainty</td>
<td>Minimize CV&lt;sup*d&lt;/sup&gt;</td>
<td>Plover: 17.71, Tern: 6.60</td>
<td>Plover: −0.1%, Tern: −1.5%</td>
<td>-</td>
</tr>
</tbody>
</table>

<sup>a</sup>Population growth rate ($λ$) for year $t$ is the population size at year $t + 1$ divided by the population size at year $t$.

<sup>b</sup>Percent change = (Value at year $t + 1$ − Value at year $t$)/Value at year $t$ × 100

<sup>c</sup>Acreage measurements for 2010 were not available; this number represents an estimate of acreage available due to measured flows and assumed loss rates.

<sup>d</sup>CV of population sizes projected forward five years from current year (e.g. 2010-2015)
III.C.III. Lessons Learned and PDT Observations

The 2010 nesting season was marked by high water in the Gavins Point and Ft. Randall segments and increases in reservoir water elevations in Lake Oahe, Lake Sakakawea and Ft. Peck Lake. Flows in the Garrison and Ft Peck river segments remained relatively low. While Lewis and Clark lake had somewhat increased reservoir levels during the nesting season, the pool remained relatively stable. Recently constructed bars in the Gavins Point segment at RM 781, 781.4 and 791 provided some of the only exposed, high quality nesting habitat in that segment during the peak of the high water. In addition, power-peaking flow fluctuations were reduced in some river segments due to system conditions. Garrison is currently experiencing higher flows than are anticipated during the 2011 nesting season which may form new habitat or scour existing habitat.

Preliminary results from the vegetation modification study indicate that all methodologies have been successful at reclaiming bare sand habitat. All methods tested involve mechanical removal of vegetation in the fall and use of pre-emergent herbicides in the spring. Some methods also include the use of an additional herbicide prior to fall vegetation removal. In addition, one method involves the removal of debris after vegetation removal and one involves overtopping with clean sand after vegetation removal. Construction efforts in the summer of 2010 involving the placement of geotextile tubes in the channel to cause deposition of material under high flow conditions proved more difficult than previously expected. Gulls were attracted to the black geotextile tubes presumably due to their ability to retain heat. If geotextile tubes are used in the future, a white or sand colored fabric may be more appropriate. These tubes are currently slated for removal in the fall of 2011.

There had been discussions in 2006 and 2007 about building lower elevation sandbars in Gavins Point segment, a method that had been tested at RM 795.5 by including nesting platforms at three different elevations. Sandbars built at these lower elevations in the Gavins Point segment would not have been exposed this year.

Some of the sites previously created under the ESH sub-program had experienced declines in quality. At RM 826.3 in the Lewis and Clark Lake segment, the north bar is now heavily vegetated and it is thought that this may be causing a mink predation problem being experienced at adjacent sandbars. This vegetated section is approximately 26 acres and has willows up to 16 feet tall. A controlled burn was attempted at this site in the spring of 2010, however it was unsuccessful. In addition, there has been vegetation encroachment at the other sandbars in this complex. Vegetation encroachment was also noted as a problem at sites in the Gavins Point segment including RM 761.3 and the existing sandbar at RM 777.7 which is in between the two mechanically created sandbars.

Two non-target impacts were identified that may warrant further investigation. In the Gavins Point segment, impacts to mussels continue to be an area of concern for some stakeholders. The last mussel survey that was conducted in this segment was in 2007. In addition, rates of bank erosion may be increasing due to high flows in this and other segments. This has resulted in an increase in requests for bank stabilization in the Missouri National Recreational River with some claims of a connection to constructed ESH.

III.C.IV. Recommendations/Future Direction of Implementation

Based on available data and observations, a number of recommendations have been developed for upcoming years of implementing the ESH sub-program. Recommendations to directly influence effectiveness are:

1. Increase rate of ESH construction to at least 164 acres annually,
2. Utilize vegetation removal methods from pilot project to improve habitat quality on previously constructed habitats annually,
3. Continue investigations to improve our understanding of creation actions and system and species response.
Following is a summary of all recommendations contained in the annual strategic review document grouped by major heading, including the Section of the document where the recommendation can be found.

Habitat Construction and Maintenance:

- Create at least 164 acres of new ESH per year consistent with Alternative 5 of the ESH PEIS.
- Based on the acreage deficits from Alternative 5, Gavins Point Segment and then Ft. Randall Segment should be the highest priority for construction. Garrison segment may also be a high priority.
- Previously created sandbar complexes including 761.3, 777.7 and 826.3 should be cleared of vegetation in order to improve usage and productivity at these sites.
- Pro-active vegetation control should be implemented at constructed sites to maintain quality. This should begin after the first nesting season.
- Consider overtopping sites formed by placement of geotextile tubes with additional material to raise the elevation and/or increasing the size of these sites to the size of the original plan.
- If work is undertaken in either Ft. Randall segment or Lake Sharpe, plan to create several geographically distributed sites. Vegetation removal may offer an opportunity to restore multiple sites in the Ft. Randall segment.
- Implement overtopping (vegetation removal on existing sites followed by placement of additional material to raise the elevation) as a stand-alone methodology to determine if there are cost-savings associated with this methodology.
- Any overtopped sites should also be sprayed with pre-emergent herbicide in the Spring in order to reduce subsequent vegetation encroachment.
- Consider building high elevation sandbars in the reservoirs during the next drought cycle that will provide habitat in those areas when the reservoirs fill again.

Pilot Projects:

- Implement vegetation modifications at the full-site scale as a pilot project.
- Consider leaving one or more geotextile tubes in place throughout the 2011 nesting season in order to both protect the habitat that was formed and potentially form additional habitat.
- Evaluate the effectiveness of various other methods of forming ESH under high flow conditions (examples include the use of large woody debris, rock, sheet-metal pilings, etc.) that could be implemented during future high-flow conditions. If warranted, design a pilot project to test one or more of these methods.
- Further investigate the feasibility and cost of creating several small sites in the Gavins Point segment.
- Further investigate the potential benefits and trade-offs of off-channel (within the Missouri River floodplain but outside of the main channel) habitat prior to implementation as a pilot project.

Monitoring and Investigations:

- Investigate the potential for constructed ESH sites to cause bank erosion in the Gavins Point Segment.
- Conduct surveys following the high flows in Gavins Point, Ft. Randall and Garrison segments to determine changes in habitat including vegetation cover, area and elevation including the effectiveness of these flows at “scouring” or “conditioning” sandbars.
- Investigations should be undertaken to determine the effectiveness of geotextile tubes at forming ESH under high-flow conditions.
- Investigations should be undertaken to determine the effectiveness of geotextile tubes at forming ESH under high-flow conditions.
- Monitor the results of vegetation removal projects to determine the population use and productivity of these sites in comparison to natural habitat in the same segment.
- Monitor construction projects to determine vegetation growth rates, erosion and deposition rates.
- Undertake investigations to update the habitat-flow curves (Section 3).
• Consider conducting a new Gavins Point mussel survey to address concerns over non-target impacts of ESH creation.
• Alter the Tern and Plover Population and Productivity monitoring methodology based on feedback from the USGS study to provide more accurate estimates in the future.

Data Analysis:

• Conduct an analysis of the cost per acre, population use and productivity amongst sites created using different methodologies as well as against naturally formed habitat.
• Analyze multiple years of data from individual sandbars to determine rates of change due to erosion and vegetation encroachment.

Other:

• Continue to explore opportunities to create and maintain tern and plover nesting habitat on reservoirs.
• Explore the potential to reduce power-peaking flows out of Ft. Randall to improve habitat availability and reduce erosion in this segment.

III.D. Pallid Sturgeon

The Pallid sturgeon (Scaphirhynchus albus) is an endangered species of ray-finned fish, endemic to the waters of the Missouri and lower Mississippi River basins of the United States. Named for its pale coloration, the Pallid sturgeon is closely related to the relatively common shovelnose sturgeon (Scaphirhynchus platorhynchus), but is much larger, averaging between 30 and 60 inches (76 and 150 cm) in length and 85 pounds (39 kg) in weight at maturity. The Pallid sturgeon takes 15 years to mature and spawns infrequently, but can live for up to a century (Montana, Fish & Wildlife Parks).

III.D.I. History of the Pallid Sturgeon

III.D.I.1. Current Status

The pallid sturgeon was listed as an endangered species under the ESA over its entire range on September 6, 1990 (55 FR 36641-36647). The Service concluded in the 2007 Pallid Sturgeon 5 Year Review that the pallid sturgeon does not meet the criteria for delisting or for downlisting to threatened status in any portion of its range. For more information, visit the web link below:

http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E06X

III.D.I.2. Reasons for Current Status

The primary threats identified for pallid sturgeon in the final rule in 1990 (USFWS 1990b) and in the Recovery Plan (USFWS 1993) are: 1) curtailment of range due to habitat destruction and modification, 2) low population size, 3) lack of recruitment, 4) commercial harvest, 5) pollution/ contaminants, and 6) hybridization. Significant new information gathered since listing is summarized below in relation to the species’ status and associated threats (USFWS 2007).

• Habitat: Recent studies and data from recovery priority management area (RPMA) 5, which is the Mississippi River under the old RPMA system (Appendix A, Figure 8), suggests that riverine habitats are less degraded than previously believed, and that they continue to support diverse and productive aquatic communities, including pallid sturgeon (USFWS 2007).

• Population Size: Wild pallid sturgeon abundance remains low. Pallid sturgeon observations are higher in the Mississippi and Atchafalaya rivers than initially documented in 1993. This high observation number may indicate more pallid sturgeon are present than initially believed or may just be the results of increased sampling efforts and the data are not quantified with catch-per-unit effort data.
• **Recruitment:** Most recent data on natural recruitment of pallid sturgeon continues to be limited throughout the species’ range. RPMA 1 and 2 are comprised of old-aged individuals, and RPMAs 1, 2, 3, and 4 are dependent on hatchery augmentation programs for recruitment (Appendix A, Figure 8). No wild pallid sturgeon have been collected in the last 10 years within RPMA 3 that cannot be explained by translocation efforts, and no spawning or recruitment has been detected. A few sub-adult or young adult wild pallid sturgeons have been collected in RPMA 4, along with a few larval pallid sturgeons. The presence of smaller-sized cohorts of pallid (400-600 mm) in both RPMA 5 and 6, coupled with age data indicating that no pallid sturgeon were beyond 15 yrs old in the middle Mississippi River (Colombo et al. 2007), suggests that some level of recruitment is occurring. Additional efforts are needed to document population demography, reproduction, and recruitment in RPMAs 4, 5, and 6.

• **Commercial Harvest:** Illegal commercial harvest of pallid sturgeon is occurring in portions of RPMAs 4 and 5. Data show lower ages and higher mortality rates of pallid sturgeon in areas where shovelnose sturgeon (*Scaphirhynchus platorynchus*) are commercially harvested (Colombo et al. 2007). The shovelnose sturgeon and the pallid sturgeon are difficult to differentiate in the wild which has resulted in the documented take of pallid sturgeon (Bettoli et al. 2009). This threat is likely to increase as caviar sources are reduced world-wide and caviar prices increase. Due to this threat, the Service published the Proposed Rule to list the shovelnose sturgeon as threatened due to similarity of appearance (SOA) under provisions of the Endangered Species Act of 1973 (74 FR 48215-48220) on September 22, 2009.

• **Pollution and Contaminants:** Limited data have documented elevated contaminants levels in pallid sturgeon (Ruelle and Keenlyne 1992). The Basin-Wide Contaminants Plan describing the contaminants of concern throughout the pallid sturgeon's range in the Missouri River is being written by a group of State and Service contaminants specialists. This project is being funded by the Western Area Power Administration with Service, Missouri Department of Conservation, and U.S. Geological Service (USGS) in-kind contribution.

• **Hybridization:** Although more recent genetic information using updated study methods is now available, true “hybridization” from sympatric speciation and assortative mating between pallid sturgeon and shovelnose sturgeon cannot be distinguished (Campton et al. 2000, also suggested in Heist and Schrey 2006). It is not possible at this time to determine if genetic intermediates are a natural part of sturgeon evolutionary history or somehow a result of anthropogenic changes in their habitats, thus it is not possible to conclude if it is a true threat (USFWS 2007).

### III.D.1.3. History of Listing

Literature from the 1960s through the 1970s showed a sharp decline in the pallid sturgeon observations over the range of the species in the Missouri River (55 FR 36641-36647). The Service was petitioned to list the pallid sturgeon as “threatened” under the ESA on April 17, 1978. The Service determined that the petitioner did not supply sufficient substantial evidence of the threats to the pallid sturgeon to permit it to move directly on the petition; however, that the Service was gathering status data on this species and others. On December 30, 1982, the Service published a notice of review (47 FR 58456) that included the pallid sturgeon indicating that substantial information was available to support the biological appropriateness of proposing to list it as endangered or threatened. The Service received a petition to list the pallid sturgeon as an endangered species on June 16, 1988. A Notice of Petition Finding (54 FR 7813) was published on February 23, 1989, stating the Service made a 90-day finding that listing may be warranted. On August 30, 1989 (54 FR 35901), the Service provided notification that the petition was warranted and proposed to list the pallid sturgeon as endangered throughout its range and asked for information relevant to a final determination. On September 6, 1990, the Service published a determination (55 FR 36641) that the pallid sturgeon is endangered under the authority of the ESA.
III.D.I.4. “Thinking” Behind the 1990 Listing

Procedures found in section 4(a) (1) of the ESA and regulations (50 CFR part 424) promulgated to implement the listing provisions of the ESA that were followed by the Service when the endangered determination of the pallid sturgeon was made can be found at the web link below:


III.D.I.5. Information Used for the 1990 Listing

The Service used the best available information at the time for listing the pallid sturgeon as endangered. Sources were from the various comments received during the comment period for the proposal to list, which are included in the 1990 listing and the literature listed in Appendix B.

III.D.II. Estimated Population

III.D.II.1. Entire Range

Total population estimates are currently unavailable due to limited sampling in RPMA 5 and 6, the lower Mississippi River (USFWS 2007). Population estimates for the lower river are anticipated within the next 3 years. Garvey (2009) estimated a population of 1,600 pallid sturgeon in the Middle Mississippi River, between the Missouri River confluence and the Ohio River confluence. See Figure 25 below for locations of the RPMA segments on the Missouri River.

III.D.II.2. Missouri River

There are no recent population estimates for pallid sturgeon (hatchery or wild) in the upper Missouri River (above Lewis and Clark Lake). In 2004, the estimated population size for wild adults in RPMA 2 (Lake Sakakawea to Fort Peck Dam and lower Yellowstone River up to the confluence of the Tongue River) was
158 individuals. The 2007 5-year review (USFWS 2007) states that data for the Missouri River continue to indicate that wild pallid sturgeon in RPMA 1 and 2 are large, mature, and likely old individuals, and provide little to no evidence supporting a naturally self-sustaining population. There appears to be no natural wild population surviving in RPMA 3. Sampling in RPMA 4 during the past decade continues to confirm a small population of wild pallid sturgeon in the lower Missouri River. Pallid populations in RPMAs 1-4 are being augmented with hatchery produced fish in order to ensure persistence of the species until threats are adequately addressed to promote a self-sustaining population (USFWS 2007). Using 1994 to 2007 stocking information, an estimate of the number of hatchery fish in the lower Missouri River (Gavins Point Dam to Saint Louis) is 27,069 with confidence intervals of 18,230-34,931 (Steffensen 2009 pers. comm.). There is no population estimate for the remaining wild adult fish in the lower river; however, a pallid sturgeon population estimate for the lower Missouri River is expected in 2011. Little or no recent recruitment has been documented throughout the Missouri River from current monitoring efforts.

III.D.III. Downlisting and/or Delisting Criteria

III.D.III.1. Entire Range

Downlisting and delisting will be initiated when pallid sturgeon are reproducing naturally, juveniles are recruiting into the population, and populations are self-sustaining within designated river reaches. Under the current preliminary criteria, downlisting may be considered when 1) a population structure with at least 10 percent sexually mature females occurring within each RPMA has been achieved, and when 2) sufficient population numbers are present to maintain stability.

The Service believes that the best scientific and commercial information available suggests these downlisting criteria are no longer relevant to a potential future downlisting as written. Each RPMA is faced with problems beyond just total population numbers and male-to-female ratios. A self-sustaining population cannot be maintained without adequately addressing identified threats (USFWS 2007). A revision of the recovery plan is currently underway.

III.D.III.2. Missouri River

The species is listed range-wide and thus downlisting/delisting cannot occur on a reach by reach basis.

III.D.IV. Recovery Successes in the Past Year

Propagation and Trends of Stocked Pallids: The four federal (Gavins Point National Fish Hatchery, Garrison Dam National Fish Hatchery, Bozeman Fish Technology Center, Neosho Nation Fish Hatchery) and two state (Blind Pony State Fish Hatchery, Miles City State Fish Hatchery) hatcheries involved with propagation of Missouri River pallid sturgeon stocked a combined 39,089 fingerling and yearling-sized pallids (an additional 42 six-year old fish were stocked into RPMA 1; all pallids stocked in 2010 equate to 32,314 yearling equivalents) into RPMA’s 1-4 during 2010 (Figure 26). Pallid sturgeons are stocked to insure survival of the species in the short term and preserve existing genetics of the wild population. Data from ongoing monitoring indicate that stocked pallid sturgeon are surviving (Figure 27), growing, and reaching a size and age that is capable of spawning. Recent survival estimates for hatchery fish stocked into the Missouri River show relatively high rates of survival (Hadley and Rotella 2009; Steffensen et al. 2010) that are similar to other sturgeon species (Irelands et al. 2002). Since 2001, over 235,000 yearling equivalent pallid sturgeon have been stocked into the Missouri River (Figure 26). Continued monitoring of the stocked population will determine how these fish contribute to the next generation of pallid sturgeon.
Figure 26: Total number of fingering and yearling-sized pallid sturgeon stocked into the Missouri River during 2010 (42 six-year old fish stocked into RPMA 1 are not included in this figure). Note that majority of fish are 2009 year class. See Figure 25 for a map of RPMA segments on the Missouri River.
Figure 27: Length frequency of hatchery, wild, and unknown origin (unknown origin = species identification could not be determined or genetic identification is pending) pallid sturgeon randomly sampled in the upper (top graph) and lower (bottom graph) Missouri River using all gear types during the 2007-2010 sampling years.

Length-frequency distributions and origins (i.e., hatchery, wild, or unknown) of pallid sturgeon randomly sampled with all standard gears in the lower monitoring area (Fort Randall Dam to the Mouth; PSPAP segments 5, 6, 7, 8, 9, 10, 13, 14) of the Missouri River during the 2006-2010 sampling years.

Figure 28: Number of Pallid Sturgeon Stocked by year class (as yearling equivalents) since 2001 in the Missouri River within each Recovery Priority Management Area

**Total Yearling Equivalents**
- RPMA 4 - Gavins Pt. Dam to Mississippi R.
- RPMA 3 - Niobrara R. to Lewis & Clark Lake
- RPMA 2 - Ft. Peck Dam to Lake Sak. & lower Yellowstone R.
- RPMA 1 - mouth of Marias R. to Ft. Peck Res.

*Majority of 2010 year class will be stocked in 2011*
III.D.V. Describe BiOp Requirements

The 2003 Amended BiOp original SWH definition for the U.S. Army Corps of Engineers’ (Corps) Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP), and the Kansas River Reservoir System is described as areas where water depth is greater than 0 but less than 5 feet (0-1.5m) and current velocity is less than 2ft/sec (0.6 m/s).

In a letter dated June 29, 2009, the USFWS provided the following clarification of the original definition of SWH:

Shallow water habitats include side channels, backwaters, depositional sandbars detached from the bank, and low lying depositional areas adjacent to shorelines.

- Key physical components of SWH’s are their dynamic nature with depositional and erosive areas, predominance of shallow depths intermixed with deeper holes and secondary side channels, lower velocities, and higher water temperatures than main channel habitats.
- Several critical questions that large-river ecology research needs to address is the issue of relative habitat size, the importance of SWH location relative to other habitat types, the influence of organic input and deposition and hydrograph influence.

The USFWS also formally revised portions of the BiOp in a letter dated October 23, 2009 to the USACE by substituting a new RPA element at Intake Dam and the irrigation headwaters on the Yellowstone River, Montana for one which was originally identified to be taken at Fort Peck Dam.

The Water Resources Development Act (WRDA) of 2007 authorized the U.S. Army Corps of Engineers (Corps) to use Missouri River Recovery and Mitigation funds to assist the U.S. Bureau of Reclamation (Reclamation) with design and construction of the Intake Diversion Dam Project for the purpose of ecosystem restoration. The restoration of the dam and diversion canal will address long standing issues related to fish passage and entrainment at this location and will open up more than 150 miles of new aquatic habitat to the highly imperiled pallid sturgeon.

The current RPA element reads as;

1. The Corps shall or is to provide funding necessary for NEPA analysis and construction leading to sturgeon passage at the Intake, Montana irrigation dam and diversion.
2. The Corp shall provide funding necessary for NEPA analysis and subsequent construction of the Intake Diversion Dam Project to address native fish entrainment near Intake, Montana.
3. As resources are being used for construction of the Intake Diversion Dam Project, the 2020 shallow water habitat milestone will be deferred by an equal amount of time – not to exceed 4 years or 2024.
4. The Corps will not be required to conduct the Fort Peck Dam tests until after assessing the efficacy of the Intake Diversion Dam Project. This determination will be made within the first 8 years following conclusion of the construction at Intake.
5. The Corps will complete its feasibility report related to temperature improvements at Fort Peck Dam. Including a review of the Milk River for possible sources of warm water.
6. The Corps, Reclamation and Service will, in cooperation with Montana Fish Wildlife and Parks, determine the requirements and funding necessary for post-construction monitoring associated with the project.

Once construction of the fish passage structure is complete, monitoring will take place under the adaptive management feature of the project to insure that the water velocities at the fish passage are within the predicted range, and if not, modifications shall be made to allow for fish passage. If the success criteria are not met, the 2003 amended BiOp RPA elements requiring the Corps to operate Fort Peck to benefit pallid
sturgeon would be reinstated either as currently written or modified to incorporate the results of the Corps on-going feasibility study.

III.D.V.1. SWH Creation / Intake Diversion Dam Project

The Missouri River Biological Opinion (BiOp) (UWFWS, 2000) and the Amended Biological Opinion (USFWS, 2003) set forth the definition of shallow water habitat as Missouri River flow depths less than 5 feet (1.5M) and velocities less than 2 fps (0.6 m/s) (USFWS, 2003, pg. 193). Subsequently, the definition of shallow water habitat was clarified in a letter from the USFWS to the USACE dated June 29, 2009, emphasizing the use of depth and velocity criteria as general guidelines and iterating the importance of depth and velocity diversity, increased productivity, and erosion and depositional processes. This analysis is based only on the general criteria of depths less than 5 feet (1.5M) and flow velocity less than 2 ft/sec (0.6 m/s) because other qualitative data are not yet available. An expanded monitoring effort including additional metrics based on the clarified definition will begin in 2011.

The SWH restoration goal as outlined in the BiOP is to achieve an average of 20-30 acres of shallow water per mile of river. The near term goals of the project are to reach 10% (2000 acres) of the SWH goal by 2005 and 30% (5,870 acres) by 2010. These targets have been setback by as much as 4 years as a result of implementing the Yellowstone fish passage project as outlined in a letter from the USFWS to the USACE dated October 23, 2009.

III.D.V.2. List Specific Objectives / Alternatives

The objectives are currently under review by the Shallow Water Habitat Product Delivery Team. Once finalized, they will be incorporated through an Adaptive Management strategy.

III.D.V.2.a. Performance Verses BiOp requirements

Figure 29 shows the Corps performance versus BiOp requirements. Prior to 2009 a range was used to determine the maximum and minimum available SWH that the Corps construction efforts created on the river. Using two methodologies, Habitat Assessment and Monitoring Program (HAMP) and Geographic Information System (GIS), the Corps measured the amount of habitat actually created and available on the river using best available aerial imagery and 2009 survey data. Measurement results indicate the Corps has constructed 3,443 acres of SWH to increase the total available on the Missouri River system to 9,201 acres.
III.D.VI. Monitoring, Research, & Population Assessment

Pallid sturgeon recovery requires a comprehensive approach to ensure success. Our pallid efforts include habitat creation, flow modification, monitoring and research focused on improving habitat and understanding of pallid life history needs. Our management actions require specific monitoring to determine effectiveness of the action (physical and biological monitoring conducted within the HAMP), as well as monitoring to determine the species response to the action (conducted through the Population Assessment Program). These are supported by research activities to address critical uncertainties. Research activities are focused on understanding the ecological factors within the life history as well as uncertainties regarding recruitment and habitat use. Together these elements, along with propagation, seek to increase habitat availability, and remove bottlenecks to recruitment.

III.D.VI.1. Key Questions, Findings and Status Updates

See Appendix B, General Science Questions, Sections I-IX.

III.D.VI.2. Comparison of Estimated Population with Previous Years

See Section III.D.II.

III.D.VI.3. Recent Findings

III.D.VI.3.a. Sturgeon Research Program – Spawning

There are currently two research project underway: larval life history and Comprehensive Sturgeon Research Project. Both projects are multi-year studies and produce some findings each year, but do not necessarily produce a synthesis report each year. Some of our recent findings are as follows:

1. Assessments of reproductive fish from the telemetry project show that females upstream of Omaha have 50% of the egg mass of fish in the lower section (Jefferson City to Waverly).
2. Migration patterns in Yellowstone confluence area, upper section of lower river, and lower section of lower river are strikingly different.
3. Male migration patterns differ from females; reproductive males are in relatively short supply; observed reproductive abnormalities have been mostly in males; and males used in the hatchery have been shown to have low sperm quality.
4. Larval pallid avoid gravel during substrate preference study.
5. Larval pallid cannot hold position at 30 cm/s (0.98 ft/s) velocities.

These studies are ongoing and will produce reports as elements are completed.

III.D.VI.3.b. Sturgeon in Reservoirs

High flows in the Missouri River during the spring and summer of 2010 created some unusual conditions in the Missouri River between the Yellowstone River mouth and the headwaters of Lake Sakakawea. Lake levels were approximately 30 ft. higher during the spring and summer of 2010 than during the same period in 2008 and nearly 43 ft. higher than the all-time low of 1806.6 ft. recorded in 2005 when BiOp monitoring for pallids began in this area. The higher lake levels in 2010 created a headwaters region of Lake Sakakawea that was characterized by flooded terrestrial vegetation (Figure 30) that had established during the recent low lake levels. Standard sampling in this section of river conducted by Pallid Sturgeon Population Assessment crews in 2010 resulted in 346 pallid captures as compared to 298 captures from 2005-2009. Non-standard sampling conducted in this same area over a 2.5 day period produced an additional 371 pallid captures for a total of 717 during the 2010 sample year representing 12 year classes of stocked fish (1997-1999, 2001-2009). A 5-mile long stretch of the headwaters area of Lake Sakakawea produced 504 of the 717 total captures.
III.D.VI.3.c. Habitat Assessment and Monitoring Program (HAMP)

In 2010, there were two pilot projects in the Habitat Assessment and Monitoring Program. These efforts were designed to assist in the development of a shallow water habitat (SWH) adaptive management strategy. One project, conducted by the USFWS in Columbia, Missouri compared catches of native fishes from river reaches with relatively high amounts of SWH to reaches with much less SWH. This data is currently being analyzed. Another project, conducted by Nebraska Game and Parks Commission (NGPC) is looking at the abundance and diversity of benthic invertebrates in created habitats to help determine usefulness as a metric for success. These data are currently being analyzed as well. Results from both pilot studies will be used in the development of a SWH adaptive management strategy including a revised Habitat Assessment and Monitoring Program plan.

A Shallow Water Habitat (SWH) Adaptive Management Strategy including a revised HAMP are currently being developed by a multi-agency team to better focus monitoring efforts at providing information needed to evaluate and continually improve SWH projects. Routine monitoring efforts were suspended in 2010 awaiting the revised monitoring plan. Two smaller-scale, one year pilot projects were conducted in 2010 to fill information gaps and assist in revising the HAMP which will be implemented beginning in 2011. Data analysis is underway with results expected in 2011.

III.D.VI.3.d. Water Quality Monitoring

In 2010, sampling at mainstem and tributary sites was expanded to include additional sites. Data collected from this effort will be used to support the application of the CE-QUAL-W2 hydrodynamic and water quality model on the lower Missouri River. This was the first of three years of expanded data collection efforts for model development. Contaminants linked to endocrine disruption (atrazine, estrogen compounds, etc.) were also sampled in 2010.

In 2010, sampling efforts were expanded at multiple created habitat sites. In addition to water quality parameters collected in 2009 (temperature, dissolved oxygen, specific conductance, turbidity, pH, and chlorophyll a, ammonia, nitrate/nitrite, total kjeldahl nitrogen, total nitrogen, total phosphorus, dissolved ortho-phosphate, total suspended solids, alkalinity, and total organic carbon), information related to phytoplankton (species and biovolume) and zooplankton (species and density) was collected at six created habitat sites. This information will help guide future assessments of shallow water habitat (HAMP).

III.D.VI.4. Sampling Efforts
III.D.VI.4.a Pallid Sturgeon Population Assessment

The Implementation Strategy for the Pallid Sturgeon Population Assessment Project is built on partnerships, common goals and objectives, and sound science. The Corps, as the Action Agency, is responsible for ensuring that these long-term assessment activities occur. The Corps has developed partnerships with state and federal agencies already active on the Missouri and Kansas Rivers and has provided them funding necessary to implement the field component of this long-term assessment. The Corps will continue to use partnerships to fully implement the project. The strategy to provide guidance and direction to the Project is also based on partnerships and adaptive monitoring. The Corps and the core group of scientists (Population Assessment Team; PAT) have developed common goals and objectives thought necessary to accomplish this task. As a guidance team they continue to meet to refine and adapt efforts as information becomes available through consensus and adaptive monitoring. The 2003 Amended BiOp also provides direction through description and explanation of the RPA elements. For example, RPA element VI B discusses philosophy and strategy, lists specific segments in which information must be gathered and specific data needs, identifies segments of research and restoration, and also identifies the need for a coordination and communication plan. This Project will refer back to this type of guidance to ensure project direction is in line with the 2003 Amended BiOp.

The Project area for Pallid Sturgeon Population Assessment encompasses the Missouri River from Fort Peck Dam, Montana at River mile (RM) 1771.5 downstream to the confluence of the Missouri and Mississippi Rivers near St. Louis, Missouri (RM 0) and the lower reach of the Kansas River. Eleven priority river segments are sampled within the Project area (Figure 31). The number of bends required within each segment is outlined in Table 24. Within a segment, a minimum of 25.2% of all bends are sampled in a sample year. With few exceptions in 2010, selected bends were sampled with the full suite of fish collecting gears identified for the Project.

![Figure 31: Study area for the Pallid Sturgeon Population Assessment Project](image-url)
### Table 24: Required Sampling Effort (River Bends Replication) for Each River Segment

<table>
<thead>
<tr>
<th>Segment Number and Description</th>
<th>Randomly Selected River Bends</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fort Peck Dam to Milk River</td>
<td>0</td>
</tr>
<tr>
<td>2 Milk River to Wolf Point (Hwy 13 bridge)</td>
<td>12</td>
</tr>
<tr>
<td>3 Wolf Point to Yellowstone (Confluence)</td>
<td>21</td>
</tr>
<tr>
<td>4 Confluence to Headwaters (Sakakawea)</td>
<td>12</td>
</tr>
<tr>
<td>*5 Fort Randall Dam to Niobrara (Confluence)</td>
<td>10</td>
</tr>
<tr>
<td>*6 Confluence to Headwaters (Lewis &amp; Clark)</td>
<td>combined w/ segment 5</td>
</tr>
<tr>
<td>7 Gavins Point Dam to Lower Ponca Bend</td>
<td>12</td>
</tr>
<tr>
<td>8 Lower Ponca Bend to Platte River (Confluence)</td>
<td>15</td>
</tr>
<tr>
<td>9 Platte River to the Kansas River (Confluence)</td>
<td>20</td>
</tr>
<tr>
<td>10 Kansas River to the Grand River (Confluence)</td>
<td>10</td>
</tr>
<tr>
<td>11 Kansas River from the Hwy 7 bridge to the Confluence with the Missouri River</td>
<td>3</td>
</tr>
<tr>
<td>13 Grand River to Osage River (Confluence)</td>
<td>11</td>
</tr>
<tr>
<td>14 Osage River to the mouth</td>
<td>14</td>
</tr>
</tbody>
</table>

### III.D.VI.4.B. Water Quality Monitoring

The Project area for Water Quality Monitoring efforts within the MRRP is the Missouri River from Gavins Point Dam, South Dakota at River mile (RM811) downstream to the confluence of the Missouri and Mississippi Rivers near St. Louis, Missouri (RM 0).

A fixed-site monitoring program has been implemented at multiple mainstem river and tributary sites to monitor the status and trends of ambient water quality parameters in the project area. Sampling is targeted to occur monthly March through October (weather permitting) to provide spatial and temporal status and trends. In 2010, 13 mainstem sites and 20 tributary sites were collected by Kansas City District and Omaha District Corps staff. See Figure 32 below for a map indicating sample locations.

Created habitats are surveyed to monitor chemical parameters and the biological response to habitat creation efforts. These surveys are designed to detect differences in water quality between the created habitat and the mainstem (specifically assumed differences in primary productivity). As these sites mature over time, water quality parameters (chlorophyll a, turbidity, etc.) and the biological community (i.e. zooplankton) should change relative to the mainstem river. These surveys will compliment the Habitat Assessment and Monitoring Program in assessing the success of the habitat creation actions, and will be used to apply adaptive management to habitat creation efforts. Sampling occurs monthly from April through September. In 2010, six created habitat sites were sampled which included four created chutes and three backwaters.
III.D.VII Actions to Meet BiOp Requirements

The 2003 Amended BiOp established that certain operations of the Missouri River main stem system would likely jeopardize the continued existence of the pallid sturgeon. Identified within the Opinion are Reasonable and Prudent Alternative Elements (RPA) specifically related to the recovery needs of pallid sturgeon. The RPA identifies three management actions that will be implemented to avoid jeopardizing the existence of the pallid sturgeon and aiding in recovery: Flow management (see IV.B), Habitat Restoration (shallow water habitat), and Pallid Sturgeon Propagation and Population Augmentation.

III.D.VII.1. Management Decisions

In 2009, USFWS revised the RPA to include the Intake Diversion Dam Project which will provide up to four years of construction relief in meeting BiOp SWH requirements. Funding for the Intake Diversion Dam Project was taken from the SWH creation program; therefore, no new construction activities were initiated. Projects that had begun were continued and/or completed and emphasis was placed on moving project designs forward in anticipation of award for FY 11 and beyond.

III.D.VII.2. Efforts Undertaken under the MRRP

III.D.VII.2.a. Shallow Water Habitat Construction and Acreage Estimates

1. Backwater Connection Modifications. This project was constructed in the spring of 2010 and consisted of reestablishing connection of Glovers Point, Soldier Bend and California Bend backwater projects with the Missouri River.

2. Three Rivers/Little Sioux Bend (12 acres). This project was completed in the summer of 2010 and consisted of a revetment lowering on the left bank of the Missouri River between river miles 669 and 670. Significant amounts of large woody debris was designed into this project, however, due to high flows these features were not constructed. Currently, the possibility of using project forces to construct the features in the spring 2011 is being investigated.
3. Fawn Island (9 acres). This is a left bank Missouri River chute near river mile 673.6. The chute is a 3,000 foot long, 150 foot wide chute. The project was completed in the spring of 2010.

4. Boyer Bend Backwater/Lower Calhoun Chute (52 acres). This project was a continuation of a construction project that was began in 2008. It was completed in the fall of 2010 and consists of a 2,800 feet long chute and a backwater between river miles 634.1 and 637.5. See Figure 34 for a view of the dredge operating on the Boyer Bend Backwater.

Figure 33 - View of Dredge Operating at the Boyer Bend Backwater Project

Figure 34: Map depicting locations of 2010 SWH construction projects
III.D.VII.2.b. Hatchery Support

The Corps has taken a progressive approach to meeting its “shared” responsibility of producing pallid sturgeon for the purpose of meeting the current stocking needs of the pallid sturgeon. The Corps’ action to facilitate meeting the annual stocking needs was two-fold. First, a series of facility improvement projects were identified by the hatchery manager’s at each of the hatchery facilities producing pallid sturgeon. These projects were incorporated into the Corps’ November, 2003 Final Biological Assessment on the Operation of the Missouri River Mainstem Reservoir System, the Operation and Maintenance of the Bank Stabilization and Navigation Project, and the Operation of the Kansas River Reservoir System (Biological Assessment). The hatchery improvements have been completed. Secondly, the Corps continues to provide “Supplemental Annual Support” to the collective propagation program to address the Average Annual Shortfall identified in the BiOp. This supplemental annual support also addresses the increased operational costs associated with the project’s various hatchery facility improvements (e.g., utilities, feed). For 2010 propagation and population augmentation accomplishments, see Section III.D.IV.

III.D.VII.2.c. Lower Yellowstone Intake Diversion Dam Modification Project

Reclamation and the Corps jointly prepared an Environmental Assessment and Finding of No Significant Impact (FONSI) for the Lower Yellowstone Intake Diversion Dam Modification Project (Intake Diversion Dam Project) which was released for public review in March 2010. The FONSI was signed in April 2010 by BG McMahon (USACE) and Mike Ryan (Bureau of Reclamation). The chosen alternative includes a rock ramp for fish passage and a new main canal headworks structure with removable rotating drum screens for entrainment protection.

Due to the complexity of the project and the aggressive schedule, SES level conference calls occur on a regular basis between Corps of Engineers, Fish and Wildlife Service, Bureau of Reclamation and EPA. The calls work to both strengthen the collaborative partnership of the agencies as well as to address potential issues as they develop.
Groundbreaking for the headworks structure took place on August 13, 2010. Since that time the cofferdam required for construction of the structure has been completed and work has been initiated on the new drainage canal. Work on the structure will proceed with a target completion date of February 2012. The ramp and weir design has been completed through 15%. A physical model of the proposed ramp has been constructed by the Bureau of Reclamation at their Denver facility and this model was reviewed by the design team and Biological Response Team (BRT) in early November 2010. The model has illustrated the overall efficacy of the proposed structure while at the same time identifying some features that required modification to meet Pallid passage requirements. A design review meeting was held November 18, 2010 to discuss the status of the design and to discuss a number of design options that remain open at this time. Rock ramp design efforts will continue in 2011.

III.D.VIII. Adaptive Management / Future Projects / Vision Forward

III.D.IX.1. Status and Organization of Adaptive Management Strategy

A multi-agency PDT is currently in the process of developing a draft Adaptive Management strategy for the shallow water habitat sub-program. A draft of this document is anticipated in the spring of 2011. Currently draft objectives and performance metrics have been developed which focus on monitoring the physical and biological changes in the river due to construction activities.

III.D.IX.2. Lessons Learned and Observations

The list below describes some of the more notable items:

- Construction of longer chutes should receive higher priority than short chutes
- Promote channel movement through the use of structures or large woody debris.
- Avoid designing chute entrances that may block upstream migration of fish (e.g., high sills or constricted entrances with high velocities and turbulence).
- Avoid designs that promote sedimentation at chute entrances; keep entrances open so desired flows can be achieved.
- The variation in fish abundances seen among the three years of sampling indicates that a long term monitoring effort would be needed to detect population trends in chutes or backwaters. Furthermore, fish data from the chutes and backwaters should be compared to data from the main channel to determine how the chutes and backwaters are functioning with respect to main channel fish use.

III.D.IX.3. Recommendations/Future Direction of Implementation

These are anticipated to be developed and refined during FY11 and FY12 as part of implementation of the SWH AM strategy.

IV. Flows and Sediment

IV.A. Annual Operation Plan

In December 2010, the Corps’ Missouri River Basin Water Management Division (part of NWD) prepared the Missouri River Mainstem System (System) 2010-2011 Annual Operating Plan (AOP), which presents information regarding the Corps’ planned regulation of the System through December 2011. The information provided in the AOP is based on water management guidelines designed to meet the regulation objectives of the Missouri River Mainstem Reservoir System Master Water Control Manual (Master Manual). The results of this flow management, with regard to compliance with RPA elements of the BiOp, will be described in further detail in the Missouri River Mainstem System Summary of Actual 2010 Regulation report (released April 2011). The System document, “System Description and Regulation,” published in November 2007, presents a summary of pertinent data and a description of the System and discusses the regulation of the System to serve the Congressionally-authorized project purposes. The
Missouri River Basin Water Management Division, located in Omaha, Nebraska, directs the regulation of the System to serve the Congressionally-authorized project purposes of flood control, navigation, hydropower generation, irrigation, water supply, water quality control, recreation, and fish and wildlife.

IV.B. Flow Modifications

The technical criteria presented in the Master Manual includes provisions for two ‘spring pulses’ out of Gavins Point Dam, one in late March and another in May. These technical criteria also include System storage ‘precludes’ for each of the spring pulses to be measured on March 1 and May 1 of each year. The spring pulse technical criteria, which was added to the Master Manual in 2006, sets the storage preclude at 40 MAF for both pulses. Additional information on the spring pulse criteria is included in the Master Manual or the System document, “System Description and Regulation,” published in November 2007, and in the annual AOPs.

In 2010, System storage on March 1 was 54.6 MAF, which was above the minimum storage level of 40.0 MAF required to conduct the March pulse. The March spring pulse, with peak releases of 5,000 cubic feet per second (cfs) above navigation service flows minus the flow from the James River, was scheduled to coincide with the start of the navigation season. However, the March pulse was not implemented in 2009 due to high downstream flows. During the March pulse period, flows on the James River were also in excess of 5,000 cfs.

System storage on May 1 was 59.4 MAF, well above the 40.0 MAF storage criteria. The May spring pulse was scheduled to be implemented between 1 May and 19 May base on the technical criteria. The May spring pulse was not implemented in 2010 due to downstream flows in excess of the downstream flow limits.

Considerable monitoring was conducted by the Corps’ Omaha and Kansas City Districts, the USGS, USFWS, and state game and fish agencies to better understand the impacts of the May 2010 releases and natural spring rises on the Missouri River from Gavins Point Dam to the mouth. These monitoring efforts and the subsequent evaluation of the data acquired focused on impacts to native river fish (especially the endangered pallid sturgeon), drainage from riparian lands, and groundwater levels adjacent to the Missouri River. Various reports are being, or will be, prepared presenting the findings of these monitoring and evaluation efforts, all of which were conducted as part of the Integrated Science Program of the MRRP (discussed in Section IV, Science of this report).

IV.C. Unbalanced System Regulation

The unbalancing of the three reservoirs to benefit reservoir fisheries and the endangered interior least tern and threatened piping plover was not implemented in 2010 as Fort Peck continued to recover from the recent long-term drought. Although unbalancing was not implemented, the large variability of reservoir levels in recent years did benefit the reservoirs by flooding vegetation that had established during the drought years.

IV.D. Fort Peck

The Fort Peck ‘mini-test’ was not implemented in 2010. With regard to the Fort Peck mini-test, a priority for pallid sturgeon recovery has been placed on the Intake Diversion Dam Project. The Fort Peck mini-test and full test flows will be deferred until the efficacy of the Intake Diversion Dam Project has been assessed. The groundbreaking for this project took place in August 2010. In the meantime, background data on native river fish, especially the pallid sturgeon, are being obtained and evaluated on the river reach downstream from Fort Peck Dam. See Section IV.D. for more details.

IV.E. Lewis and Clark Sediment Study

The Lewis and Clark Lake Sediment Management Study (LCLSMS) was developed to examine the engineering viability of moving deposited sediments from Lewis and Clark Lake into the Missouri River downstream of Gavins Point Dam. In the 2003 Amended BiOp, the USFWS stated, ‘The Corps shall
research and develop a way to restore the dynamic equilibrium of sediment transport and associated turbidity in river reaches downstream of Fort Peck, Garrison, Fort Randall, and Gavins Point Dams. Sediment bypass around large dams is feasible (Singh and Durgunoglu 1991). Bed degradation below dams and head cutting at the mouths of tributaries might be addressed with grade control structures. Weir notches at grade control structures would allow for fish passage to the tributaries. Because of the large sediment deposition zone at the upper end of Lewis and Clark Lake and its proximity to Gavins Point Dam, Gavins Point may provide the best opportunity for a pilot study."

Initial consideration of using flows through Gavins Point Dam to transport deposited sediment was not strongly supported. Additional research on the Lewis and Clark Lake reach showed that there is the possibility of physically transporting sediments through Lewis and Clark Lake (Engineering and Hydrosystems, 2002). A number of different flow and stage scenarios were suggested by this research. With the recommendation for a study at Gavins Point Dam by the 2003 Amended BiOp and proof of concept provided by the 2002 Engineering and Hydrosystems’ study, the LCLSMS was initiated in 2005.

Project Goals: The LCLSMS is an engineering viability study. As defined, the study will deal only with the physical processes of hydraulic flow, sediment erosion, sediment transport, and sediment deposition. Environmental, economic, political, and quality of life issues are not considered in the scope of this study. The project goals, as stated in the LCLSMS draft Project Management Plan (PMP), are:

- Determine the hydraulic capacity to transport sediment in and below Lewis and Clark Lake.
- Develop estimated final reservoir geometries as a result of flow alternatives.
- Determine downstream sediment transport capacity and possible deposition zones.
- Develop a test flow to mimic the hydraulic alternative most likely to result in the desired outcome.
- Protect existing project infrastructure.

Timeline: The LCLSMS began with the development of the study plan and scope of work for modifying GSTARS3 by the Colorado State University, Hydroscience and Training Center (HTC) in 2005. Award of the work to develop GSTARS3-HTC signaled the beginning of the study in late 2005. The current schedule expects to see the completed project by the summer of 2011.

The LCLSMS is broken into seven phases. These phases are:

- Phase 1: Modification of the GSTARS reservoir sediment transport model to allow for an unsteady-state flow analysis. (Creation of GSTARS4 model) – Done previously.
- Phase 2: Collection of river and reservoir geometry and sediment samples between Fort Randall Dam and Sioux City. Agency workshop and public meeting to gather input on developing alternatives. Done previously.
- Phase 3: Verification of the GSTARS4 model. Complete 2010
- Phase 4: Development and analysis of alternatives using the GSTARS3-HTC model from Fort Randall Dam to Gavins Point Dam. Complete late spring 2011
- Phase 5: Development of a HEC-RAS v.4 downstream computer model from Gavins Point Dam to Sioux City. Complete summer 2011
- Phase 6: Implementation of the HEC-RAS v.4 model using output files from the GSTARS3-HTC model. Complete summer 2011
- Phase 7: Completion of the LCLSMS and recommendation of an alternative for possible further testing. Complete summer 2011

A public/agency meeting will be held to disseminate results during this phase, initially scheduled for the spring of 2011. Complete summer 2011

During 2010, phases 3 and 4 were completed, and phases 5, 6, and 7 scheduled to be completed by late spring 2011. Final delivery of the GSTARS4 modeling results report from Colorado State University is expected in January 2011. Complete summer 2011
IV.F. National Academy of Sciences Sediment Study

The National Academies study (NRC report) was initiated in 2008 for the primary purpose to provide independent science review relating to concerns with nutrients from shallow water habitat creation raised by the Missouri Clean Water Commission in 2007. However when scoping the study, the Corps took the opportunity to seek input for addressing other aspects of the Missouri River Recovery Program sediment management activities. For example, the Biological Opinion has several requirements regarding sediment management, namely Sections B.3 and IX.1.a.iii. Under Section B.3 there are requirements to initiate sediment transport studies, which lead to the Lewis and Clark Lake Sediment Study addressed in the previous section of the report.

“The Corps shall research and develop a way to restore the dynamic equilibrium of sediment transport and associated turbidity in river reaches downstream of Fort Peck (Segment 2), Garrison (Segment 4), Fort Randall (Segment 8), and Gavins Point Dams (Segment 10), and stop or reverse bed degradation of the river. Sediment input is necessary to restore in-stream habitats and turbid waters.” – BiOp page 97

Related quotes from page 82 of the NRC report related to sediment by-pass as an alternative state that

“There are two fundamental strategies for moving sediment past reservoirs and dams: capturing and diverting sediment before it deposits in the reservoir, or re-mobilizing sediment that has accumulated within the reservoir. The first involves constructing a canal or pipeline to collect and convey sediment over the dam or through low-level outlet works; this is the only option in very large reservoirs.”... “Gavins Point Dam and its reservoir, Lewis and Clark Lake, represent an example of a system where flushing is likely to be the best solution for moving sediment past the dam (Coker et al., 2009).”... “Sediment bypassing opportunities have been designed into Chinese dams at Three Gorges on the Yangtze River and at Xiaolangdi on the Yellow River; and they have been retrofitted into the rock wall of the canyon at the older Sanmenxia dam on the Yellow River.”... “The effectiveness of their operations has not yet been widely documented or analyzed.”

Discussions in the NRC report point towards the Corps being on the correct path for exploring options for Gavins Point, and highlight the challenges associated with the larger dams and uncertainties due to the newness of technologies to bypass sediments at similar sites worldwide. Additional strategies to reintroduce sediment related to Section B.3. of the BiOp were also discussed by the National Academies on page 88.

“This chapter discusses several other alternatives (beyond ESH and SWH) that might be employed to reintroduce additional sediments into the Missouri River.”... “Implementing combinations of these alternatives would require current Missouri River planning efforts (MRERP and MRAPS) to formulate and evaluate combinations of the actions discussed in this chapter”

“Primary alternatives that might be employed to re-introduce additional sediment into the Missouri River are: removing bank stabilization and control structures; (reductions in) commercial dredging; bypassing sediment around mainstem dams; dam removal; and increasing sediment from tributaries. Implementation of any of these alternatives would be constrained by financial, technical, and other factors. A major constraint on any alternative is the degree to which current economic activities, transportation infrastructure, and public safety depend on the existing system of dams and river bank control structures.”

Specific to habitat creation projects, Section IX.1.a.iii of the BiOp calls on the Corps to increase sediment transport.
“The Corps shall, in designing and implementing sandbar and shallow water habitat restoration, determine how these features may contribute to the sediment deficit that exists in the lower river. For example, set back levees could be developed with erodable banks to allow for sediment input and redistribution. The Corps shall incorporate to the maximum extent, the relevant features to restoration projects to provide sediment to the lower river.” – BiOp page 238

The NRC report considered sediment from emergent sandbar projects and also analyzed upper bound limits of sediment from shallow water habitat projects. General statements from the NRC report indicate that the projects are moving in the direction specified by the BiOp, for example on page 88:

“These Emergent Sandbar Habitat and Shallow Water Habitat projects are reintroducing some sediment into the Missouri River, and are gradually reintroducing channel mobility and hydraulic connections between the main channel and its floodplain that support new habitat formation.”

Page 77 of the NRC report briefly mentioned the limited degree for which emergent sandbar habitat creation projects can affect the sediment deficit.

“The constructed bars gradually erode, however, and their sand is re-distributed to the bed with no net effect on the river’s sediment balance.”

Specific statements regarding the degree to which upper bound estimates of sediment from SWH creation and sediment bypass around Gavins point could contribute to the sediment deficit were also provided by the NRC report on page 87-88.

“If all the sediment excavated for the Corps of Engineers’ shallow water habitat projects were to be delivered to the channel, the added sediment would equal about 34 million tons/year. This would represent roughly a 10-20 percent increase in sediment delivered to Louisiana for at least the next 15 years, depending on the trapping efficiency of the Mississippi floodplain. This figure is less than the annual 250 million ton ‘deficit.’ The bypassing of sediment from Lewis and Clark Lake around Gavins Point Dam would at best increase the supply of wetland constructing sediment to the Mississippi delta by only a few percent. Other prospects for mobilizing sediment in the Missouri and its tributaries are more likely to have local effects on bar building and local channel mobility than to contribute significantly to wetland construction in the Mississippi delta.”

Page 83 of the NRC report provides more specifics on sediment bypass around Gavins Point and potential to influence bed degradation trends and the sediment deficit.

“It has been estimated that only about 6 MT/yr of sediment currently accumulate in the lowermost reservoir behind Gavins Point Dam (Coker et al., 2009).”... “Most of the sandy sediment entering this reservoir is stored at the upstream end of the Niobrara River delta in Lewis and Clark Lake. There are severe constraints on bypassing coarse sandy sediment”... “it was estimated that 60 percent of the released sediment would be silt and clay and approximately 25 percent of the sand would be fine enough to behave as washload through the degraded reach (estimated from figures in Coker et al., 2009). Therefore this action will result in little if any sediment settling to the bed of the lower Missouri River below the dam to ameliorate the bed degradation.”

“even if the entire 6 MT/yr that might bypass Gavins Point dam were to reach St. Louis, it would constitute only a roughly 10 percent increase in the total sediment flux into the Mississippi from the Missouri.”
Accordingly, the strategies of sediment bypass around Gavins Point, ESH creation, and SWH creation appear to have a limited and or temporary ability to influence the sediment deficit on the lower Missouri River.

At the same time, the NRC report also highlighted the importance of sediment to native species and identified several long-term impacts from the lack of sediment including reduced turbidity, loss of habitat for some native species, bed degradation (and related infrastructure problems), and reduced volumes of sediments transported downstream to the Mississippi River and delivered to the Mississippi River delta region (NRC 2010). Sediment management, both for native species and for social and economic reasons, will continue to be a challenge, and will be a key component of considering stresses on focal natural resources and for formulating alternatives as part of the Missouri River Ecosystem Restoration Plan.


IV.G. Adaptive Management Activities

The Corps is in the process of convening an Independent Science Advisory Panel to assist in the development of a scope and various elements of an Adaptive Management strategy for the Spring Pulse. The development of this Spring Pulse AM strategy is anticipated to be initiated in FY11 and is likely to continue through FY13.

V. Conservation Recommendations

V.A. Bald Eagle

Bald eagles (Haliaeetus leucocephalus) and other native wildlife species that use the mainstem of the Missouri River depend on the adjacent cottonwood forest for nesting, roosting, and wintering habitat. The establishment and preservation of early successional forest along the Missouri River not only provides habitat for the bald eagle, but creates a riparian floodplain system that is a benefit to other wildlife and aquatic resources that utilize similar habitat along the Missouri River.

V.A.1. Status

The bald eagle was reclassified as threatened in 1995 and was removed from the Federal threatened and endangered species list on August 8, 2007. However, the bald eagle is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The Corps recognizes federal laws protecting the bald eagle, and that maintaining cottonwood forest is an integral component of the current MRRP.

V.A.2. Bald and Golden Eagle Protection Act

With the 2007 delisting of the bald eagle, the Bald and Golden Eagle Protection Act (BGEPA) became the primary law for incidental takes. In most instances, the USFWS is continuing the Reasonable and Prudent Measures (RPMs) presented in the BiOp under the Endangered Species Act (ESA) to address incidental takes under the BGEPA. However, not all incidental takes under the ESA are considered incidental takes under the BGEPA. If the USFWS issued a biological opinion to a Federal agency for a take under the ESA, the Federal agency should evaluate the action under BGEPA and submit an evaluation to the USFWS, indicating if the action constitutes a take under BGEPA. If the action constitutes a take under BGEPA, the Federal agency can request that the USFWS apply the remedy in the BiOp to the take under BGEPA. The Corps will continue to follow the recommendations of the BiOp; however, it is the responsibility of the Federal agency taking action to notify and consult with the USFWS regarding potential for a take under BGEPA.
The 2003 Amended BiOp requires that the Corps fulfill three RPMs: (1) map the health of the remaining cottonwood forests, (2) create a cottonwood regeneration plan, (3) and ensure that no more than 10 percent of the cottonwood forest that is suitable bald eagle habitat is lost as eagle habitat.

Corps cottonwood management team members continued to oversee the contract to conduct and write a Cottonwood Management Plan / Programmatic Environmental Assessment (CMP/EA) in 2010. The purpose of the CMP/EA is to guide management actions along the Missouri River to provide a diverse age-class of cottonwood stands, to the extent possible, over the natural range of cottonwood forests. This Plan recommends measures the Corps and other entities can implement to protect cottonwood stands that are currently valuable to the bald eagle, as well as establish new cottonwood stands to keep the riparian habitat along the river a viable forest community. Letters were mailed in November 2010 to all tribes, agencies, and other entities listed in the 2004 Programmatic Agreement for the Operation and Management of the Missouri River Basin Main Stem System for Compliance with the National Historic Preservation Act, as amended. The draft CMP/EA was completed and released for public review, and is expected to be finalized in January/February 2011. The draft document may be viewed at the following URL: http://www.moriverrecovery.org/mrrp/?p=136:134:2354488838300224::NO. When the document is finalized, it will be incorporated into specific site cottonwood management plans.

To develop the CMP, the Corps is developing a landscape-level cottonwood riparian community model to assess habitat quality along six priority reaches identified by the USFWS in the 2003 BiOp. Work on the model continued through the fall of 2010, culminating in two reports, the model documentation and the Decision Support Structure report. The model for Segment 10 is anticipated to be completed in 2011. Completion of other priority river segments is anticipated by 2016, pending funding.

Conceptual site design has started for the following three sites within Segment 10 of the Missouri River: Audubon Bend (Wynot Farms), Rush Island, and Sister Island. These areas were identified as the most suitable locations within Segment 10 where natural regeneration would have a higher degree of success. Site locations were based on a review of current and historic aerial mapping and then compared to the Land-Capability Potential Index (LCOI) prepared for the Segment 10 reach. Corps cottonwood management team members and key team members of the MRRP will begin to meet early 2011 to discuss and consider alternative site designs, implementation strategies, and restorative measures that will benefit recovery efforts for threatened and endangered species addressed in the 2003 BiOp.

Several cottonwood management team members delivered several presentations at a session focused on the cottonwood management program at the MRNRC Conference and BiOp Forum, which was held March 15-19, 2010 in Nebraska City, Nebraska.

2010 MRNRC Conference & BiOp Forum; Cottonwoods Session

Michael Scott – “Historical Riparian Cover Types in the Missouri Breaks National Monument”

Mark Dixon – “Status and Trend of Cottonwood Forests along the Missouri River from Kansas City to Montana”

Adam Benson - “Effects of Forest Type and Age Class on Songbird Populations across a Cottonwood Successional Gradient within the Missouri National Recreational River”

Lisa Rabbe - “Using GIS to Prioritize Cottonwood Restoration Site Selection on the Missouri River”

Suzanne Boltz - “The Cottonwood Mgmt Plan: Tools for Other Restoration Efforts”

Lisa Rabbe -“Ecosystem Modeling for the Missouri River Cottonwood Mgmt Plan and its Potential Uses and Relationship to MRERP”

VI. Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project
VI.A. Introduction

This section of the report presents the current status and future plans for implementation of the Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project, Iowa, Nebraska, Kansas, and Missouri, hereinafter referred to as the “Mitigation Project.” Congress first authorized construction of the Mitigation Project in Section 601(a) of the Water Resources Development Act of 1986 (Public Law 99-662). Section 334(a) of the Water Resources Development Act of 1999 (Public Law 106-53) modified the Mitigation Project by increasing the amount of acreage to be acquired and/or mitigated. The total amount of land authorized for mitigation is currently 166,750 acres, replacing 32 percent of the habitat losses attributed to construction of the Missouri River Bank Stabilization and Navigation Project (BSNP).

The Mitigation Project will acquire, develop and preserve native aquatic, wetland, and upland habitats on individual mitigation sites. The Mitigation Project location is in and adjacent to the Missouri River from Sioux City, Iowa to the mouth near St. Louis, Missouri, a distance of 735 river miles.

VI.B. Background

The original authorization for the Mitigation Project was based upon a report of the US Army Corps of Engineers, Chief of Engineers, dated April 24, 1984, entitled “Missouri River Bank Stabilization and Navigation Project, Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan.” The authority to prepare the Feasibility Report was the 1958 Fish and Wildlife Coordination Act (P.L. 85-624). The Final Feasibility Report described the fish and wildlife and habitat losses that have occurred due to the BSNP. Also described in the Report are various measures to mitigate for these losses and a recommended plan to mitigate, preserve, or develop 48,100 acres of habitat. During the public involvement process for the EIS and Feasibility Report for the Mitigation Project, a policy of obtaining lands only from willing sellers was established.

Preconstruction Engineering and Design (PED) for the Mitigation Project was initiated in December 1989. As a part of PED work, the Corps completed the “Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Reaffirmation Report, July 1990.” The purpose of the Reaffirmation Report was to confirm that the plan recommended in the 1984 Feasibility Report and Final EIS was still viable. PED was completed in September 1991 and the Mitigation Project has been in a “Construction” status since that time. The Reaffirmation Report explains the various aspects of the Mitigation Project such as the approval process, funding levels, costs, schedules, documentation and involvement of other State and Federal agencies. Kansas City District is responsible for implementation on the individual sites located in Missouri and Kansas. Omaha District is responsible for implementation on the individual sites located in Nebraska and Iowa.

An additional portion of the Reaffirmation Report was dedicated to the establishment of roles and responsibilities for execution of the program in accordance with an Agency Coordination Team. Because the BSNP was constructed and maintained by Federal action, the Mitigation Project is 100 percent Federally funded. However, even though there is not a cost share sponsor, Federal and State fish and wildlife agencies participate in the implementation of the Mitigation Project. The agency participation is primarily through an Agency Coordination Team that was developed to formulate and decide upon the various acquisition sites and appropriate mitigation for the sites. The members of the Agency Coordination Team are the Iowa Department of Natural Resources, the Nebraska Game and Parks Commission, the Kansas Department of Wildlife and Parks, the Missouri Department of Conservation, and the U.S. Fish and Wildlife Service. Other agencies have also been invited to participate in team meetings.

"Real Estate Design Memorandum No. 1" was completed by CENWK in March 1990. This report was endorsed by the Corps of Engineers’ Missouri River Division in July 1990, and approved by Corps of Engineers’ Headquarters in May 1991. This report established the real estate requirements for the acquisition in fee or easement of 29,900 acres of privately owned lands and for any real estate requirements for development of 18,200 acres of existing public lands within the four affected States. WRDA 99 expanded the amount of acres authorized for the Mitigation Project from 48,100 acres to a new total of 166,750 acres. As directed in the authorization, the Corps of Engineers worked with the Agency Coordination Team to develop a cost estimate to implement the additional acres authorized by WRDA99.
In December 2001, the Corps completed a document titled “Missouri River Mitigation Project, Missouri, Kansas, Iowa, and Nebraska, Report to Congress, in Compliance with the Water Resources Development Act of 1999”. This document presented a cost range for implementation of the WRDA 86 authorization and WRDA 99 modification from $826 million (includes development of 7,000 acres of shallow water habitat) to $1.425 billion (includes development of 20,000 acres of shallow water habitat) based on October 2001 price levels. Also included was a ceiling of 6% of the total modified mitigation efforts to be expended on monitoring efforts.

Since the expanded authorization of WRDA99 resulted in a significant change to the Mitigation Project, from August 2001 to June 2003, the Corps of Engineers prepared a Supplemental Environmental Impact Statement (SEIS) for the Mitigation Project. The draft SEIS was published in September 2002. The Final SEIS was published March 1, 2003. The Corps of Engineers issued their Record of Decision on June 12, 2003. This decision, along with the Final SEIS, reflects the programmatic plan for implementation of the current mitigation program. As per the June 12, 2003 Record of Decision, the plan includes development of 7,000 to 20,000 acres of shallow water habitat to address pallid sturgeon habitat goals established by the U.S. Fish and Wildlife Service in the 2003 Amended BiOp.

VI.C. Mitigation Agency Coordination Team Activities

The Mitigation Agency Coordination Team (ACT) meets quarterly to discuss implementation of the Mitigation Project. ACT efforts are centered around the 1958 Fish and Wildlife Coordination Act, which calls on the U.S. Army Corps of Engineers to coordinate with the U.S. Fish and Wildlife Service and State Fish and Game Agencies on water resource development projects. The four Fish and Game Agencies for the Mitigation Project are the Iowa Department of Natural Resources, the Nebraska Game and Parks Commission, the Kansas Department of Wildlife and Parks, and the Missouri Department of Conservation. However, several other agencies and non-governmental organizations interested in conservation are invited to attend such as the Environmental Protection Agency, U.S. Geological Survey, Natural Resource Conservation Service, Missouri Department of Natural Resources, and the Nature Conservancy. Coordination meetings in FY 2010 were held as follows:

- October 7, 2009 – EPA Region 7 Headquarters, Kansas City, KS
- January 27, 2010 – Missouri Department of Conservation (MDC) Office, St. Joseph, MO
- April 21, 2010 – MDC Office, St. Joseph, MO
- July 7, 2010 – MDC Office, St. Joseph, MO

Topics discussed include a review of existing real estate criteria, mitigation site mapping and activities to complete land cover maps and post them on the web pages, review of habitat development projects, monitoring and adaptive management plans, lessons learned in developing shallow water habitat, project priorities, and ongoing discussions of current and future year funding and work plans.

VI.D. Mitigation Project Monitoring

In 2005, a monitoring and evaluation (M&E) plan was prepared by an M&E Committee appointed by the Mitigation ACT. The goal of the M&E plan is to understand the physical and biological responses to Mitigation Project’s actions within an adaptive management context. The objectives of the M&E plan include the following:

- Track location, type, and physical characteristics of each mitigation site
- Quantify habitat use and population responses of key species
- Recommend adaptations based on new information
- Gain understanding of the physical and biological responses through time
- Formalize information transfer among all to communicate lessons-learned and increase the effectiveness of project actions.

This information will help determine the Mitigation Project’s level of success and provide a basis for future adaptive management. By monitoring the mitigation sites and collecting basic habitat data, the ACT can
determine whether the mitigation sites are performing as expected. Information obtained through the monitoring of sites will enable decision makers to recommend improvements to existing sites and make more informed decisions about planning and design of future sites.

In the 2005 plan, the M&E committee agreed to a three tiered M&E plan where tier 1 will gather data on the physical aspects of the mitigation sites, tier 2 will document the project's biologic response, and tier 3 activities will include focused research to test a specific hypothesis. However, in recent years within the study design of each of the monitoring projects involving mitigation activities, the focus is being shifted from documenting biological response to testing hypothesis. As such, monitoring activities are grouped into two categories: physical monitoring and science integration with management action.

VI.D.I. Physical Monitoring

Physical monitoring activities performed in FY 2010 include ongoing monitoring of land cover and limited hydrographic surveys to document how some of the shallow water habitat sites are developing as part of the Corps engineering assessment. An effort to estimate the amount of existing shallow water habitat on the Missouri River downstream of Ponca, Nebraska was also completed as discussed under the pallid sturgeon shallow water habitat sections of the report.

VI.D.I.1. Land Mapping / Land Cover Summary

Habitats are classified using the National Wetland Inventory (NWI) for aquatic and wetland areas and the National Land Cover Data (NLCD) classification system for all upland habitats. The existing habitat conditions are being documented for each mitigation site to establish the habitats that existed prior to acquisition by the Mitigation Project. This data will be established and maintained by the Corps as a GIS land cover data layer. Mitigation and shallow water habitat funds out of Kansas City District are used to complete landcover maps at all sites and document the baseline conditions for use in NEPA documents. Newly purchased sites are typically mapped within the first year. Previously mapped sites are updated at least once every five years to track changes over time and monitor progress, but can be done more frequently such as after major phases of work or as needed to create NEPA compliance documents. Since a monitoring effort was not included in the original authorization, there are many sites without baseline habitat information. Therefore, the Corps has been working with the ACT to generate pre-purchase maps at some of the older sites to establish the baseline habitat conditions. Desired conditions maps are often completed when going through the NEPA process, and can be a useful tool for tracking progress towards the goals for each site. The GIS mapping team focused activities in 2010 on completing several draft maps, visiting over 20 mitigation sites along with Corps biologists and the management agencies to ground truth these maps and provide quality assurance. Additionally, 15 site updates and 13 initial land-cover depictions were completed.

A key highlight of FY 2010 is that these landcover maps were made available to the public on the MRRP website, www.moriverrecovery.com, under the BiOp/Mit tab and Mitigation Site link. Additional mapping tools are now available online, including two map views, the Missouri River Basin map view and the Missouri River Historical Map view.

Mitigation land cover acreages as currently mapped are presented in Figure 35. This type of analysis allows comparison of how land cover has changed since the sites were acquired for the Mitigation Project. Source dates for the mapping vary from 1985 to 2009. In general mapping to date shows an increase in grasslands, deciduous forest, and forested and scrub shrub wetlands, and a corresponding decrease of cultivated acres.
Historic land coverage information can provide useful context for planning restoration activities. Accordingly, the Corps compiled land coverage for the 1879 data set. The 1879 data set extended from river bank to river bank and from the river’s mouth in St. Louis to current day river mile 883. Figure 36 presents a summary of the 1879 dataset. A total of 1,555,606 acres were included in the dataset which showed approximately 53 percent of the mapped area in some type of agricultural production (pasture or cropland), with just over 730,000 acres in the other land cover categories.

- Several other mapping projects have been completed in FY 2010, and a partial list is provided below:
  - Overton Bottoms—200 Years’ Worth of Land Cover
  - Historic Land Cover Change in Kansas City- A Look at 1879 and 1894 Mapping
  - Upper Missouri River Basin illustrating Corps Projects and Lakes
  - Series of maps illustrating mitigation site boundaries, levee locations, and access points.
  - Updated Mitigation Site Location Map
  - Shallow Water Habitat and Emergent Sand Bar Habitat Site Map
  - Series of maps depicting chute alternatives for a Cora Island public meeting
  - MRRIC Map update
  - Tribal Lands within Missouri River Basin
  - Over 15 mitigation site landcover updates

---

**Figure 36: Land Cover Mapping Summary for Mitigation Sites**

---

**Figure 37: 1879 Land Cover Mapping Summary for the Missouri River Floodplain**
VI.D.I.1.a. Data Acquisitions

Topographic data is valuable to the Missouri River Recovery Program for a number of reasons. For example, data collected during low flows can be utilized for computing shallow water habitat acreage. Another useful application of detailed topographic data in the floodplain is in habitat design for wetlands and shallow water habitat. Collection of this type of data can often be expensive. Accordingly, the Corps has been looking at ways to partner with other agencies to minimize the cost of the data.

In 2009, the Corps entered into an agreement with the USGS who was working to improve the National Elevation Dataset (NED) in areas in and surrounding Boone County, Missouri. The Corps had a need for the portions within the floodplain of the Missouri River, but just out of the USGS area of interest to measure shallow water habitat acreage between Missouri River Mile 186.1 and 148.9, to monitor and improve habitat at the adjacent Overton Bottoms, Eagle Bluffs, and Providence Bend Mitigation sites, and perhaps to also conduct studies on how habitat restoration efforts have benefited and or impacted the floodplain as part of a future Flow Corridor Study. A similar agreement was utilized in 2009 to obtain data in the Missouri River Floodplain along Atchison and Leavenworth Counties in Kansas. The Corps received the data in FY 2010.

Additional soils mapping data was received in FY 2010 through cooperative work with the NRCS funded in FY 2009. Sites collected include Cora Island, Providence Bend, Bakers Bend (including portions of Cranberry Bend unit of the Big Muddy National Fish and Wildlife Refuge), and Dalbey Bottoms. Previous data was also collected at the Jim and Olivia Hare and Wolf Creek sites. This type of data can be useful in planning wetlands and natural vegetation restoration. Need for similar data at future sites will be evaluated on a site by site basis.

VI.D.II. Science Integration with Management Action

Activities performed in FY 2010 include the Functional Wetland Assessment (Herp study), Habitat Assessment and Monitoring Program (HAMP), and Water Quality Monitoring (WQM). Study designs of HAMP and WQM also monitor physical changes associated with shallow water habitat. HAMP and WQM activities are discussed in Section III.D. of the report.

VI.D.II.1. Functional Wetland

FY 2010 marked the first full year of implementation for the Functional Wetland Assessment. The goal of this project is to gather the data needed to determine what constitutes a successful wetland restoration, given the desired endpoints of the U.S. Army Corps of Engineers (USACE). An assessment of herpetofauna - primarily amphibians - will be used as indicators of wetland quality. This will be accomplished by quantifying the occurrence and recruitment of amphibians at existing mitigation sites, and by formulating models of quality wetland restorations. These models will then be used by managers in planning future restorations and for adaptive management of existing restorations.

The Functional Wetland Assessment departs from previous mitigation monitoring efforts by focusing within eco-regional boundaries and by tightly linking monitoring with hypothesis testing in an adaptive framework. The program design consists of two parts: frog call surveys to determine occupancy rates for a large number of wetlands on numerous restoration properties across a broad geographic area coupled with intensive sampling of frogs, turtles and salamanders to assess abundance and recruitment on eight restored wetland complexes in four states. The geographic focus of the project is the Missouri River Valley in Nebraska, Iowa, Missouri and Kansas, an ecologically important physiographic/ecological region of the Great Plains.

VI.E. Land Management Activities

Work continued at several mitigation sites to restore native vegetation, control invasive species, allow public access, and other operational activities. A key component of the land management is the partnerships with several State and Federal Agencies for on-site management. Annual management plans are developed jointly between the Corps and the on-site management partners to determine activities and
funding for each site. Funding sources include MRRP funding for sites that are still in development or planning stages, agricultural lease funds, and Operation and Maintenance funding for completed sites. A natural resource manager has been assigned to the Mitigation Project for both Kansas City and Omaha District to oversee implementation of these activities. A more detailed accounting of completed and planned activities for each site, and management of those sites is provided in Appendix D.

VI.E.I. Boundary Surveys

The American Recovery and Reinvestment Act provided an opportunity to initiate required boundary surveys and set up signage for several priority sites including Elwood Bottoms, Baltimore Bend, Audubon Bend, Copeland Bend, Dalbey Bottoms, and Auldon Bar. Work was awarded for these sites in April 2010 and is anticipated to be completed by March 2011. One additional site was awarded with appropriated funds in September 2010 to complete boundary surveys for the newly acquired Burr Oak site. Boundary surveys are useful for a number of reasons, for example ensuring project designs and public users do not impact private property.

VI.F. Real Estate Acquisition

During the Feasibility effort for the Mitigation Project, a breakdown of the originally authorized 48,100 acres was established. This was completed through coordination with the four affected States and the U.S. Fish and Wildlife Service. The original authorized acres were divided up between the States proportional to the amount of fish and wildlife losses attributed to each State. After WRDA99 expanded the authorization by 118,650 acres, the additional acres were also broken down during the effort to update the Supplemental Environmental Impact Statement for the Project. In the SEIS, affects of dividing the additional acres between the States proportionally to the amount of river bank miles was evaluated. Table 22 presents the current distribution of lands authorized in both WRDA86 and WRDA99, and remaining authority for those distributions after subtracting the existing site acquisitions. All private lands authorized by WRDA 86 have been acquired.

<table>
<thead>
<tr>
<th>State</th>
<th>Private Lands Authorized WRDA 86 (acres)</th>
<th>Public Lands Authorized WRDA 86 (acres)</th>
<th>All Lands Authorized WRDA 99 (acres)</th>
<th>Total Authorized at 30 acres/mile*</th>
<th>Remaining WRDA 86 (Public) (acres)</th>
<th>Remaining WRDA 99 (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missouri</td>
<td>13,200</td>
<td>15,750</td>
<td>75,791</td>
<td>104,741</td>
<td>11,680</td>
<td>8,247</td>
</tr>
<tr>
<td>Kansas</td>
<td>2,350</td>
<td>0</td>
<td>9,282</td>
<td>11,632</td>
<td>1,553</td>
<td>0</td>
</tr>
<tr>
<td>Iowa</td>
<td>7,200</td>
<td>2,400</td>
<td>14,125</td>
<td>23,725</td>
<td>2,511</td>
<td>0</td>
</tr>
<tr>
<td>Nebraska</td>
<td>7,150</td>
<td>50</td>
<td>19,452</td>
<td>26,652</td>
<td>3,562</td>
<td>0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>29,900</td>
<td>18,200</td>
<td>118,650</td>
<td>166,750</td>
<td>19,559</td>
<td>8,247</td>
</tr>
</tbody>
</table>

*Assumes required Biological Opinion SWH acreage is equally distributed by river bank miles.

Throughout the remainder of the Mitigation Project, the Corps will be working with the Mitigation ACT to track acquisitions. As the acquisitions progress over the life of the Mitigation Project, changes to this distribution of the authorized acres may be necessary. Any changes will be approved by the Mitigation ACT and presented annually in future implementation reports, and will also be offered for discussion with the Missouri River Recovery Implementation Committee. The current process for acquiring lands begins with working with the Mitigation ACT to identify sites that have potential for restoration. The Corps completes a survey of willing sellers (both public and private) near the areas with the most restoration potential.

As of 19 October 2010, there have been 57,546 acres acquired for the Mitigation Project. This consists of fee title acquired on 44,656 acres that was formerly private land and no cost easements and/or licenses on 12,890 acres of existing public land. A total of 34.5% of the authorized 166,750 acres has been acquired. Acquisitions on the Mitigation Project in FY 2010 consisted primarily of in-holdings on three existing sites and two new sites (Grand River Bend and Sandy Point) totaling 804 acres. The largest acquisition for the Missouri River Recovery Program in FY 2010 was a 2,392 acre property called Audubon Bend on the National Recreational River. A total of 2,930 acres of formerly private land has been acquired to date on
the National Recreational River between Ponca, Nebraska and Gavins Point Dam. Accordingly, total lands acquired for the Missouri River Recovery Program as of 19 October 2010 have been 60,476 acres. Appendix D presents additional details for acquisitions at each site and summaries by state. Acquisitions in FY 2011 are anticipated to focus on the Mitigation Project reach between Sioux City, Iowa and St. Louis, Missouri in order to continue to meet the BSNP Mitigation and shallow water habitat creation requirements.

Interest in tracking and projecting future amounts of public lands in the Missouri River Floodplain between St. Louis, Missouri and Sioux City, Iowa has been expressed by MRRIC. This type of analysis takes into account others who own lands in the Missouri River Floodplain, such as the USFWS and States, regardless of whether or not these lands are to be utilized for the Corps Mitigation Project requirements. Based on USFWS acquisitions as of 30 September 2009, and known State ownership data, approximately 137,900 acres of public land exist in the Missouri River Floodplain in this reach of river, accounting for approximately 7 percent of the floodplain acreage. Projected future public land acreage is estimated at 286,800 acres if all USFWS and Corps authorities acquire the authorized acreage, representing 14 percent of the floodplain in public ownership in the future. Table 27 presents an overview of the data by state.

### Table 26: Cumulative Land Effects in Acres - Sioux City, Iowa to St. Louis, Missouri

<table>
<thead>
<tr>
<th></th>
<th>Iowa</th>
<th>Kansas</th>
<th>Missouri</th>
<th>Nebraska</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat Losses</td>
<td>65,400</td>
<td>55,100</td>
<td>304,900</td>
<td>96,600</td>
<td>522,000</td>
</tr>
<tr>
<td>USACE Owned Mitigation Lands</td>
<td>9,041</td>
<td>5,001</td>
<td>22,381</td>
<td>3,469</td>
<td>44,656</td>
</tr>
<tr>
<td>USFWS Owned Lands</td>
<td>1,432</td>
<td>0</td>
<td>17,168</td>
<td>2,209</td>
<td>22,699</td>
</tr>
<tr>
<td>State &amp; other Public Lands ²</td>
<td>22,180</td>
<td>0</td>
<td>44,030</td>
<td>4,960</td>
<td>71,170</td>
</tr>
<tr>
<td>Existing Public Lands</td>
<td>32,654</td>
<td>5,001</td>
<td>83,579</td>
<td>16,662</td>
<td>137,895</td>
</tr>
<tr>
<td>Remaining USACE Fee Title Authority (max)</td>
<td>10,654</td>
<td>6,631</td>
<td>66,610</td>
<td>17,061</td>
<td>100,957</td>
</tr>
<tr>
<td>Remaining USFWS Authority ¹</td>
<td>0</td>
<td>0</td>
<td>40,319</td>
<td>7,607</td>
<td>47,926</td>
</tr>
<tr>
<td>Future Public Lands</td>
<td>43,308</td>
<td>11,632</td>
<td>190,508</td>
<td>41,330</td>
<td>286,778</td>
</tr>
<tr>
<td>Total Floodplain acres ²</td>
<td>632,667</td>
<td>53,668</td>
<td>1,091,694</td>
<td>291,373</td>
<td>2,069,402</td>
</tr>
<tr>
<td>Percent of the Floodplain (current)</td>
<td>5%</td>
<td>9%</td>
<td>8%</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Percent of the Floodplain (future)</td>
<td>7%</td>
<td>22%</td>
<td>17%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Total county acres bordering the Missouri ²</td>
<td>2,687,996</td>
<td>1,286,527</td>
<td>9,086,525</td>
<td>2,695,563</td>
<td>15,756,611</td>
</tr>
<tr>
<td>Percent of the Counties in public ownership ³</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Percent future public lands / habitat losses</td>
<td>66%</td>
<td>21%</td>
<td>62%</td>
<td>43%</td>
<td>55%</td>
</tr>
</tbody>
</table>

¹ As of 30 Sep 2009, and including USACE-owned mitigations lands scheduled for management by Big Muddy Refuge
² Source: Adapted from USGS 2001
³ Does not include all public lands in the counties (floodplain only)

### VII. Missouri River Ecosystem Recovery Program

The Missouri River Ecosystem Restoration Plan (MRERP) is a study effort led by the Corps in partnership with the US Fish and Wildlife Service (USFWS) to develop a plan to mitigate, recover, and restore the Missouri River ecosystem. The MRERP will provide a long-term, focused analysis of restoration, mitigation, and recovery needs of the Missouri River for the next 50 years. The final product of the planning process will be a Record of Decision which identifies the agency’s plan for implementation of MRERP. As part of the plan, an environmental impact statement will be integrated to ensure that the environmental effects of restoration activities recommended in the plan are analyzed and considered before implementation begins. The plan will be prepared in consultation with other federal and state agencies, basin Tribes, and many other basin stakeholders, including the Missouri River Recovery and Implementation Committee (MRRIC).

The water resource development act (WRDA) of 2007 provided the authority directive for the Secretary of the Army for Civil Works to prepare the MRERP. Subsection (a) of Section 5018 of WRDA 2007 directs the Secretary of the Army, in consultation with the MRRIC, to conduct a study of the Missouri River and its tributaries to determine actions required to:
1. Mitigate losses of aquatic and terrestrial habitat;
2. Recover federally listed species under the Endangered Species Act; and,
3. Restore the ecosystem to prevent further declines among other native species.

During fiscal year 2010, the MRERP Project Delivery Team (PDT) conducted a wide array of activities. Primary focus centered on
- Revising draft Purpose and Need statement based on public scoping input.
- Development of Project Goals, the No Action Alternative, and the Affected Environment.
- Focal Natural Resource (FNR) Baseline Assessment.
- Identification of Social, Cultural, and Economic (SCE) values,
- Coordinating and communicating with basin Tribes, Cooperating Agencies, and working with the MRRIC.

The Notice of Intent for MRERP was posted on Monday, January 26th, 2009.

1. Purpose and Need.

The MRERP-EIS draft Purpose and Need statements were developed by the MRERP PDT in fiscal year (FY) 2007. The “Purpose statement” tells the audience what the Corps intends to accomplish by conducting the MRERP-EIS study. The “Need statement” tells the audience why the Corps is conducting an ecosystem restoration study of the Missouri River basin. Input was gathered and analyzed from public scoping sessions, MRRIC, Tribes, and the MRERP cooperating agencies on the draft Purpose and Need statements. In FY 2010, input was incorporated into the revised draft Purpose and Need statement and a Purpose and Need summary document was developed to communicate further justification of the planning effort. The draft purpose and need statement received leadership review and was presented to the MRRIC and the Cooperating Agency Team (CAT) in April 2010.

The following statements are the revised draft Purpose and Need statements; these will remain draft statements until the completion of the study. Please visit our website to view the draft Purpose and Need summary document: [http://www.moriverrecovery.org/mrrp/f?p=136:43:1291768838750901::NO](http://www.moriverrecovery.org/mrrp/f?p=136:43:1291768838750901::NO).

Draft Need Statement:

The need for the Missouri River Ecosystem Restoration Plan is to address current trends indicating diminished habitat, reduced populations of native species and communities, and altered physical processes such as flows, floodplain connectivity, and sediment erosion and deposition.

Draft Purpose Statement:

The purpose of the Missouri River Ecosystem Restoration Plan is to determine the actions required to:

a. mitigate losses of aquatic and terrestrial habitat,
b. recover federally listed species under the Endangered Species Act, and
c. restore the ecosystem to prevent further declines among other native species.

This purpose is intended to be broad enough to allow consideration of all reasonable alternatives required by the study authorization. The alternatives should be judged in part by their ability to be accomplished in harmony with the congressionally authorized purposes of the mainstem of the Missouri River, other relevant authorized purposes, cultural resource values, and social and economic needs for current and future generations by engaging the public and in consultation with Tribes, states, other federal agencies and the Missouri River Recovery Implementation Committee.

2. Draft Goals:

In FY 2009 and 2010, the MRERP team drafted project Goals. These Goals were developed primarily based on the Principles and Standards for Water and Related Resources Implementation Studies, Corps of
Engineer’s Program development guidance, U.S. Army Corps of Engineers Water Resource Development Policy, input gathered during a public involvement period, input from the MRRIC, cooperating agencies, Tribes, and the public. The MRERP draft Goals are as follows:

a. Restore the Missouri River ecosystem and its nationally scarce habitats.
b. Restore connectivity between important habitat areas.
c. Provide key life requisites for federal listed threatened or endangered species and native species at risk.
d. Restore degraded ecosystem structure, function, and dynamic processes to a more natural condition, including:
   1) Seek to establish appropriate hydrologic/geomorphic character in order to restore ecological function of aquatic, floodplain, wetland, and riparian systems.
   2) Seek to establish conditions and processes suitable for successful restoration of ecosystem structure and physical process.
e. Seek to establish a more sustainable ecosystem through a multi-partner approach to conserve, protect, and improve the fish, wildlife, plants, and habitats of the Missouri River for the benefit of the American people

Each Goal will be accompanied by either measurable objectives or planning processes which the MRERP will fulfill or implement. Each Goal is intended to further accomplish the draft Purpose statement provided in the Purpose and Need section above.

A draft “MRERP Goals” document has been posted to: http://www.moriverrecovery.org/mrrp/?p=136:43:1291768838750901::NO.

3. Focal Natural Resources Baseline Assessment:

The MRERP team is defining the conditions and pivotal processes (Key Ecological Attributes) of focal natural resources (FNRs) within the Missouri River and its floodplain. The primary outcome of defining the resource conditions/processes will be to fully understand the natural variation and conditions required for viable and functional habitats and native species. Resource conditions/processes are being assessed utilizing historic data, expert opinion and best available data related to species life-history patterns, population ecology, community processes, and ecosystem structure. A draft list of system FNRs, collectively encompassing the full range of biological diversity of the Missouri River ecosystem, has been developed and refined with input from the MRERP cooperating agencies, Tribes, technical experts, and the public. Five ecosystems and three individual species are included within the assessment and include the following:

a. Ecosystem FNRs:
   1) Rocky Mountain Foothills
   2) Upper Great plains
   3) Middle Great plains
   4) Lower Great plains
   5) Central Lowlands

b. Species FNRs:
   1) Interior Least Tern (Sternula antillarum athalassos)
   2) Piping Plover (Charadrius melodus circuncinctus)
   3) Pallid Sturgeon (Scaphirhynchus albus)

The ecosystem FNRs includes the natural habitat types of the Missouri River ecosystem. The species FNRs are native Missouri River species for which special management focus is required because they are rare and have unique requirements or threats that set them apart from the terrestrial and aquatic system types in which their habitats are found.
The MRERP team convened a group of technical resource experts from state and federal agencies and academia within the Missouri River basin in 2010. These experts were divided into two Technical Teams, Aquatic and Terrestrial. Expertise knowledge areas included: aquatic ecology, fisheries, geomorphology, invertebrates, ichthyology, herpetology, macrophytes, water quality, floodplain ecology, wetlands, groundwater, mammals, ornithology, prairie ecology, and forest ecology. Each technical team convened in person at three workshops and conducted dozens of working conference calls to develop the following products:

- Develop FNR functional models and identifying key nested species and assemblages
- Identify key ecological attributes (i.e., natural processes or conditions which promote the health and ecological integrity of an FNR such as faunal complexity, hydrologic regime, or river connectivity of FNRs)
- Select indicators (i.e., metrics such as fish assemblage composition, spring large floods, or mainstem-backwater connectivity) and defining indicator values that describe a gradient of ecological conditions, ranging from excellent to very poor
- Determine current “health” condition ratings based on the gradient of ecological conditions defined for each indicator
- Evaluate contributing areas (i.e., tributaries, upland areas)
- Document sources, rationale, and uncertainties

These products will culminate into existing conditions or Affected Environment for the previously listed FNRs and will inform the development of objectives and alternatives. The MRERP team will continue to develop and refine the listed draft products in FY 11. Future steps in the MRERP process will be further evaluation and identification of stresses, sources, drivers, opportunities, and constraints.

The CAT and the MRRIC have both been rigorously involved in existing conditions and assessment of natural resource conditions and processes. CAT and MRRIC representatives have participated in multiple working sessions conducted to characterize Natural Resource Conditions/Processes, as both direct contributors and observer roles, depending upon the circumstance.


Development of the MRERP-EIS Future without Project & no-action alternative continued through FY 2010. The no-action alternative will describe the efforts related to mitigation, recovery, and restoration implemented within the Missouri River ecosystem in the absence of the MRERP. Information gathered includes actions by Basin states, Tribes, and federal agencies that mitigate, recover, or restore the Missouri River ecosystem, in addition to Corps actions. The MRERP CAT will review the actions included in the Future without Project & no-action alternative in FY 2011 and refine the alternative in contributing any missing information. The no-action alternative will be finalized in FY 2012.

5. Affected Environment

The MRERP team continued the assessment of “existing”, or Affected Environment in 2010. Although this assessment will include some of the same resources as included in the Focal Natural Resource (FNR) Baseline Assessment, it will also include the full suite of existing conditions and resources within the scope of the project. Some key distinctions include the addition of the reservoir reaches, existing but perhaps non-native species, social resources, cultural resources, and economic resources. The primary outcome of defining existing conditions will be to establish a baseline upon which all MRERP alternatives will be applied and all impacts will be assessed. An annotated chapter outline and task assignments have been developed during FY2010. The team is coordinating with CAT representatives to identify data sources. A preliminary draft of the Affected Environment is anticipated for FY 2012.

6. External Expert Review:

In accordance with EC 1165-2-209 the MRERP project has an approved review plan which includes three formal Independent External Peer Reviews. In FY 2010 the MRERP project underwent an informal but
substantive additional review called an External Expert Review. This was the first external expert review of project development and included:

a. MRERP FNR selection process (FNRs described above)

b. Natural Resource Condition Assessment Method

The expert panel, identified through a subcontractor (Battelle), reviewed the MRERP FNRs (see list above) and the assessment methodology. A kick-off meeting was held to familiarize the panel with basic MRERP concepts, MRERP planning process, stakeholders, and basin interest groups. The purpose of the peer review is to determine whether the methods described are objective, consistent, and comparable, whether they will provide accurate output, and whether they are efficient and comprehensive. A public meeting, held April 29, 2010 in Bismarck, North Dakota provided the public an opportunity to observe discussion between the review panel and the lead agencies. The review panel’s feedback was supportive of the FNR selection process and condition methodology, agreed that the methods described are scientifically sound and will meet the project objectives. The review panel gave a recommendation to help narrow the scope of the project area. The MRERP team is continuing to discuss this recommendation internally, as well as with technical teams, CAT, MRRIC.

7. Social, Cultural, and Economic Values.

MRERP PDT conducted a Social Cultural and Economic (SCE) workshop at the MRRIC meeting in November 2009, to identify the activities, uses, resources, and ecosystem services which provide values and benefits to the basin stakeholders. MRRIC summarized the input from the workshop and delivered this product back to the Corps. This product will be combined with input from public scoping, Tribal meetings and other research forming a broad comprehensive list of Social Cultural and Economic Values which will be included within an overall inventory of existing resources within the Missouri River.

The MRERP team began drafting a set of SCE measures and indicators by which to characterize these resources. The identification and characterization of SCE measures and indicators is being conducted in parallel with the identification and characterization of the FNRs. This list will eventually be supplemented by other identified components of the affected environment. Each component of the affected environment, including the SCE values will be characterized to an appropriate level of detail.

Eventually, impacts of the MRERP alternatives upon each of these resources will be assessed and the significance of those impacts may affect further formulation and selection of alternatives. NWO and NWK economists have been coordinated to determine a strategy for economic analysis of existing conditions in the Missouri River basin. The team will continue efforts to characterize the activities and uses associated with the Missouri River, provide a profile and trend analysis, and a description of the connection between the river and the socioeconomic conditions will be conducted in FY 11.

8. Communication with Basin Tribes.

The various meetings with basin Tribes during FY 2010 provided opportunities to comply with the Federal Government’s Tribal trust responsibilities to the Tribes and to provide insight into concerns that many of the Missouri River Basin Tribes share. Main events in 2010 included CAT meetings, informal meetings with Tribes, Tribal Natural Resources meetings, and MRERP information mailings. The USACE, FWS, and other members of the MRERP PDT have attended several workshops and conferences (5) where Tribes were in attendance to informally discuss MRERP and when requested conduct a brief presentation on MRERP.

The MRERP team began meeting with Tribes in May 2010 to discuss natural resources important to Tribes. Ultimately, 10 regional Tribal Natural Resource meetings were held. Information gathered during these meetings will be used to help characterize the existing condition of the natural, social, cultural, and economic resources in the basin. A Tribal Natural Resources document is being developed to cumulatively capture identified resources and to communicate where those resources will be integrated into the MRERP planning process.
Tribal Outreach meetings are defined as informal meetings with Tribes where MRERP is the main topic of discussion. These types of meetings were scheduled upon request from interested Tribes. In 2009, five (5) Tribal Outreach meetings were conducted.

9. Missouri Recovery Implementation Committee: MRRIC.

An engagement strategy with MRRIC was outlined and approved by consensus during 2009. This strategy will assist the MRERP PDT in providing timely engagement with MRRIC. The engagement strategy is to remain a living document. Additionally during FY 2010, MRERP PDT members engaged with MRRIC on the draft Purpose and Need statements and the important social, cultural, and economic values (SCE Values) associated with the Missouri River through coordination with the MRERP workgroup and information-sharing presentations at meetings.

In early FY 2010, the MRERP PDT conducted an SCE Values workshop at a MRRIC meeting to identify the activities, uses, resources, and ecosystem services which provide values and benefits to the basin stakeholders. MRRIC summarized the input from the workshop and delivered a report back to the Corps. This report was combined with input from public scoping and Tribal meetings forming a broad comprehensive list of SCE Values which will be included within the overall inventory of existing conditions (see Affected Environment section above). The next step related to SCE Values is to develop a draft set of social and economic measures and indicators by which to characterize these resources. The MRERP team will continue to coordinate with MRRIC to inform and provide review of draft SCE indicators. The draft MRERP goals were transmitted to MRRIC during an information sharing session; the Committee has not developed a formal recommendation related to this draft product to date.

A summary of the Committee’s consensus recommendations regarding the MRERP to date is as follows:

a. MRRIC-MRERP engagement strategy process map (2009, substantive)
b. MRERP Purpose and Need Statements (2009, substantive)
c. MRERP SCE Values Workshop collective input report (2010, substantive)

8. Cooperating Agency Team- CAT

The CAT participated directly in defining the FNRs and indentifying experts to perform the Focal Natural Resource (FNR) Baseline Assessment, at no cost to the project. CAT provided technical review and discussed study design and analysis methods related to the natural resource assessment. Discussions & efforts provided further information for refining and detailing methods related to natural resource indicator rating definitions and contributing areas analyses.

In addition, the CAT representatives coordinated with the MRERP team to schedule a series of “Walk Around” meetings during October and November, 2010. These meetings are intended to provide a project status update to CAT representatives and their appropriate agency executives.

VIII. Missouri River Recovery Implementation Committee

The Missouri River Recovery Implementation Committee (MRRIC or Committee) is comprised of 69 sovereign and stakeholder representatives from all parts of the Missouri River basin. The Secretary of the Army adopted the Charter for MRRIC on July 1, 2008, pursuant to congressional authorization set forth in the Water Resources Development Act of 2007 (WRDA 2007). The Assistant Secretary of the Army for Civil Works (ASA(CW)) appointed the first stakeholder members of the MRRIC members during fall 2008, and the first Committee meeting was held in St. Louis, Missouri, September 29-October 1, 2008.

PURPOSES:
MRRIC’s purposes include:
Providing guidance to federal agencies on the existing Missouri River recovery plan including priorities for recovery work and implementing changes based on the results of adaptive management.

Providing guidance to federal agencies on a long-term study of the Missouri River and its tributaries to identify actions to recover species listed under the federal Endangered Species Act (ESA), mitigate aquatic and terrestrial habitat losses, and restore the ecosystem to prevent further declines of native species.

Developing recommendations that recognize the social, economic, and cultural interests of stakeholders; mitigate the impacts on those interests; and advance the multiple uses of the river.

**ORIGINS:**

In 1989, the U.S. Army Corps of Engineers (USACE) announced it would undertake a revision of the Master Water Control Manual for Missouri River Mainstem Reservoir Operations, the basic water management tool for the river. The revision process coincided with the listing of the pallid sturgeon, least tern and piping plover as threatened or endangered species under the federal Endangered Species Act; the issuance by the U.S. Fish and Wildlife Service (USFWS) of two Biological Opinions on steps necessary to recovery these species; and extensive federal and state court litigation on water management and species recovery issues. When the USACE finalized the revised Master Manual in 2004, the agency committed to establishing a sovereign and stakeholder group, to be known as the Missouri River Recovery Implementation Committee or MRRIC.

Commencing in 2005, the USACE, USFWS, Environmental Protection Agency (EPA) and other federal agencies enlisted the assistance of the U.S. Institute for Environmental Conflict Resolution (USIECR) to develop a process for establishing the MRRIC. These steps included a situation assessment \(^1\) that concluded that a group like the MRRIC was needed to assist in coordination of recovery actions in the basin and recommended that federal agencies provide the leadership to establish the Committee. In response, the Missouri River Basin Interagency Roundtable (MRBIR), a regional forum for federal agencies, established a Federal Working Group (FWG) to guide MRRIC’s creation.

The FWG, working with the USIECR, convened a Planning Group to draft a governing document for MRRIC. The MRRIC Planning Group held ten meetings at almost monthly intervals in different locations in and near the basin. The Planning Group proposed a Charter to the ASA(CW) in February 2008, and the ASA(CW) approved the Charter at the Planning Group’s last meeting in St. Louis, Missouri, on July 1, 2008.

**MEMBERSHIP:**

MRRIC’s membership includes representatives of federal agencies (USACE and USFWS serve as lead agencies), eight states, up to 28 tribes, and 16 stakeholder categories (28 total stakeholder members). After adoption of the Charter, states, tribes, and federal agencies were invited to appoint representatives. An announcement was published in the *Federal Register* inviting applications for the stakeholder positions. In September 2008, the USACE’s Northwestern Division, tasked by the ASA (CW) to implement the Charter made appointments of stakeholder members to the MRRIC. Stakeholder members serve three year terms.

**MEETINGS:**

At the September 2009 MRRIC meeting, the Committee agreed to hold four (4) in-person, plenary meetings in calendar year 2010.

- February 2-4, 2010 in St. Louis, Missouri
- April 27-29, 2010 in Bismarck, North Dakota
- July 20-22, 2010 in Sheridan, Wyoming
- October 19 – 21, 2010 in South Sioux City, Nebraska

The meetings are held on two full days (Tuesday and Wednesday) and one half-day on Thursday, and generally include field trips or special tribal sessions on the Monday preceding the meetings and social events in the evenings. MRRIC New Member Orientation sessions are scheduled on Monday evenings.

---

1 The Situation Assessment Report is available at [http://missouririver.ecr.gov/pdf/FINAL_SARTR.pdf](http://missouririver.ecr.gov/pdf/FINAL_SARTR.pdf)
before Tuesday’s plenary session. Meeting participants include Committee members from each of the stakeholder interest categories, some alternate members, and appointed representatives of the Missouri River basin states, tribes and federal agencies. Members of the public also attend the meetings.

**ORGANIZATION:**
MRRIC selects its Chair, Vice Chair, and facilitation team. The USIECR provides support services to MRRIC under a contract with the federal agencies and contracts with the Chair and the facilitation team. The Committee has established six work groups consisting of MRRIC members, alternates, and agency staff. The Agenda Work Group develops the agenda for each MRRIC meeting. The Communications/Information Technology Work Group advises on MRRIC websites, plans webinar programs, conducts annual self-assessments, prepares the MRRIC annual report, and is developing a comprehensive communications plan. The Recovery Plan Work Group develops recommendations for the USACE’s existing recovery program. The Ecosystem Restoration Plan Work Group works on issues related to the USACE’s long-term restoration plan known as the Missouri River Ecosystem Restoration Plan (MRERP). The Integrated Science Program Work Group is developing an independent science advisory panel and addressing other science-related issues. The Nominating Work Group developed processes for selecting MRRIC’s leadership and facilitation team and renewing and filling membership vacancies; it is currently working on membership recruitment.

The groups meet by facilitated conference calls at least twice between meetings and at occasional face-to-face meetings. They help prepare presentations for plenary sessions and develop recommendations for MRRIC’s consideration.

**ACHIEVEMENTS:**
Section 5018 of WRDA 2007\(^2\) sets forth the Committee’s purposes. The Preamble to the MRRIC Charter\(^3\) reiterates that the Committee’s purpose is to “make recommendations and provide guidance on a study of the Missouri River and its tributaries and on the existing Missouri River recovery and mitigation plan.” The Charter also defines recommendations as “official suggestions, comments, or advice representing the consensus of the Committee and provided to the appropriate governmental or non-governmental agencies, groups or persons.”

The MRRIC Operating Procedures and Ground Rules\(^4\) clarify that a substantive issue is an issue for which the Committee is considering developing recommendations and guidance consistent with the Committee’s Purpose and Scope as well as other issues identified as substantive by any member of the Committee.

Consensus recommendations made on substantive issues require a two-step decision making process with a tentative recommendation made at an initial meeting and a final recommendation made no sooner than the next MRRIC meeting. The two-step process is intended to allow time between the tentative and final consensus recommendation determinations for members to deliberate and consult with their constituents on the recommendations.

Please see Appendix D for more details regarding MRRIC recommendations and responses.

**IX. Communications and Outreach**

The Missouri River Recovery Program (MRRP) seeks to balance the Missouri River’s many uses while restoring habitat for endangered species. There are many stakeholders who have diverse interests in the Missouri River and as such, require consistent and accurate messages about the MRRP. To provide these stakeholders with outstanding communications support, the MRRP team participated in numerous communications and outreach activities. Transparency and openness throughout the MRRP project planning process is a serious commitment of the program.


Major activities are summarized below.

**MRRP Website**

The MRRP website (http://www.moriverrecovery.org/) serves as a direct conduit to the public. As well as presenting an overview of the current tasks the program is undertaking, many program documents are posted. The following documents were added to the MRRP Website:

- **Draft Cottonwood Mgmt Plan/Programmatic Environmental Assessment; Status and Trend of Cottonwood Forests Along the Missouri River; Emergent Sandbar Habitat Complexes in the Missouri River, Nebraska and South Dakota Draft Project; Draft Project Implementation Report with Integrated Environmental Assessment for Sandy Point Bend Shallow Water Habitat in Harrison County; Implementation Report with Integrated Environmental Assessment**
  

- Six (6) MRRP fact sheets
- Sixty (60) Project Information Sheets (PInS)
  

The following documents were added to the MRRIC Website:

- **2009-2010 MRRIC Annual Report**
  

The following documents were added to the MRERP Website:

- **2009 MRERP Public Scoping Summaries**
  

- **MRERP Public Comment Summary**
  

- **Draft MRERP Purpose and Need Summary and MRERP Goals**
  

**MRRP Publications**

- The Fall Quarterly Newsletter was mailed to 873 contacts and 94 locations received bulk copies. Newsletter topics included: Missouri River Futures, Cottonwood Habitat Program, ESH Projects, and MRRIC/MRERP Public Meetings. The newsletter was also added to the MRRP website.
- The *Missouri River Navigation* fact sheet was revised in FY2010 and added to the MRRP website.

**MRRP Public Relations Activities**

**NWK District**

- In FY2010, the NWK District took a local film production company out on site at Overton Bottoms to shoot an episode of a six part series titled “River Miles.” This episode featured the USFWS fish sampling crews, the Missouri River Mitigation Project and the USFWS Big Muddy National Wildlife Refuge. Agreements are in place for the series to air on two public radio stations in central Missouri and in Kansas City.
- One (1) press release regarding sedimentation management/shallow water habitat was distributed.

**NWO District**

- Two (2) press releases regarding construction of sandbar habitat were distributed.
- An article entitled “Missouri River Recovery Program propelled into new year” was featured in the Omaha District’s Spring 2010 *News Brief* magazine.

**X. Other Related Developments**

These sections include items not directly tied by authorities or mandates to the MRRP, but are active in the basin and relate to the recovery program. These items include: similarity of appearance of the shovelnose and pallid sturgeon, Landscape Conservation Cooperative, the Missouri River Authorized Purposed Study and Title VII and IX of the Missouri River Restoration Act of 2000.
X.A. Similarity of Appearance

As a result of a consensus recommendation from MRRIC in July 2009, the USFWS reopened the public comment period for the proposal on January 14, 2010 to treat the shovelnose sturgeon as a threatened species under the “Similarity of Appearances” provisions of the Endangered Species Act for 21 days. Public comments were accepted until February 4, 2010. A public hearing was held in Cape Girardeau, Missouri on January 28, 2010 at Southeast Missouri State University.

On September 1, 2010, the Service announced a Final Rule (75 FR 53598) that it is necessary to treat the shovelnose sturgeon as a threatened species under the Endangered Species Act due to its similarity of appearance to the endangered pallid sturgeon in the portions of its range where it commonly overlaps with the pallid sturgeon.

The Service also enacted a special rule that prohibits the harvest of any shovelnose sturgeon or shovelnose-pallid sturgeon hybrids, and their roe associated with or related to a commercial fishing activity. The special rule applies only to activities that relate to the harvest of shovelnose sturgeon and shovelnose-pallid sturgeon hybrids for commercial fishing purposes and is not expected to impact commercial fishing targeting non-sturgeon species, recreational or other non-commercial fishing activities. The special rule does not prohibit the legal commercial harvest of shovelnose sturgeon outside the range where the shovelnose and pallid sturgeons commonly overlap. (http://www.fws.gov/midwest/News/release.cfm?rid=165)

X.B. Landscape Conservation Cooperative (LCC)

Changes in the global ecosystem due to increasing land use pressures and widespread resource threats amplified by a rapidly changing climate are occurring at an unprecedented pace and scale, which are documented in extensive scientific literature. These include increasing temperatures; varying precipitation; rising sea levels; and acidifying oceans. These changes, in turn, are impacting local environments and economies. Sea level rise puts landscapes important to humans and wildlife at risk; variations in precipitation affect water resource availability for humans and natural systems; temperature changes affect terrestrial and aquatic systems, species distributions and interactions; these same forces will also pose threats to our Nation’s cultural traditions and resources.

The Secretary of the Department of Interior, Salazar, signed a Secretarial Order on September 14, 2009, entitled, “Addressing the Impacts of Climate Change on America’s Water, Land, and Other Natural and Cultural Resources.” That Order established a Climate Change Response Council, chaired by the Secretary, which is coordinating activities within and across the bureaus to develop and implement an integrated strategy for climate change response by the Department. Agencies will be working at the landscape, regional, and national scales through the establishment of DOI Climate Science Centers and Landscape Conservation Cooperatives (LCCs).

These LCCs are a network of science partnerships between Federal, state, tribal, local government and nongovernmental organizations collaborating across geographically similar national and international landscapes to address climate change and other stressors within and across landscapes to ensure the sustainability of America’s land, water, wildlife and cultural resources. These partners will together engage in biological research, conservation planning and design, and inventory and monitoring programs. LCCs will help partners establish common goals and priorities so that they can be more efficient with their efforts and money. Products developed by LCCs will inform partners of each other’s on-the-ground conservation projects and development so that they will not duplicate their efforts and target science in the right places. There are 21 biologically based Geographic Areas where the LCCs efforts are located. These 21 areas represent long-standing partnerships that facilitate conservation planning and design projects at landscape scales. The Missouri River runs through five LCCs. More information regarding LCCs can be found by [Link](http://www.fws.gov/midwest/News/release.cfm?rid=165)


X.C. Missouri River Authorized Purposes Study (MRAPS)

The authorization for this study is derived from Omnibus Appropriations Act of 2009, Title I, Sec 108, as described below:

“The Secretary is authorized to conduct a study of the Missouri River Projects located within the Missouri River basin at a total cost of $25,000,000 with the express purpose to review the original project purposes based on the Flood Control Act of 1944, as amended, and other subsequent relevant legislation and judicial rulings to determine if changes to the authorized project purposes and existing Federal water resource infrastructure may be warranted: Provided, That this study shall be undertaken at full Federal expense.”

This study follows the Corps of Engineers Civil Works Planning Process. The Study is conducted using the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines (see Principles and Guidelines) for Water and Related Land Resources Implementation Studies, dated March 10, 1983. The Principles and Guidelines prescribe the following six-step planning process:

1. Identify water resources problems in the study area.
2. Collect data on the problems identified.
3. Develop alternatives to solve the problems.
4. Evaluate the effects of the alternatives.
5. Compare alternatives.
6. Select a plan for recommendation or decide to take no action. The alternative plan with the greatest net economic benefits consistent with protecting the nation's environment is normally selected, but exceptions may be granted by the Secretary of the Army.

Public (including stakeholders) involvement is an integral part of the MRAPS process, including periods for formal and informal input to the study during early study stages, alternatives analysis and report development. There were 31 public scoping meetings and 11 Tribal-focused meetings held across the Missouri River Basin and parts of the Mississippi Basin. Meetings provided the public an opportunity to talk one-on-one with Study team members. Formal scoping meetings ran from May 25, 2010 to September 7, 2010. The meetings were open to the public and staffed by Corps of Engineers subject matter experts. Exhibits explaining the study, the planning process and each of the eight authorized purposes were professionally displayed to help educate those attending. Public comments were solicited verbally, in writing and electronically at each meeting and could be submitted up to September 20, 2010. The public participates in review of draft report and draft environment impact statement (EIS) also. More information can be obtained from the project website at the following web address: [http://www.mraps.org/](http://www.mraps.org/).

The final stages of the feasibility report/EIS review and approval will involve providing the proposed report and final EIS to heads of Federal agencies and Governors of affected states for comment. The Chief of Engineers report is then transmitted to Congress through the Assistant Secretary of the Army (Civil Works) and to the President's Office of Management and Budget (OMB), who comments on the report as it relates to the President's programs. Congress will review and decide whether to enact any resultant changes to the current authorized project purposes.
XI. Acknowledgements

Contributors:

Carol Aron², Laura Bentley¹¹, Ruth Bentzinger¹¹, Chance Bitner¹³, Joe Bonneau¹³, Paul Boyd¹¹, Tracy Brown¹³, Kelly Crane¹¹, Dave Crane¹¹, Casey Cruse⁴, Steve Fischer¹³, Tim Fleege¹¹, Craig Fleming⁴, Carol Hale², Rose Hargrave¹⁴, John Hartley¹¹, Tracy Hill³, Chris Horihan¹¹, Coral Huber⁴, Gweyn Jarrett¹¹, Robert B. Jacobson⁹, Galen Jons⁴, George Jordan³, Rob Klumb⁶, Matt Krajewski¹¹, Steven Krentz³, Jane Ledwin⁸, Theresa Martin¹¹, Roy McAllister¹¹, Mike Olson², John Palensky¹¹, Greg Pavelka⁴, Teresa Reinig¹¹, Mary Roth¹¹, Jennifer Salak¹¹, John Shelman¹¹, Karla Sparks¹³, Wayne Nelson-Stastny¹, Andy Staroska³, Kirk Steffensen¹², Jerry Smith¹¹, Mike Swenson¹¹, Jennifer Switzer¹³, Brad Thompson¹¹, Tiffany Vanosdall¹¹, Molly Webb¹⁶, Timothy Welker⁴, and George Williams⁴.

1. U.S. Fish and Wildlife Service (USFWS), Gavins Point Project Office, SD
2. USFWS, Bismarck Ecological Services Field Office, ND
3. USFWS, Columbia Fish and Wildlife Conservation Office, MO
4. U.S. Army Corps of Engineers (USACE), Threatened & Endangered Species Section, Omaha District, NE
5. USFWS, Northern Rockies Fish and Wildlife Conservation Office, Billings, MT
6. USFWS, Great Plains Fish and Wildlife Conservation Office, Pierre, SD
7. USFWS, Missouri River Fish and Wildlife Conservation Office, Bismarck, ND
8. USFWS, Columbia Ecological Services Field Office, MO
10. USFWS, Bozeman Fish Technology Center, Bozeman, MT
11. USACE, Omaha District, Omaha, NE
12. Nebraska Game and Parks Commission, Lincoln, NE
13. USACE, Kansas City District, Kansas City, MO
14. USACE, Northwest Division, Omaha, NE
Appendix A

MRRP Performance Assessment Slides
Missouri River Recovery Program

Missouri River Recovery Area

Headwaters to the mouth and tributaries

BSNP Fish & Wildlife Mitigation

• 10 States
• 2,300 miles of river
• 530,000 square miles
• 6 main stem reservoirs
Problems / Need

- Biological Opinions 2000 & 2003 - operation of system jeopardized continued existence.
  - 500 – 755 miles inundated under reservoirs. 750 miles channelized.
  - 51 of 67 native fish species listed as rare or decreasing
  - 80% reduction in Piping Plover habitat
  - Lack of full understanding of progress and requirements

MRRP Annual Performance Assessment

- Utilized Planning Process as part of establishing annual strategic review.
  - Formerly known as the “Gap” Analysis
- Evaluate Status of Meeting BiOp / BSNP Mitigation
  - Identify areas that need focus / effort in meeting authorization / mandates
  - Document / refine project selection process
  - Identify potential refinements to the program
Performance Assessment

- Evaluated each BiOp item:
  - 3 Mitigation items: 69 RPA Elements
  - 21 RPMs: 14 CRs (15 in 2008)
  - Yellowstone Intake CR amended to RPA element per USFWS letter dated 23 OCT 2009
- Program has numerous measurable metrics
- Work has been done on virtually all items and a lot is getting accomplished.
- MRRP behind schedule on several items due to limitations related to: funding, issue resolution, climate, reservoir capacity, and optimistic time frames.
- Above constraints on MRRP could put current operation of the Missouri River mainstem in jeopardy.

2010 Notable Developments

- High flows impact MRRP implementation
- Innovative approach tested for ESH construction (Geotubes)
- PEIS for ESH public review complete
- Construction initiated on Yellowstone Intake Diversion Dam headworks structure, Aug. 2010
- NAS Sediment Study completed, Sep. 2010
- Shovelnose sturgeon listed due to similarity of appearance, Sep. 2010
2010 High Flows Program Impacts

- Anticipate widened of SWH projects
- Potential ESH creation through sediment aggradation
  - Monitoring to document change, 2011
- Limited typical construction methods
  - Opportunity for new approach
  - Geotubes were used to create ESH at RM 757.0 and 789.6

Performance Assessment

<table>
<thead>
<tr>
<th>Metric on target</th>
<th>Metric slightly below target</th>
<th>Metric below target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RPA Characterization (draft)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>2009</td>
<td>2010</td>
</tr>
<tr>
<td>= 22</td>
<td>= 24</td>
<td>= 26</td>
</tr>
<tr>
<td>= 40</td>
<td>= 39</td>
<td>= 38</td>
</tr>
<tr>
<td>= 7</td>
<td>= 6</td>
<td>= 5</td>
</tr>
<tr>
<td><strong>RPM Characterization (draft)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>2009</td>
<td>2010</td>
</tr>
<tr>
<td>= 7</td>
<td>= 7</td>
<td>= 10</td>
</tr>
<tr>
<td>= 14</td>
<td>= 14</td>
<td>= 11</td>
</tr>
<tr>
<td>= 0</td>
<td>= 0</td>
<td>= 0</td>
</tr>
</tbody>
</table>
Performance Assessment

- **RPA Improvements**
  - IV.B.B1.C Baseline habitat evaluations at Ft. Peck complete (Seg. 2)
  - VI.A.4 Established an independent group of scientists and developed an AM plan (Independent Science Advisory Panel ISAP)
  - IV. Annual Performance Assessment satisfies three year program evaluation required by the 2003 BA.

- **RPM Improvements**
  - Evaluate effective measures to reduce LT/PP predation
  - Implement program to monitor and evaluate effectiveness of created sandbars (ESH AM Annual Review)

Land Acquisition / Floodplain Rest.

- Land acquisition rate is on track to meet 2042 goal of 166,750 acres
  - Total land acquired as of OCT ’10 = 60,476 ac.
  - 2,392 acre purchase in 2010, Audubon Bend
- Restoration of Floodplain in many cases lags due to need to assemble large parcels
- Focusing on assembling sites for SWH critical to progress on that element
Appendix A

**Land Acquisition Selection Criteria**

| Inholding within existing wildlife area | Oxbow – wetland habitat |
| Borders existing wildlife area         | Percent farmed – marginal |
| Levee Protection – reconnection potential | Percent interior water – present/restorable |
| Percent WRP easement                   | Borders creek or tributary |
| Percent timber – amount/restorable     | Scour holes |
| Number buried dikes                    | Sand damage |
| Approx. length borders Missouri River  | Percent land accretion |
| Side channel or chute                  | Airport within 5 miles – Limits options |

*Does not include 2,392 acres at Audubon bend and 546 acres at North Alabama Bend (Missouri River National Recreation River segment)*
**Shallow Water Habitat**

- Estimated construction = 3,443 acres
  - Constructed SWH on pace with BiOp through 2010
- Estimated system total, 2010 = 9,201 acres
  - Includes constructed and naturally occurring
- BiOp requires 19,565 acres of constructed SWH
- Intake providing up to 4 years of relief from meeting 2020 and interim SWH targets.
- Updated Habitat Assessment & Monitoring Program (HAMP)
  - New methods will better assess biological and water quality benefits of projects including primary productivity and near term metric tracking.

**High Flows May Create Positive Impacts on SWH**

- May widen pilot chutes
  - Maximize available habitat in normal flow years
  - The rate at which constructed chutes (and natural chutes) develop depends on flows
    - High flows develop chutes rapidly.
    - Chutes are constructed with relatively deep, fast water initially because these conditions are conducive to chute widening.
Deroin Chute

View of Deroin Chute exit (constructed in 2002)

20 APR 2004  23 APR 2009

Smokey Waters: RM 133

July 7, 2004  September 21, 2010
2024 completion of SWH requires creation of ~600 to ~1,500 acres per year

2010 SWH Total – Natural and Constructed ~ 9,201 Acres
Construction ~ 3,457

Intake Diversion Dam Const. provides up to 4 year relief

2024 completion of SWH requires creation of ~600 to ~1,500 acres per year

2010 SWH Total – Natural and Constructed ~ 9,201 Acres
Construction ~ 3,457

Graphic Shows SWH Created, 2024 BiOp Milestones and Measured SWH
### SWH Selection Criteria

- **Availability of sites** (willing sellers) – See RE Criteria
- **Hydraulics & physics** narrow range of alternatives at a site (i.e. bend curvature and channel alignment).
  - Site elevations and conditions (ability to reconnect floodplain, historic channels, etc.)
  - Channel configurations and width
  - Constraints include not effecting navigation or creating long term need for dredging.
- **Views of resource agencies, public, etc.**

### Results to Date from Monitoring SWH

- **Flow-through chutes**
  - Chutes are providing refuge for juvenile native fish. Created chutes are dominated by juveniles (61-75% of all catch was juvenile fishes).
  - 22 pallid sturgeon were captured within chutes between 2006 and 2008 (predominantly hatchery raised fish)
  - Adult sturgeon travel through chutes when migrating upstream
- **Backwaters**
  - Backwaters with connections to the main channel tend to have greater numbers of fish, species and diversity compared to isolated backwaters.
  - Fish communities in backwaters differ from those in chutes.
    - Backwaters contain sunfishes, shads and herrings, temperate basses, walleye and sauger.
    - Chutes contained large numbers of blue sucker, shovelnose sturgeon and chub species (benthic riverine species).
More Results to Date from Monitoring SWH

- Young sturgeon prefer habitat with shallow depths, sand substrate, and low water velocity
- Adult sturgeon utilize depth and velocity gradients found at the interface of main channel and SWH
- SWH is designed to:
  - avoid conflicts with other authorized purposes of the system;
  - restore riverine structure, function and dynamic processes;
  - are meant to be self-sustaining with minimal operation and maintenance costs (although backwaters may require periodic dredging of inlets).

Pallid Sturgeon Population Assessment

- Random sampling has produced 1,840 pallid sturgeon captured as part of this project to date (2010)
  - 90% are from hatchery stocking efforts
  - 5% are categorized as “Unknown” and are pending genetic verification and/or database update
  - 5% are from existing wild stocks (large adults)
- Headwaters area of Lake Sakakawea produced 717 total captures.
- A pop. estimate of pallids is expected in 2011
- Incorporate research findings into monitoring methods
  - In 2009, Pallid Sturgeon Population Assessment Project, PMP and several other research papers completed
Propagation, RPA IV.A-C

- Hatchery improvements called for in 2000 BiOp complete – capacity up from 6,000 to 60,000 juveniles
- Working with 6 hatcheries
- Potential for increased production with more lessons learned sharing.

Propagtion, RPA IV.A-C

Number of Pallid Sturgeon Stocked (as yearly equivalents) since 2001 in the Missouri River within each Recovery Priority Management Area

BiOp RPA - produce 4,700 juveniles, Corps role 2,973 juveniles.

*Majority of 2012/2013 class will be stocked in 2011.
Emergent Sandbar Habitat, RPA IV B

- PEIS tentative selected plan = adaptive management implementation framework
  - Focus on attaining biological metrics vs. set number of acres
    - Construction ceiling disclosed is alt. 3.5 = 4,370 acres
  - IEPR, ATR, and Public Review complete
  - Final PEIS & Record of Decision (ROD): Summer 2011
- MRRIC recommended pursuing off-channel / reservoir pilot projects
- Reservoir Habitat Study initiated in 2010, RPA IV B.2
- ESH projects initiated in additional reaches
- High flows, erosion rates, predators, vegetation succession are all ongoing issues
BiOp calls for total of ~5,500 acres by 2005 to ~11,886 acres on system by 2015.

Emergent Sandbar Habitat on the System

- Constructed Sandbars
- Natural Sandbars

Yearly Acres of ESH Constructed:
- 2004: 49
- 2005: 54
- 2006: 52
- 2007: 219
- 2008: 227
- 2009: 163
- 2010: * (Note: Other FY10 construction included RM 759 & 842)

*2010 ESH calculations yet to be determined due to high flows.

Over 750 acres of ESH created to date.
Approx 150 acres/year.

Geotubes were used to create ESH at RM 757.0 and 789.6.
ESH Selection Criteria

- Geomorph/Hydraulic – thalweg width, min erosion,
- Predators – distance from bank 200’, distance from trees 550’
- Avoidance – power lines, pipeline crossings, cultural/archeological, rec areas/boat ramps, cabins, intakes, discharges, etc.
- Min Impacts to other Species - eagle nests, mussel beds, wetlands, habitats (fish, turtles, etc.)

Overview – PEIS costs by Alternative (all riverine reaches)- RPA IV B.3

<table>
<thead>
<tr>
<th></th>
<th>Alt. 1</th>
<th>Alt. 2</th>
<th>Alt. 3</th>
<th>Alt. 3.5</th>
<th>Alt. 4</th>
<th>Alt. 5</th>
<th>Existing Program</th>
<th>No Pgm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>11,886</td>
<td>5,502</td>
<td>6,754</td>
<td>4,370</td>
<td>1,985</td>
<td>1,315</td>
<td>883</td>
<td>0</td>
</tr>
<tr>
<td>Annual Work</td>
<td>4,802</td>
<td>1,786</td>
<td>2,140</td>
<td>1,182</td>
<td>347</td>
<td>164</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>Total Annual Cost** in $Mil</td>
<td>$197.1</td>
<td>$73.3</td>
<td>$87.8</td>
<td>$48.6</td>
<td>$14.3</td>
<td>$6.7</td>
<td>$6.1</td>
<td>$0.0</td>
</tr>
</tbody>
</table>

** Total Annual Cost includes construction cost, engineering and design, field supervision and admin, program management, planning, NEPA compliance and 10% contingency
Incidental Take Thresholds

- Total Take Allowed (2003 BiOp)
  
  - Least terns - Reinitiation of consultation will be required if the Corps’ actions result in take of more than 180 eggs in a 3-year consecutive period.
    - Actual 3 year take was 63 eggs, well below the 180 egg threshold
  
  - Piping plover - Take should not exceed that observed from 1993-2003 in any single year. This was quantified as the lesser of 294 eggs (1995) or 46% of all eggs in any given year.
    - 2010 results indicate that the 10 year avg is 4.7%, well below the 9.2% upperlimit in 2003 BiOp
    - 43 eggs were lost due to Corps operations, represents 2.5% of the 1,703 known eggs in 2010. Well below the 294 eggs per year threshold.
Comparison of Take, 2009-2010

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th></th>
<th>2009</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LT</td>
<td>PP</td>
<td>LT</td>
<td>PP</td>
</tr>
<tr>
<td></td>
<td>Eggs</td>
<td>Chicks</td>
<td>Eggs</td>
<td>Chicks</td>
</tr>
<tr>
<td>Fort Peck</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lake Sakakawea</td>
<td>17</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Dakota</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Francis Case</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lewis and Clark</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Garrison River Reach</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gavins Point River Reach</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Take</td>
<td>17</td>
<td>43</td>
<td>9</td>
<td>167</td>
</tr>
</tbody>
</table>

Missouri River Adult Census 1986 – 2010 RPA I.B

- Least Tern Goal = 900
- Piping Plover Goal = 850
- Least Terns
- Piping Plovers

BUILDING STRONG®
Missouri River Fledge Ratios 1986 -2010
RPA I.B

Piping Plower Goal = 1.22
Least Tern Goal = 0.94

Actual BiOp Fledge Ratio Metrics
3, 5, and 10 year running average

Missouri River Least Tern
5 Year Running Average Fledge Ratio

Goal = 0.94
## Missouri River Least Tern
### 3 Year Running Average Fledge Ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2002</td>
<td>1.23</td>
</tr>
<tr>
<td>2001-2003</td>
<td>1.39</td>
</tr>
<tr>
<td>2002-2004</td>
<td>1.23</td>
</tr>
</tbody>
</table>

*Goal = 0.94*

## Missouri River Piping Plover
### 3 Year Running Average Fledge Ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Fledge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2002</td>
<td>1.40</td>
</tr>
<tr>
<td>2001-2003</td>
<td>1.60</td>
</tr>
<tr>
<td>2002-2004</td>
<td>1.20</td>
</tr>
</tbody>
</table>

*Goal = 1.22*
Missouri River Piping Plover
10 Year Running Average Fledge Ratio

Goal = 1.22

Bird Usage Before and After ESH Construction

Sandbar located at river mile ~ 774
Appendix A

Least Tern Constructed vs. Non-Constructed 2004 - 2010

Note: Gavins Point Reach / Lewis Clark Lake data

BUILDING STRONG®

Piping Plover Constructed vs. Non-Constructed 2004 - 2010

Note: Gavins Point Reach / Lewis Clark Lake data

BUILDING STRONG®
**Least Tern Fledge Ratios**

**Constructed vs. Non-Constructed**

<table>
<thead>
<tr>
<th>Constructed Acres</th>
<th>Fledglings per Adult Pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0.85</td>
</tr>
<tr>
<td>2005</td>
<td>1.40</td>
</tr>
<tr>
<td>2006</td>
<td>1.22</td>
</tr>
<tr>
<td>2007</td>
<td>0.95</td>
</tr>
<tr>
<td>2008</td>
<td>0.87</td>
</tr>
<tr>
<td>2009</td>
<td>0.84</td>
</tr>
<tr>
<td>2010</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Goal = 0.94

*Note: Gavins Point Reach / Lewis Clark Lake data*

**Piping Plover Fledge Ratios**

**Constructed vs. Non-Constructed**

<table>
<thead>
<tr>
<th>Constructed Acres</th>
<th>Fledglings per Adult Pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.41</td>
</tr>
<tr>
<td>2005</td>
<td>1.75</td>
</tr>
<tr>
<td>2006</td>
<td>1.82</td>
</tr>
<tr>
<td>2007</td>
<td>2.03</td>
</tr>
<tr>
<td>2008</td>
<td>2.32</td>
</tr>
<tr>
<td>2009</td>
<td>2.67</td>
</tr>
<tr>
<td>2010</td>
<td>2.95</td>
</tr>
</tbody>
</table>

Goal = 1.22

*Note: Gavins Point Reach / Lewis Clark Lake data*
Flows

- Master Manual tech criteria includes up to a 20,000 cfs rise and duration 2 days at peak.
- 2010 / 2011 AOP does not include unbalancing of reservoirs (working on criteria)
- Independent Science Advisory Panel initiated in conjunction with MRRIC, RPA VI.1.d
  - Charge scope drafted to look at Spring Pulse and Adaptive Management

Spring Pulse, RPA VII.A

- Independent Science Advisory Panel initiated, RPA VI.1.d
- Spring pulse conducted May 2006, March 2008 and May 2009
- March & May 2010 pulses eliminated due to high downstream flows in excess of downstream flow limits
- 2010 monitoring to examine effects of high flows on native fish, drainage from riparian lands & GW levels
  - Report expected Spring 2011
- March & May 2011 pulses planned under all runoff scenarios (2011 AOP), downstream flows permitting
- Releases adjusted when birds begin nesting activities
2006 Gavins Point Releases

Spring pulse conducted in May

2008 Gavins Point Releases

Spring pulse conducted in March
2009 Gavins Point Releases

Spring pulse conducted in May

Gavins Point Releases 2010 (Mar. – Aug.)

Note: Early releases low due to high tributary in-flows.

No spring pulse in 2010 due to high flows
Cottonwoods
Bald Eagle RPM 1 & 2

- Completed Management Plan with EA / FONSI
- Cottonwood Management Plan completed / EA public review (Dec 2010), finalized early 2011
  ▶ Letters to solicit comments were sent out to all tribes, agencies and entities listed in the 2004 Programmatic Agreement
- Conceptual site designs for cottonwood habitat development for Audubon Bend, Sister and Rush Island

BiOp ISP Assessment

- Evaluated each BiOp item:
  - 3 Mitigation items –
    - ISP 3 items
      ▶ 2009 and 2010, 3 = □
  - 69 RPA Elements –
    - ISP 19 items
      ▶ 2009, 7 = □, 13 = □ & 2010, 9 = □, 11 = □
  - 21 RPMs –
    - ISP 13 –
      ▶ 2009, 3 = □, 10 = □ & 2010, 6 = □, 7 = □
  - 14 CRs (15 in 2008)
    - ISP 9
**Integrated Science Program (ISP)**  
*RPA, RPMs, CRs – 41 total*

- Developed General Science Questions and Key Findings – draft available on the web at:  
  - Focuses on pallid, plover, tern, bald eagle, cottonwoods and mitigation

- Sixty project information sheets (PInS) available on web  

- “Eye on Science” newsletters
- Ensure findings get to habitat teams
- Efforts ongoing to evaluate approach to monitoring (USGS & PNNL)
- Continue efforts to prioritize based on critical research questions

**Integrated Science Program (ISP)**

- Developed General Science Questions and Key Findings – draft available on the web at:  
  - Focuses on pallid, plover, tern, bald eagle, cottonwoods and mitigation

- Sixty project information sheets (PInS) available on web  

- “Eye on Science” newsletters
- Efforts ongoing to evaluate approach to monitoring (USGS & PNNL)
- Continue efforts to prioritize based on critical research questions
- System wide guidance documents and SOP
  - Research and annual progress reports for pallids, terns, plovers, flow modifications, adaptive management and cottonwoods.
Adaptive Management (AM)

- Integration of Science with implementation
- Working with MRRIC to establish formal interaction strategy for the MRRP AM process
- Specific Products
  - Formalizing AM Process Framework to be integrated into the planning, implementation and mon. of MRRP
  - Completed Draft ESH AM Strategy as part of PEIS
  - Annual ESH AM Report to implement ESH AM Strategy completed, Feb 2011
  - SWH AM Plan under development
    - Multi-agency SWH PDT established
  - Site Specific Monitoring and AM Plans

Work Plan/Alternatives Analysis

- Currently are not meeting some RPA targets/timing
  - Not creating habitat at BiOp rates
  - Runoff has filled system reducing ESH habitat
- Evaluated cost to implement BiOp per milestones
  - Additional ESH Construction based on Bird Metrics
  - Continued and increased SWH Construction potential based on BiOp Metrics
- Consider accelerating near term land acquisition (assemble mores sites for SWH)
- Yellowstone Diversion Dam Modification funding has potential to affect other portions of the program
- Looking at options to fund long term operations and maintenance of recovery projects
### Approximate Historic Work Plan & Estimated Needs

<table>
<thead>
<tr>
<th></th>
<th>~Historic Avg</th>
<th>Minimum Need</th>
<th>Full Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM &amp; AM</td>
<td>$3,498,000</td>
<td>$3,500,000</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>MRRIC (Stakeholder Committee)</td>
<td>$1,200,000</td>
<td>$1,200,000</td>
<td>$1,600,000</td>
</tr>
<tr>
<td>MRERP (Long Term Study)</td>
<td>$2,148,600</td>
<td>$3,500,000</td>
<td>$4,500,000</td>
</tr>
<tr>
<td>ISP</td>
<td>$15,803,600</td>
<td>$11,500,000</td>
<td>$17,000,000</td>
</tr>
<tr>
<td>SWH/Mitigation Creation</td>
<td>$15,410,000</td>
<td>$20,600,000</td>
<td>$35,000,000</td>
</tr>
<tr>
<td>SWH/Mitigation Land Acquisition</td>
<td>$12,561,200</td>
<td>$14,000,000</td>
<td>$17,500,000</td>
</tr>
<tr>
<td>ESH Creation</td>
<td>$6,814,800</td>
<td>$14,300,000</td>
<td>$48,600,000</td>
</tr>
<tr>
<td>Propagation</td>
<td>$311,000</td>
<td>$400,000</td>
<td>$400,000</td>
</tr>
<tr>
<td>Other</td>
<td>$0</td>
<td>$1,000,000</td>
<td>$1,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$57,747,000</strong></td>
<td><strong>$70,000,000</strong></td>
<td><strong>$130,600,000</strong></td>
</tr>
</tbody>
</table>

Note: Total does not include Yellowstone Intake Diversion Dam Project expenditures ~ $20 M to date

Note: Long term minimum need can vary based on prior year progress and year to year variation.

---

### Historical Expenditures

- **Total** = $57,747,400

---

BUILDING STRONG®
Minimum Expenditures Needed

- ESH Creation: 20%
- SWH/Mitigation: 13%
- Other: 14%
- Propagation: 1%
- PM & AM: 5%
- MRHC: 5%
- MSEP: 5%
- NP: 13%
- SWH/Mitigation Creation: 29%

Total = $70,000,000

Expenditures Needed For Full Compliance

- ESH Creation: 37%
- SWH/Mitigation: 27%
- Other: 14%
- Propagation: 1%
- PM & AM: 5%
- MRHC: 4%
- MSEP: 4%
- NP: 13%
- SWH/Mitigation Creation: 13%

Total = $130,600,000
Other Recommendations

*Project Related*

- Continue refining annual strategic review process (Performance Assessment)
- Continue to actively develop and formalize sharing of lessons learned (biologists and engineers)
- Determine approach to budgeting and funding O&M
- Further development of project database (consistent recording)
- Annual Reports should provide cumulative context and metrics.
Near Term Issues

- Continue to develop a 3 to 5 year work plan for the MRRP
- ESH development in multiple reaches, reservoirs and off-channel pilot projects
- Continue AM of SWH projects
  - Improve monitoring / reporting of sites
- Monitoring pallid sturgeon reproduction / 0-1 age
- Evaluate Yellowstone Intake rock ramp approaches to complete next phases of construction

Conclusions

- Performance Assessment – currently serving as a quick report card of MRRP progress

- USACE, USFWS and MRRIC using Performance Assessment in making recommendations regarding funding needs and allocation of effort.
Appendix B

ISP - Science Questions and Findings
Missouri River Recovery Program:
Integrated Science Program
General Science Questions
& Key Findings

October 2010
Missouri River Recovery Program:
Integrated Science Program
General Science Questions & Key Findings
October 2010

Contents

General Pallid Sturgeon Questions: 5
I. What is the population of pallid sturgeon in the Missouri River and its tributaries? 5
   1. What are the population trends over time? ........................................................... 5
II. Is propagation a viable short-term solution to augment pallid sturgeon populations? 6
   2. Can pallid sturgeon be propagated? ................................................................. 6
   3. Will stocked fish survive in the river? ............................................................... 6
   4. Will stocked fish spawn in the river? ................................................................. 7
   5. What is the appropriate level of stocking? ....................................................... 7
III. Do pallid sturgeon spawn in the Missouri River? 7
   6. Where are the locations of spawning sites? ..................................................... 7
   7. What is the timing of the spawn? ................................................................. 8
   8. What are the cues that induce spawning? ....................................................... 8
IV. What are potential limiting factors to the reproduction, survival, and growth of the pallid sturgeon? 9
   9. What are the specific requirements for pallid sturgeon to successfully transition between life-stages? ................................................................. 9
   10. What are the details of larval drift? ................................................................. 10
   11. Is the abundance or diversity of forage a limiting factor for young and / or adult sturgeon? ................................................................. 10
   12. How is disease affecting recruitment? .......................................................... 10
   13. What substrate types are important for pallid sturgeon life history? .............. 10
   14. How does water quality (e.g. temperature, dissolved oxygen, turbidity, endocrine disrupters) affect recruitment of pallid sturgeon? ....... 11
   15. Is predation impacting recruitment? .............................................................. 11
   16. What habitat types are necessary during pallid sturgeon migration, how much is available and are there missing habitat components? ......................................... 11
   17. How is hybridization affecting sturgeon populations? .................................. 11
   18. What role does flow regime play in the survival and growth of young pallid sturgeon? ................................................................. 12
   19. Is lack of sediment a limiting factor? .............................................................. 12
V. How are management actions (flow modifications, habitat creations) affecting pallid sturgeon spawning, recruitment and population trends? 13
   20. Do habitat creation activities affect pallid sturgeon reproduction, survival, and growth? ................................................................. 13
   21. Could a fall pulse achieve ecological outcomes? ........................................... 13
   22. Do pulse flows from Gavins Point have the ability to condition spawning habitat? ................................................................. 13

Appendix B
23. How important is floodplain connectivity/ seasonal inundation to pallid sturgeon reproduction, survival, and growth? ..........................................................13
24. What other ecological processes are potentially influenced by management actions (e.g., larval drift distances)? ..........................................................14

VI. What are the trends in availability of shallow water habitat (both constructed and natural)? 14
25. What trends are shown through monitoring/documentation of the physical habitat? ........................................................................................................14

VII. Can data on other biological factors and fish species (shovelnose sturgeon, chubs, etc.) provide meaningful information about pallid sturgeon? 15
26. Does primary and secondary production provide meaningful information for the MRRP? .........................................................................................15
27. Do other native fish species provide meaningful information for the MRRP? ........................................................................................................15

VIII. How do different populations interact? 15
28. What is the relationship between the Mississippi and Missouri River habitats for the pallid sturgeon population? ..........................................................15

IX. What are the effects of management actions on non-target resources? 16
29. How do management actions affect water quality? ........................................16
30. How do management actions affect interior drainage/ groundwater? ..........16
31. How do management actions affect cultural resources? ................................16

General Least Tern and Piping Plover Science Questions: 16
X. What are the population trends of interior population of least tern and Northern Great Plains population of the piping plover? 16
32. What are the Range wide population trends? .............................................16
33. What are the population trends of least terns and piping plovers on the Missouri River? .................................................................................................17

XI. How are management actions affecting tern and plover productivity and population numbers? 18
34. How are releases from dams affecting productivity and populations? ..........18
35. How is habitat restoration affecting productivity and populations? ..............19
36. How are fluctuations in reservoir levels affecting productivity and populations? ........................................................................................................19
37. How are predator controls and nest caging affecting productivity and populations? ....................................................................................................20

XII. What other opportunities exist to positively affect tern and plover productivity and population numbers? 21
38. Can vegetation modification positively affect terns and plovers? ..................21
39. Can created reservoir habitat positively affect terns and plovers? ...............21
40. Can flow modification positively affect terns and plovers? .........................21
41. Can captive rearing positively affect terns and plovers? .............................22
42. How does human disturbance affect tern and plovers? ...............................23
43. Can placement of restriction signs and public education positively affect terns and plovers? ......................................................................................23

XIII. What are the trends in habitat availability on the system? 24
44. What are the trends in flow events that create habitat (frequency/probability)? ........................................................................................................24
45. What are the trends in erosion rates? .........................................................24
46. What are the trends in vegetation/ re-vegetation rates? ............................24
47. How does availability of ESH change due to water levels and dam releases? ....................................................................................................................24

XIV. What factors influence nest site selection, productivity and populations trends?  

48. How does breeding ground location and site selection affect tern and plover populations and productivity? .................................................................26
49. How does food availability affect piping plovers and least terns? ....................26
50. How does density-dependence affect piping plovers?........................................26
51. How does predation affect terns and plovers?..................................................27
52. How do weather events affect terns and plovers?.........................................27

XV. How are factors outside of the Missouri River affecting populations? 28

53. How does immigration/ emigration (use of other nesting habitats) affect Missouri River piping plover populations? ..................................................28
54. How does survival during migration affect Missouri River populations? .........28
55. How does survival on the wintering grounds affect Missouri River populations? ..............................................................................................................29

XVI. What are the effects of management actions on non-target resources? 29

56. How do management actions for terns and plovers affect sturgeon? .................29
57. How do management actions for terns and plovers affect mussels? ..................29
58. How do management actions terns and plovers affect riverbank erosion? .......30
59. How do management actions for terns and plovers affect water quality? ........30
60. How do management actions for terns and plovers affect turtles? .....................30

General Bald Eagle / Cottonwood Science Questions: 30

XVII. What are the trends in land cover and cottonwood forests along the Missouri River? 30

61. What is the current status of cottonwood populations on the Missouri River? ..................................................................................................................30
62. What are the trends in Bald Eagle Populations? .............................................31

General Mitigation Questions: 31

XVIII. What are the trends in land cover at Mitigation sites? 31

XIX. What are the effects of mitigation sites on floodplain ecosystems? 31

63. How much habitat has been restored? ............................................................31
64. What is the quality of restored habitat? .........................................................31
65. What are indicators of mitigation success? (Reptiles, amphibians, birds)? ......32

Literature Cited: 33
General Pallid Sturgeon Questions:

I. What is the population of pallid sturgeon in the Missouri River and its tributaries?

Service Providers: ACE, LAB, GS, FWS, MT, MO, NE, SD

1. What are the population trends over time?
   - Approximately 90% (2,720 of 3,131) of the pallid sturgeon sampled were identifiable as stocked fish. Pallid sturgeon populations are increasing and age structure is improving due to stocking (see below example for gill net catch in the lower Missouri River for the period 2006-2008).
   - A population estimate has been developed for the Fort Peck and Yellowstone River reaches (158 wild adults in 2004; Klunghol and Baxter 2005); other estimates for the lower Missouri and the Mississippi rivers are under development by scientists at the USGS, NGPC, and USACE.
   - Population viability and a sensitivity analysis of the critical population parameters for pallid sturgeon have been completed and published (Bajer and Wildhaber, 2007). Results suggest that management that increases population-level fecundity and improves survival of age-0, juveniles, and young adults should most effectively benefit sturgeon populations.
Sampling indicates that reproductive adults remain very rare. There is no evidence of recruitment of wild, naturally spawned pallid sturgeon above Gavins Point Dam. Recruitment downstream of Gavins Point Dam to the mouth is extremely rare (cite population assessment reports?)

**ISP Projects Addressing Questions:**
- Pallid Sturgeon Population Assessment
- Pallid Sturgeon Propagation and Population Augmentation
- Other Sturgeon Investigations
- System Status Reports

II. **Is propagation a viable short-term solution to augment pallid sturgeon populations?**

Service Providers: ACE GS FWS MT MO NE SD U

2. **Can pallid sturgeon be propagated?**
   - Since the 2000 Biological Opinion was issued, over 350,000 fingerling-sized or larger pallid sturgeon have been stocked into the system.
   - The graphs shows the number of pallid sturgeon stocked since 1994 within different management areas.

![Graph showing number of pallid sturgeon stocked since 1994](image)

- Hatchery improvements have increased the maximum production capability of 8"-sized pallid sturgeon from approximately 20,000 to 60,000 per year.
- Iridovirus is a natural pathogen of pallid and shovelnose sturgeon, which can induce significant mortality in hatcheries and is being successfully managed. In addition, the propagation program continues to struggle with other emerging diseases (e.g., ranavirus and herpes virus) and rearing difficulties (gas supersaturation and fin curl).

3. **Will stocked fish survive in the river?**
Stocked fish are surviving and growing in the river. Pallid sturgeon stocked as larvae, fingerlings and age-1 juveniles are surviving and their growth rates are comparable to wild sturgeon (Steffensen and others 2010). Survival rates for pallid sturgeon stocked as age-1 and older in the Missouri River may exceed 90%.

Fish stocked into the river through the Propagation and Augmentation Program are beginning to reach sexual maturity.

4. **Will stocked fish spawn in the river?**

   - Hatchery origin pallid sturgeon are reaching reproductive age and appear to exhibit characteristic migration and spawning behaviors (DeLonay and others, 2009). It is unknown, however, whether adult hatchery sturgeon are spawning at the right time, right place or under the right conditions with other wild or stocked pallid sturgeon.

5. **What is the appropriate level of stocking?**

   - The BiOp recommends an annual stocking rate of 4,700 juvenile to 1-year old sturgeon, 2,973 of which are the responsibility of the USACE.

   - Based on subsequent investigations an annual minimum stocking target of approximately 48,760 yearling pallid sturgeon or yearly equivalents is the objective identified by the Pallid Sturgeon Recovery Team for the Missouri River.
     - Survival rates for hatchery propagated white sturgeon were initially used as surrogate survival rates to set pallid sturgeon stocking objectives.
     - Survival rates for stocked pallid sturgeon (Hadley and Rotella 2009, Steffensen and others 2010) derived from USACE and State monitoring program data were similar to white sturgeon, indicating that the original assumptions of the stocking program were accurate.
     - Survival rates of stocked pallid sturgeon (Hadley and Rotella, 2009) and estimates of original population levels (Braaten and others, 2009) have been used to adjust stocking levels for populations above Lake Sakakawea.

   - Growth and survival analyses on hatchery fish have been mostly limited to year classes of hatchery fish that have yet to transition to a fish diet or reach reproductive maturity. It is unknown what the carrying capacity for adult pallid sturgeon is in most portions of its range, whether there are sufficient forage fish to support large numbers of predatory adults, or what constitutes a threshold population for adequate spawning success. Continued monitoring and adaptive management of stocking goals will be necessary.

   - Determination of survival rates is ongoing to refine the appropriate level of stocking.

---

**ISP Projects Addressing Questions:**

- Pallid Sturgeon Population Assessment
- Pallid Sturgeon Propagation and Population Augmentation
- Development of Management Tools for the Pallid Sturgeon Iridovirus (PSIV)
- Fishing for Cytokines and Immune Molecules to Better Understand Pallid Sturgeon Health
- Genetic Analysis – Species and wild origin determination
- Comprehensive Sturgeon Research Project (CSRP)

---

III. **Do pallid sturgeon spawn in the Missouri River?**

   - **Where are the locations of spawning sites?**
Female sturgeon have been documented releasing eggs; primarily in areas of converging flow, in the deepest, faster water available over or adjacent to coarse substrate on outside revetted bends (DeLonay and others 2009).

These documented occurrences are spread out over 100’s of river miles and occur upstream in the Gavins Point reach to the confluence with the Mississippi.

- Spawning in the lower basin has been identified over a wide range of modified habitats. Spawning has occurred at locations between Gavins Point Dam and Sioux City, between Sioux City and Omaha, and between Kansas City and Boonville for the period 2007-2010.
- Spawning in the upper basin has been documented in the Yellowstone River near its confluence with the Missouri.

Small flow pulses similar to those under consideration for dam releases are capable of transporting sediment and substantially rearranging the bed (Elliott and others, 2009; DeLonay and others, 2009); hence such flows have the potential to condition coarse spawning substrate by flushing fine sediment. Presently identified spawning patches (deep, turbulent water on outside revetted bends), however, are likely to be persistently free of fine sediment.

7. **What is the timing of the spawn?**

- Spawning of shovelnose and pallid sturgeon has occurred over extended periods (weeks to months).
- Pallid sturgeon in the lower Missouri River are typically spawning at temperatures from 15 to 18 °C (DeLonay and others, 2009).
- While the data are still limited, documented spawning times for pallid sturgeon in the Lower Missouri River have occurred over a narrower time frame than shovelnose sturgeon. Spawning in the lower 400 miles of the Missouri River typically occurs at the very end of April through the first two weeks of May (DeLonay and others, 2009). Pallid sturgeon further upstream near Gavins Point Dam generally spawn later. Spawning near the dam may not occur until the end of May.
- In river reaches below dams, it is believed that cooler water temperatures may inhibit spawning by sturgeon (e.g. below Fort Peck Dam).

8. **What are the cues that induce spawning?**

- Temperature, photoperiod (day length), and flow magnitude are emerging as potential migration and spawning cues (DeLonay and others 2009). At this time, the individual effects of these factors on spawning cues cannot be isolated.
- Other factors that may affect spawning include substrate type, proximity of fish of the opposite sex, reproductive health, and water quality.
- Pallid sturgeon have spawned without intentional pulsed flow releases from Gavins Point Dam (DeLonay and others 2009), but the importance of flow variability due to other sources (such as tributaries) is unknown. While pallid sturgeon can spawn under a wide range of flows it is unknown how flow influences spawning success, development and hatch of eggs, predation, or dispersal of resulting larvae.

**ISP Projects Addressing Questions:**
- Comprehensive Sturgeon Research Project (CSRP)
- Pallid Sturgeon Population Assessment
- Pallid Sturgeon Habitat Assessment and Monitoring Program (HAMP)
IV. What are potential limiting factors to the reproduction, survival, and growth of the pallid sturgeon?

Service Providers: ACE, LAB, GS, FWS, MT, MO, NE, SD, U, IA, O

9. What are the specific requirements for pallid sturgeon to successfully transition between life-stages?

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Life Stage Component</th>
<th>Current Understanding</th>
<th>Current and Future Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>Prespawn</td>
<td>Research indicates that pallid sturgeon mature, become reproductive and exhibit extensive migratory movements in the Missouri River.</td>
<td>What are the effects of temperature, flow regime, channel morphology, and food supply on migration and readiness to spawn?</td>
</tr>
<tr>
<td></td>
<td>Spawn</td>
<td>Research has addressed barriers to spawning and concludes that pallid sturgeon can spawn in the Missouri River. Scientists have NOT yet found deposited eggs, or larval pallid sturgeon associated with documented spawning events. Cold water-temperature events can disrupt spawning migrations.</td>
<td>What are the combined effects of water temperature, flow regime, and water quality in cueing reproductive stages in pallid sturgeon? Does the occurrence of hermaphroditism affect pallid populations?</td>
</tr>
<tr>
<td></td>
<td>Egg development</td>
<td>Wild and hatchery raised adults in reproductive condition have been successfully captured. They have been successfully spawned in the hatchery, and their progeny have hatched and recruited to larval stage, indicating that pallid sturgeon in the Missouri River are healthy, and have normal egg and larval development.</td>
<td>Do eggs adhere to river substrate? Are eggs fertilized in the wild? Do eggs hatch in the wild? Is predation an issue at the egg stage?</td>
</tr>
<tr>
<td>Egg to 1 yr. (Age 0 to 1)</td>
<td>Hatch to yolk absorption</td>
<td>Hatchery born larvae have been successfully moved to feeding on external food sources after yolk absorption. Laboratory and field studies have established that larval pallid sturgeon drift hundreds of km during this stage (Braaten and others, 2008); larvae are concentrated in the thalweg and near the river bottom (Braaten and others, in press).</td>
<td>Are larvae susceptible to predation? Are yolk sac resources sufficient to sustain larvae to a stage where they can feed on external resources? How do temperature, flow regime, and channel morphology affect drift distance and where in the channel larvae drift? Is entrainment (e.g., water intakes, diversions, dredges) a problem for drifting larval sturgeon?</td>
</tr>
<tr>
<td></td>
<td>Larvae</td>
<td>In upper basin hatchery-released larvae have recruited.</td>
<td>Where do larval fish drop out of the drift? Are resources necessary for survival available where larvae drop out? What are larval fish habitat requirements (e.g., nursery habitat)? Currently investigating drift and diet shift, habitat preferences, and feeding behavior</td>
</tr>
<tr>
<td></td>
<td>Post-larvae to one year</td>
<td>Post-larvae to age 1 pallid sturgeon have not been documented in the wild. Laboratory research has shown negative or neutral selection for pallid sturgeon as prey by some species of native, predatory fish (French 2009).</td>
<td>What is larval and juvenile pallid habitat? What are pre-winter habitat requirements for this life stage? What are over-winter habitat requirements? What food resources are necessary for survival?</td>
</tr>
<tr>
<td>Juvenile to Adult</td>
<td>Evidence provided by hatchery releases shows that pallid sturgeon released as juveniles (≥ one-year-of-age) have relatively high survival (Hadley and Rotella, 2009; Steffensen et al, 2010).</td>
<td>Juvenile pallid sturgeon eat primarily macroinvertebrates (Grohs and others, 2009; Gerrity and others, 2006)</td>
<td>What prey types and amounts are optimal for growth, survival, and reproductive maturation?</td>
</tr>
</tbody>
</table>
Larger juveniles and adults feed primarily on fish (e.g., sicklefin chub, sturgeon chub, Johnny darter, flathead chub, sand shiner (Gerrity and others, 2006).

What prey types and amounts are optimal for growth, survival, and reproductive maturation? What are the ecological requirements for preferred prey species?

10. **What are the details of larval drift?**

- Drifting sturgeon larvae have been documented in the river indicating that successful wild spawning of Scaphirhynchus sturgeon has occurred in the Missouri River. Three larvae collected from the Lower Missouri River near Lisbon Bottom were identified as pallid sturgeon (Mauldin, 1999, cited in Hrabik and others, 2007); however, these identifications were not confirmed with genetic tests.
- During USGS sturgeon reproductive studies in 2010, day-0 shovelnose sturgeon larvae were collected just downstream of a confirmed pallid sturgeon spawning site (Aaron DeLonay, pers. com), indicating that conditions at that site were suitable for Scaphirhynchus spawning and hatch.
- Upper Missouri River basin models of cumulative drift distance as a function of velocity suggest that the average larval pallid sturgeon would drift about 152 miles at a mean water column velocity of 1 ft/sec, but drift distance for the average larvae would increase to 329 miles at mean water column velocities of 2 ft/sec. (Braaten and others 2008). However, variability in drift rates and cumulative drift distance were exhibited by the larvae. Drift rates for pallid sturgeon have not yet been validated in the lower Missouri River.
- Calculations based on ranges of larvae maturation times (Braaten and others, 2008) and typical water velocities in the Lower Missouri River downstream from Gavins Point dam indicated that total drift distance could be 189 to 1100 miles, which could place Missouri River drifting larvae in the Mississippi River (DeLonay and others, 2009).
- Water temperature, velocity, and channel form have been shown to influence drift distance and time (Braaten and others, 2010).

11. **Is the abundance or diversity of forage a limiting factor for young and/or adult sturgeon?**

- Results to date indicate that sturgeon (pallid and shovelnose) under 24 inches share similar diets, and above 24 inches, the pallid shifts to a fish-dominated diet (Grohs and others 2009).
- Research indicates that there are differences in growth and condition by geographic region. More analysis needs to be conducted to better understand the relationships that exist (Population Assessment Annual Reports, 2002-2010).

12. **How is disease affecting recruitment?**

- Iridovirus occurs in both hatchery and wild populations. Iridovirus is a natural pathogen of pallid and shovelnose sturgeon, which can induce significant mortality in hatcheries and is being successfully managed.
- Sturgeon surviving Iridovirus infection can be virus carriers and potentially transmit the virus to unaffected fish (Hedrick and others 2009).

13. **What substrate types are important for pallid sturgeon life history?**

- Early observations of potential spawning substrate indicate that spawning habitat includes gravel and larger rock on outside bends on the river (DeLonay and others 2009). Abundance of this habitat type in the lower river indicates that this may not be a limiting factor. However, it is not known if stabilized river bends are adequate or ideal for spawning and subsequent survival of progeny.
- Lab studies show juvenile pallid sturgeon prefer sand and avoid gravel and wood (see Allen and others 2007, Personal communication with Tobias Rapp, SDSU).
Field studies of pallid and shovelnose sturgeon habitat selection indicate selection for sand substrate during adult life stages, with the exception of during spawning (Reuter and others, 2009; Bramblett and White, 2001).

14. How does water quality (e.g. temperature, dissolved oxygen, turbidity, endocrine disrupters) affect recruitment of pallid sturgeon?
   - In one study, 12% of the male shovelnose sturgeon also had female characteristics in their reproductive systems (DeLonay and others 2009); however, the cause is unknown at this time. In other fish species, this has been tied to endocrine disrupting chemicals such as estrogen mimicking compounds from waste-water systems. It has been established that endocrine disrupting chemicals can have population level impacts.
   - An altered temperature regime has been identified as a factor limiting condition, growth, and survival in warm water fishes (e.g., shovelnose sturgeon in the upper Missouri River; Kappenman and others 2009).

15. Is predation impacting recruitment?
   - In a laboratory study, pallid sturgeon vulnerability to predation was shown to be low (Tobias Rapp, South Dakota State University, Personal Communication).
     - Pallid sturgeon were not selected as food by walleye and smallmouth bass under all tested conditions.
     - Flathead catfish consumed 1.5 to 2 inch pallid sturgeon at the same frequency as other foods. Flathead catfish did not select 3 to 4 inch pallid sturgeon as food.
   - Capture and non-consumption by predators appears to have little effect on survival of >2.8 inch pallid sturgeon (Tobias Rapp, South Dakota State University, Personal Communication).
   - To date, many of the pallid sturgeon stocked were 8 inch yearlings, which need a large investment in feed, time, and hatchery space. Stocking smaller sturgeon would allow managers to increase the number of fish stocked, while decreasing costs in space and time required.

16. What habitat types are necessary during pallid sturgeon migration, how much is available and are there missing habitat components?
   - Migratory sturgeon appear to select areas where slow and fast water meet and habitat transitions from shallow to deep water (Reuter and others, 2009, Bonnot and others, in review; DeLonay and others 2009).
   - Migratory and rearing habitat appears to be more limited from the Platte River to Sioux City, than in the segments upstream of Sioux City, or downstream of Kansas City (Reuter and others, 2009; Reuter and others, 2008; Elliott and others, 2009; Jacobson and others, 2009; DeLonay and others 2009).

17. How is hybridization affecting sturgeon populations?
   - Hybridization between pallid sturgeon and shovelnose sturgeon has been documented in the Missouri River (Hartfield and Kuhajda 2009). Potential population level effects and the factors that contribute to hybridization, however, have not been studied.
   - The level of hybridization appears to be greater in the lower Mississippi and lower Missouri Rivers than in the upper Missouri and lower Yellowstone Rivers (Carlson and others 1985, Keenlyne and others 1994, Tranah and others 2004).
   - Hybridization does occur naturally among sturgeon at a very low rate. High rates of hybridization typically occur in sturgeon when individuals of one species are very rare and the other much more common, when barriers prevent species from reaching the spawning grounds, and when habitat alterations break down the
mechanisms that synchronize and separate reproduction of the species in time and
space (e.g., altered temperatures and flows, too little or too much spawning habitat)
18. What role does flow regime play in the survival and growth of young pallid sturgeon?

- Flows are assumed to be critical in providing essential biological and physical
  functions (spawning cues, habitat conditioning, larval dispersal) (Fisher 1983, Poff
  and others 1997, Arujo-Lima 2005, King and others 2009) and providing essential
  organic resources into the channel for increasing primary and secondary production
  (i.e., food and energy required for all pallid sturgeon life stages). Through
  connection with the floodplain, flows provide increased organic material into the
  main channel and rework the distribution of organisms and sediments (Junk and
  elements are thought to be essential in overcoming the recruitment bottleneck.
  (i.e., increased forage for a larval and juvenile pallid sturgeon through floodplain
  connectivity). The BiOp also assumes that flows in the summer should be sufficiently
  low to provide for shallow, slow velocity habitats for refuge and foraging habitat for
  these life history stages.

- A significant assumption of the BiOp is that without some level of restoration of the
  natural hydrograph the pallid will continue to decline. While we have some
  evidence that spawning can occur in the reach without a pulse from the dam, we
  have very little understanding of the effects of the altered hydrograph on pallid life
  history. The unsynchronized nature of our current hydrograph with the biological
  and ecological processes that evolved in the system is suspected to cause indirect
  impacts to pallid growth and reproduction.

19. Is lack of sediment a limiting factor?

- Prior to the 1950s, the Missouri River carried more than 320 million tons of
  suspended sediment per year at Hermann, Missouri. The construction of dams,
  channel structures and levees allowed easier river navigation and controlled
  flooding but drastically decreased the amount of sediment flowing in the river.
  Today, the Missouri River near Hermann carries only 20 to 25 percent of its original
  sediment volume (Jacobson and others, 2009; Meade and Moody 2010).

- Reintroducing sediment to the river from the floodplain (during shallow-water
  habitat construction) could temporarily and partially restore other natural river
  functions (e.g., turbidity) and could provide the building blocks for natural habitat
  creation.

- Transport of sediment around Gavins Point dam has the potential to sustainably
  increase annual suspended sediment load by approximately 5 million tons per year,
  or about 10% of the present total suspended load (as measured at Hermann,
  Missouri).

- Sediment carries nutrients which are essential for primary productivity but may
  exacerbate gulf hypoxia (Jacobson and others, 2009). “A comparison of potential
  phosphorus loads from Corps SWH projects, with load increments required to
  produce measurable changes in the areal extent of Gulf hypoxia, shows that these
  projects will not significantly change the extent of the hypoxic area in the Gulf of
  Mexico” (NRC of the National Academies, 2010).

- The pallid sturgeon evolved adaptations to persist in a naturally turbid environment
  (Blevins, 2006). “High concentrations of sediment and high turbidity in the pre-
  regulation river were important to the evolution and adaptation of native species
  such as the pallid sturgeon” (NRC of the National Academies, 2010).
V. How are management actions (flow modifications, habitat creations) affecting pallid sturgeon spawning, recruitment and population trends?

Service Providers: ACE LAB GS FWS MT MO NE SD U IA O

20. Do habitat creation activities affect pallid sturgeon reproduction, survival, and growth?

- Adult pallid sturgeon occupy the edges of shallow-water habitat in their upstream migrations (DeLonay and others 2009). They have been tracked through created chutes on their upstream migration suggesting that habitat manipulations can facilitate migration, conversely some constructed river structures have been shown to impede migratory movements, including control the structures at the upstream chute entrances, and large notched L-head structures.

- The goal of habitat creation efforts, based on the Biological Opinion, is to provide for increased primary and secondary production, as well as increasing the fish forage base for pallid sturgeon. These effects are expected to occur slowly and in step with habitat maturation.

21. Could a fall pulse achieve ecological outcomes?

- It is thought that there are some benefits to a fall pulse flow physically as it has the potential to rework sediments and bring organics (if it gets onto the floodplain) into the main channel. These effects may be beneficial for pallid sturgeon and could even create some emergent sandbar habitats for the terns and plovers (2003 BiOp RPA element II.2.b.2 page 201-202).

22. Do pulse flows from Gavins Point have the ability to condition spawning habitat?

- Flow pulses, similar to those under consideration for dam releases, have transported sediment and rearranged material on the bed of the river, (Elliot and others 2009); indicating the ability to condition habitat.

23. How important is floodplain connectivity/seasonal inundation to pallid sturgeon reproduction, survival, and growth?

- From the literature it is clear that access to the floodplain is important in providing organic inputs into the system and providing for certain life history stages for native fishes in large rivers (Bayley 1988, Junk and others 1989, Galat and others 1998, Ward and others 1999). Because the pallid sturgeon is an obligate benthic species, it rarely strays far from the sandy, turbid main channel and channel border habitats.
The value of floodplain connectivity to the species would have to be established by defining food webs or other biotic interactions.

24. **What other ecological processes are potentially influenced by management actions (e.g., larval drift distances)?**
   - High velocities and low channel diversity on the Missouri River from the Platte River to Sioux City may hinder migration (Reuter and others, 2009); shallow-water habitat construction could potentially mitigate this effect.
   - Long drift distances of larval sturgeon indicate that shallow-water habitat intended for rearing larval and juvenile sturgeon may be more beneficial downstream of the Kansas River (DeLonay and others, 2009).
   - Shallow Water Habitat may slow down velocities and reduce drift distances upstream of the Kansas River.

### ISP Projects Addressing Questions:
- Comprehensive Sturgeon Research Project (CSRP)
- Pallid Sturgeon Population Assessment
- Pallid Sturgeon Habitat Assessment and Monitoring Program (HAMP)
- Fish Community Monitoring and Habitat Assessment of Off-Channel Mitigation Sites “Chute Study”
- Gavins Point Spring Pulse Flow Modification – Groundwater Monitoring
- Gavins Point Spring Pulse Flow Modification – Interior Drainage Monitoring
- Fort Peck Flow Modification Biological Collection Plan
- Fort Peck Temperature Control Device

VI. **What are the trends in availability of shallow water habitat (both constructed and natural)?**

Service Providers: ACE LAB GS FWS MT MO NE SD U IA O

25. **What trends are shown through monitoring/documentation of the physical habitat?**
   - It is estimated that prior to any construction activities the Missouri River below Ponca, NE contained 3,025 acres of naturally occurring Shallow Water Habitat (SWH).
   - In 2009, it was estimated that there were 8,863 acres of natural and created SWH in the Missouri River below Ponca, NE (Annual BiOp Compliance Report, 2009).

### ISP Projects Addressing Questions:
- Pallid Sturgeon Habitat Assessment and Monitoring Program (HAMP)
- Acreage Accounting
- Fish Community Monitoring and Habitat Assessment of Off-Channel Mitigation Sites “Chute Study”
- Population Structure and Habitat Use of Benthic Fishes along the Missouri and Lower Yellowstone Rivers
- Two-dimensional Hydraulic Model of the Missouri River
VII. Can data on other biological factors and fish species (shovelnose sturgeon, chubs, etc.) provide meaningful information about pallid sturgeon?

Service Providers: ACE LAB GS FWS MT MO NE SD UT IA OK

26. Does primary and secondary production provide meaningful information for the MRRP?

- Shallow water habitat provides locations for increased abundance of algae and phytoplankton (primary productivity), aquatic invertebrate production and zooplankton (secondary productivity), and larval/young-of-year nursery habitat (USFWS Clarified SWH Definition, 2009).

- Primary and secondary productivity are attributes that can be used to assess overall ecosystem health (USFWS Clarified SWH Definition, 2009).

27. Do other native fish species provide meaningful information for the MRRP?

- Evaluation of the responses of other native Missouri River fish species (e.g., shovelnose sturgeon, paddlefish, blue sucker, sicklefin chub, sturgeon chub, flathead chub, etc.) to changes in habitat, flow modifications, or water quality will provide valuable feedback as to the biological benefits of those changes, including:
  - A short-term assessment of the management action as opposed to a long-term assessment (e.g., pallid sturgeon recruitment).
  - Strengthens the overall evaluation of the management action (improved weight of evidence).
  - Improved understanding of ecosystem response, relationships, health, and trends.
  - Insight into life history needs of species that share similar life history components with pallid sturgeon (surrogate species; Wildhaber and others, 2007).
  - Improved understanding of pallid sturgeon food species.

VIII. How do different populations interact?

Service Providers: ACE GS FWS MT MO NE SD UT IA OK

28. What is the relationship between the Mississippi and Missouri River habitats for the pallid sturgeon population?

- To-date we have found that some Missouri River adult pallid sturgeon migrate into the Mississippi, and vice-versa (Garvey and others, 2009, DeLonay and others, 2009).

ISP Projects Addressing Questions:
- Pallid Sturgeon Habitat Assessment and Monitoring Program (HAMP)
- Fish Community Monitoring and Habitat Assessment of Off-Channel Mitigation Sites “Chute Study”
- Population Structure and Habitat Use of Benthic Fishes along the Missouri and Lower Yellowstone Rivers
- Missouri River Restoration Project Water Quality Monitoring Program
- Comprehensive Sturgeon Research Project (CSRP)
IX. What are the effects of management actions on non-target resources?

Service Providers: ACE GS

29. How do management actions affect water quality?
   ➢ Water quality monitoring efforts are ongoing. Prior to any shallow water habitat creation efforts the Corps conducts water, soil, and sediment testing to ensure that these efforts will not negatively impact water quality in the Missouri River.

30. How do management actions affect interior drainage/groundwater?
   ➢ This is being explored as part of the Spring Rise monitoring efforts. Two years of monitoring data has shown that groundwater levels are influenced by Missouri River flows (McAllister, 2010).
   ➢ Duration of river rises appears to influence the amount of groundwater rise; however, not all changes in groundwater depth correlate with river stage.
   ➢ Changes in groundwater depth exhibit lag when compared with changes in river stage (Kelly, 2006, 2004, and 2000).

31. How do management actions affect cultural resources?
   ➢ Effects of the spring pulse on cultural resources have been monitored. No significant effects to known cultural resources sites have been identified to date.

ISP Projects Addressing Questions:
- Pallid Sturgeon Population Assessment – Informal Communication (MOU)
- Pallid Sturgeon Recovery Work Groups
- Pallid Sturgeon Research Prioritization Workshops

General Least Tern and Piping Plover Science Questions:
X. What are the population trends of interior population of least tern and Northern Great Plains population of the piping plover?

Service Providers: ACE GS FWS MT MO NE SD U O

32. What are the Range wide population trends?
   ➢ Recovery of species is determined at the range wide level, meaning achievement of Recovery goals on the Missouri River alone will not resulting in de-listing of the entire regional population.
   ➢ An international census for the piping plover has been done in 1991, 1996, 2001 & 2006 for the Northern Great Plains population. In 1991 3,469 adults were counted (Haig 1992). In 1996 the population declined to 3,286 (Plissner 1997) and in 2001 the population declined to 2,953 adults (Ferland 2002). In 2006 the population rebounded to 4,662 adults (Elliott-Smith 2009). The 2006 results are broken down as follows (Elliott-Smith 2009):
     o Canada – 1,703 adults (Goal 2,500 adults)
     o U.S. Northern Great Plains – 1,213 pairs (Goal 1,300 pairs)
       i. Montana 46 pairs (Goal 60 pairs)
       ii. North Dakota 646 pairs (Goal 650 pairs)

ISP Projects Addressing Questions:
- Missouri River Restoration Project Water Quality Monitoring Program
- Gavins Point Spring Pulse Flow Modification – Groundwater Monitoring
- Gavins Point Spring Pulse Flow Modification – Interior Drainage Monitoring
Missouri River 282 pairs (Goal 100 pairs)
- Missouri Coteau 364 pairs (Goal 550 pairs)

iii. South Dakota 244 pairs (Goal 350 pairs)
- Missouri River Gavins Point 117 pairs (Goal 250 pairs)
- Missouri River Other 109 pairs (Goal 75 pairs)
- Other 18 pairs (Goal 25 pairs)

iv. Nebraska 268 pairs (Goal 465 – 250 for the Missouri = 215 pairs)
v. Minnesota 2 pairs (Goal 25 pairs)
vi. Kansas, Iowa, Colorado 14 pairs (Goal 0 pairs)

In 2005 the first range wide adult census was completed for the interior population of the least tern. Range wide, 17,591 adults were counted (Lott 2006) (Goal 7,000).
- 11,281 were counted on the lower Mississippi River System (Goal 2,000-2,500)
- 1,821 were counted on the Red River System (Goal 300)
- 2,129 were counted on the Arkansas River System (Goal 1,600)
- 2,044 were counted on the Missouri River System (Goal 2,100)
- 138 were counted on the Rio Grande River System (Goal 500)

What are the population trends of least terns and piping plovers on the Missouri River?
- From 1986-2009 an average of 656 adult least terns have been counted with a high of 1,010 in 2007 and a low of 393 in 1986 (USACE 2009). For comparison, the interior population of the least tern recovery plan sets a goal of 900 adults for the Missouri River. From 1986 – 2009 the number of fledglings (chicks able to fly) has varied from a low of 26 in 1986 to a high of 547 in 1998 with an average of 311 (USACE 2009).
- The above chart shows least tern adult census and fledgling results for 1986 – 2009.

From 1986-2009 an average of 757 adult piping plovers have been counted with a high of 1,764 in 2005 and a low of 82 in 1997 (USACE 2009). For comparison, the Northern Great Plains population of piping plover recovery plan sets a goal of 425 adult pairs (interpreted by the FWS as 1139 total – includes estimated non-nesting birds) for the Missouri River. From 1986 – 2009 the number of fledglings (chicks able to fly) has varied from a low of 8 in 1986 to a high of 1,179 in 2004 with an average of 517 (USACE 2009).
XI. How are management actions affecting tern and plover productivity and population numbers?

Service Providers: ACE GS FWS MT MO NE SD U O

34. How are releases from dams affecting productivity and populations?
   - Runoff on the Missouri River has greatly influenced both tern and plover population. Years of high runoff, such as 1995-1997, eliminated most habitats and saw reduced numbers of both species. Years of low runoff, such as 2000-2007, saw increased numbers of both species as habitat was available both on the river and reservoir shorelines.
   - Periodic high releases from the dams can create or restore sandbar habitat resulting in a positive reproductive response of piping plovers and least terns.
   - Low releases from the dam can provide nesting and foraging habitat by exposing sandbars that are normally submerged. However continuous low flows during the nesting period over several years will marginalize this effect as habitat degrades due to vegetation encroachment.
   - At the beginning of the nesting season, dam releases may be used to influence nest site selection. This is done to prevent the two species from nesting on sandbars that
otherwise could be inundated when higher releases are needed later in the nesting season to meet navigation targets.

- Hydropower peaking releases from the dams can reduce nesting habitat for both species and foraging habitat for plovers by temporarily inundating sandbars on a daily basis. Hydropower peaking may lead to the loss of chicks that may be washed down the river as releases are increased.
- Cold water releases out of the dams may provide unsuitable water temperatures that can lead to a reduction in forage food for both species.

35. **How is habitat restoration affecting productivity and populations?**

- Newly created habitat (both natural and constructed) leads to high productivity by both species.
- Data shows a high nest success on constructed sandbars for both species (USACE 2009). Chick survival is generally highest in the first year and lowers in subsequent years (USACE 2009), possibly due to factors such as predation and habitat quality.
- On constructed sandbars, piping plovers have higher nesting densities than on natural sandbars (Catlin 2009).
- Both species currently use constructed habitat more frequently than natural habitat. However, this may be a result of the marginal quality of natural habitat, which has not been replenished since high flows in 1997.
- The movement of both species to constructed sandbars has caused increased density that leaves them more vulnerable to predators and random weather events (hail and thunderstorms) (2006-2009 Biological Opinion Compliance Reports) and in the case of the plovers, increased aggression amongst plovers (Catlin 2009).
- Studies indicate that piping plover chicks on constructed sandbars have a higher growth rate than plover chicks on natural sandbars. This may be tied to decreased habitat quality on natural sandbars (Catlin 2009).
- Decreased productivity over time and declining population trends suggest that the quantity and quality of habitat has been inadequate to sustain population growth.
- Studies indicate high site fidelity by returning piping plover adults. Newly available constructed habitat is more likely to be used by first breeding season plovers, which arrive later than older adults (Catlin 2009).
- Concentrating the two species on small areas could lead to high losses due to predation, weather, disease and other density problems (USACE 2009).
- The chart below shows the increasing concentration of piping plovers on constructed sandbars over natural sandbars from 2004 through 2009 (USACE 2009).
The chart below shows the increasing concentration of least terns on constructed sandbars over natural sandbars from 2004 through 2009 (USACE 2009).

36. **How are fluctuations in reservoir levels affecting productivity and populations?**
- Declines in reservoir levels can expose shoreline habitat and islands used for nesting.
- Declining reservoir levels over a series of years on Lake Sakakawea led to a substantial increase in piping plover adult numbers (USACE 2009).
- Declining reservoir levels over a series of years on Lake Oahe led to a substantial increase in least tern and piping plover adult numbers (USACE 2009).
- Rising reservoir levels over a series of years on Lake Sakakawea cause loss of shoreline habitat has led to decreased piping plover adult numbers, decreased productivity and an increase in incidental take (USACE 2009).
- Rising reservoir levels over a series of years on Lake Oahe has led to decreased piping plover and least tern adult numbers, decreased productivity for the two species and an increase in incidental take for the two species (USACE 2009).
- Changes in reservoir levels at Fort Peck have not demonstrated substantial effects on terns and plovers due to low usage of this reservoir by the birds (USACE 2009).

37. **How are predator controls and nest caging affecting productivity and populations?**
- Predator control methods include use of exclosures (cages), use of predator traps and other removal techniques.
- Studies have shown implementation of predator controls increases the likelihood of successful piping plover egg hatching and fledging of chicks.
- Caging of piping plover nests increases the likelihood of the eggs successfully hatching (USACE 2009).
- Protecting nests early in incubation provides maximum effectiveness.
- Caging of plover nests can lead to predation of adult plovers, juveniles, and eggs if a predator learns to key in on cages (Murphy et al 2003).
- The effects of caging plover nests on least terns are unknown. Due to a different behavior (flying off of nest if alarmed), least tern nests are not caged.
- Likelihood of successful fledging of a chick increased with more days the nest was protected.
XII. What other opportunities exist to positively affect tern and plover productivity and population numbers?

Service Providers: ACE GS FWS NE SD U IA CO

ISP Projects Addressing Questions:

- Least Tern and Piping Plover Adult Census
- Least Tern and Piping Plover Productivity Monitoring
- Annual Reports for the Biological Opinion 2001-2009
- Influence of Predation on Least Tern and Piping Plover Productivity
- Distribution and Productivity of Least Terns and Piping Plovers along the Missouri and Cheyenne Rivers in South Dakota
- Distribution, Productivity, and habitat Use by Least Terns and Piping Plovers on the Niobrara River in Northern Nebraska
- Nesting Ecology of the Interior Least Tern on the Yellowstone River, Montana
- Piping Plover Foraging Ecology in the Great Plains.
- Population Dynamics of Piping Plovers on the Missouri River, South Dakota.
- Piping Plover population dynamics on natural and engineered sandbars on the Missouri River.
- Least Tern Productivity and Foraging Ecology on the Gavins Point Reach of the Missouri River.
- Habitat Selection, Productivity, and Estimation of Available Nesting Habitat for Piping Plovers on Lake Sakakawea
- Habitat and Reservoir Elevations and RDEIS Alternatives performance as described by equivalent habitat acres
- Reservoir Habitat Assessment
- ESH Monitoring and Evaluation

38. Can vegetation modification positively affect terns and plovers?
   - Over 90% of nests of both species occurred in areas with less than 10% vegetation (Vander Lee 2002).
   - An ongoing study is investigating the most effective methods of removing vegetation.
   - Future studies will investigate usage of vegetation removal sites by terns and plovers

39. Can created reservoir habitat positively affect terns and plovers?
   - Constructed sandbars at River Mile 826.5 on Lewis & Clark Lake and at Dredge Island on Lake Oahe have been used by both species, sometimes providing significant numbers. (In 2009, 33% of all least tern nests on the Missouri were on the Lewis & Clark Lake complex.) (USACE 2009)
   - The opportunity to create reservoir habitat and its availability following creation is dependent upon dam operations which can lead to large fluctuations in water levels of the reservoirs, particularly Lake Sakakawea and Lake Oahe.

40. Can flow modification positively affect terns and plovers?
Tern and plover habitat in the Gavins Point segment was positively affected by the sustained high flows in 1997 (Vander Lee 2002).

Vegetation was reduced by 50% from 1996 to 1998 on existing sandbars, demonstrating the ability of high flows to scour vegetation (Vander Lee 2002).

Average sandbar size increased from 11 acres to 44 acres from 1996-1998 (Vander Lee 2002).

Bare sand areas greater than one acre in size increased from 151 in 1996 to 250 in 1998 (Vander Lee 2002).

Flow from the Gavins Dam increased in 1999 and 2000 compared to 1998. During this time, total sandbar acres decreased by 60% and the average site size decreased by 55%. Little or no vegetation scouring occurred and vegetation on inter-channel sandbars increased 3-fold from 1998-2000 (Vander Lee 2002).

Reduced flows during the drought years of 2000-2007 exposed additional sandbar habitat.

It has not been determined what magnitude and duration of flow would be needed to create new habitat.

41. Can captive rearing positively affect terns and plovers?

In 1995, due to high releases out of the dams and the filling of the reservoirs, least tern eggs and piping plover eggs and chicks were collected to prevent their loss from inundation. The collected eggs were hatched and chicks raised at a captive rearing facility operated by the Corps of Engineers. After fledging (able to fly) the fledglings were released into the wild. The captive rearing program then continued through the 2002 nesting season. From 1995-2002 523 piping plover eggs, 16 piping plover chicks and 478 least tern eggs were collected. Of these 443 piping plover eggs hatched (84.7% success) and 378 least tern eggs hatched (79.0% success). 411 piping plover chicks fledged (92.8% success) and 322 least tern chicks fledged (85.2% success) (USACE 2009).

Collection and incubation practices were refined during the program resulting in higher egg hatching success and lower mortality of chicks over time.

With the construction of a new captive rearing facility and flight pens in 1996, acclimation of juveniles for release into the wild was greatly improved.

A study in 2000 found the survival rate of post fledged captive reared plovers was the same as wild reared plovers (Niver 2000).

Captive reared piping plovers have been observed on the Missouri River every year from 1996 through 2010. A captive reared piping plover released in 1997 was observed in 2010. With an average life expectancy of 6-7 years, this 13 year old plover is extremely long lived (USACE 2009).

In the 2003 Amendment to the Biological Opinion the U.S Fish & Wildlife Service stated that it no longer supported captive rearing by the Corps and the program was terminated. The reasons why the Service no longer supports captive rearing, as provided by Carol Aron of the Fish & Wildlife Service are listed below:

- The U.S. Fish & Wildlife Service does not support captive rearing for several reasons. First and foremost, the Service is focused on restoring the Missouri River ecosystem, and does not think that diverting resources and time to captive rearing would allow the Corps to further that aim. Unlike the pallid sturgeon, the birds are able to reproduce in the wild, making such drastic measures unnecessary.

- Second, from previous experience, it is the Service’s understanding that while piping plovers could be reared successfully (albeit, as research on the Great Lakes has shown, with a significantly lower return rate than their wild cohorts), least terns did not successfully make the transition to the wild and had a very low survival rate.
Third, the Service is concerned about the potential for disease or genetic modification by selecting for birds in a captive environment.

The captive rearing was tried as an experiment. However, the Service does not think that this is a viable long-term solution for the Missouri River. The Service believes it is better to be working towards long-term solutions that benefit not just the birds but also the many other species that use the sandbars (turtles, sandpiper species, small fish areas in the shallows), and would benefit from a more ecologically functioning system. The Service feels that focusing on captive rearing would change the emphasis drastically away from that goal.

42. How does human disturbance affect tern and plovers?
   - A USGS study in 2006 on the Gavins Point Segment that assessed recreation and research disturbance of tern and plover nesting areas found very little recreation use of the monitored sandbars. The study found that 66% of the events monitored were classified recreational but only 3% of the recreational events resulted in a visit to a monitored sandbar. Research made up 34% of the events and 62% of these events resulted in a visit to a monitored sandbar. The study noted one instance where the presence of restriction signs seemed to redirect recreational users from a monitored sandbar (Stucker 2007).

43. Can placement of restriction signs and public education positively affect terns and plovers?
   - Restriction signs are placed around nesting sites that contain 5 or more nests or are in areas where there is a high probability of human disturbance.
   - Information signs on the least tern, piping plover and pallid sturgeon have been placed at boat ramps along the Missouri River advising the public to be aware of the species and to avoid nesting areas.
   - The Corps partially funds a USFWS special agent to provide law enforcement coverage throughout the nesting season.
   - The Corps has an extensive outreach program on the Missouri River Recovery Program and endangered species with presentations to grade schools through universities, teacher conventions, non-government organizations and other interested groups.
   - The Corps is developing a web site in conjunction with the Missouri River Institute at the University of South Dakota to promote environmental education of the Missouri River ecosystem.

**ISP Projects Addressing Questions:**
- Least Tern and Piping Plover Productivity Monitoring
- Evaluation of Vegetation Removal and Control Methods Create Emergent Sandbar Habitat
- Reservoir Habitat Study for Least Terns and Piping Plovers
- Bird Captive Rearing Program
- Assessment of the Management Strategy to Release Captive Reared Piping Plovers into the Missouri River System
- Evaluation of Captive Rearing as a Management Tool for Piping Plovers
- A Muddy Question: Assessing Human Recreation and Research Disturbances on Missouri River Sandbars Managed for Endangered Birds
- Island Clearing and Habitat Improvement for Least Terns and Piping Plovers Nesting Habitat along the Missouri River
- Unbalancing Study (Master Manual)
- Vegetation Control on Sandbars Utilizing Lime and Herbicides
- Population Dynamics of Piping Plovers on the Missouri River. South Dakota
XIII. What are the trends in habitat availability on the system?

Service Providers: ACE GS FWS NE SD U C O

- A method to annually inventory and map emergent sandbars and land cover for the Missouri River using high-spatial resolution satellite imagery (QuickBird) has been developed. Using criteria in the 2003 Missouri River Biological Opinion to define an emergent sandbar, the analysis showed all river segments except for Fort Randall are substantially below (<30 %) the 2005 minimum emergent sandbar area targets in the Biological Opinion.

- Sandbar habitat on the priority segments identified in the BiOp (Gavins Point River, Lewis and Clark Lake, Fort Randall River, Garrison River, and Fort Peck River) was measured based on aerial photographs from 1998, 1999 and 2005. In general, sandbar habitat increased significantly in 1998 due to sustained high flows on the system from 1995-1997. Sandbar habitat declined due to erosion and vegetation encroachment in the period from 1998-2005. The overall acreage of habitat in 1998/1999 was approximately 6,754 acres which declined to 1,985 acres by 2005. Measurements of habitat available in these segments were also recorded in 2006-2009 however the acreage of sandbar habitat available has not yet been reported.

44. What are the trends in flow events that create habitat (frequency/probability)?

- Analysis of system conditions (inflows and outflows) from 1968 through 2009 indicate that in 9 out of the 42 years, the potential existed to create sandbar habitat based on the criteria of 60,000 cfs for 60 days (however, this quantity and duration of flow is not known to create habitat).


- The remaining two years were early in the period of analysis (1975 and 1978) indicating that only one major event (1995-1999) was likely to have created habitat since the listing of both species in 1986.

45. What are the trends in erosion rates?

- Erosion rates of sandbars over the period of 1998-2005 varied by segment and ranged from 5% (Lewis and Clark Lake) to 14% (Gavins Point River Segment) loss per year with an average rate of 10% loss per year.

46. What are the trends in vegetation/ re-vegetation rates?

- Revegetation is widespread one year after tilling.

- Vegetation rates of sandbars over the period of 1998-2005 varied by segment and ranged from 3% to 14% per year with an average rate of 6% per year.

47. How does availability of ESH change due to water levels and dam releases?
Draft curves have been developed to capture this relationship for three segments based on 2005 LiDAR (Gavins Point) and technical appendices to the Master Manual (Ft Randall and Garrison). While these represent an initial starting point, future investigations will be undertaken to update and refine these relationships. These curves can be used by taking a known acreage and discharge, for example 100 acres at 30,000 cfs in the Gavins Point segment, and adjusting it to a desired discharge, for example 15,000 cfs. In this example, 100 acres at 30,000 cfs (30% exposed) would correspond to approximately 217 acres of ESH at 15,000 cfs (65% exposed) \( \frac{100}{30\%} \times 65\% = 217 \) acres.

The relationship of habitat availability to flow is complex. As flow is decreased, the area of exposed inter-channel sandbars and islands initially increases due to the lower river stage. However, as flow is further decreased inter-channel sandbars can become connected to islands and to floodplains which leads to a decrease in the amount of inter-channel sandbars depending upon the criteria and definitions used to define emergent sandbars.

ISP Projects Addressing Questions:
- Vander Lee Habitat Classification
- PEIS Analysis
- Inventory, Mapping, Estimation, and Monitoring of Least Tern and Piping Plover Habitats on the Upper Missouri River Using Quickbird Imagery
- Evaluation of Vegetation Removal and Control Methods Create Emergent Sandbar Habitat
- Monitoring and Evaluation of Emergent Sandbar Habitat and Management Projects on the Upper Missouri River System
XIV. 

What factors influence nest site selection, productivity and populations trends?

Service Providers: ACE WS U

48. How does breeding ground location and site selection affect tern and plover populations and productivity?

- The Missouri River Basin represents the northernmost breeding range of the interior population of the least tern. Under migration theory these terns would travel the furthest of all least terns with their wintering grounds being the southernmost of all least terns (southern Brazil and northern Argentina) (Newton 2007). This longer distance could mean a lower survival rate to and from the wintering grounds for Missouri River terns. It also means that survival should be higher for terns breeding on the lower Missouri at Gavins Point and Lewis & Clark Lake compared to those breeding on the upper Missouri below Fort Peck and Garrison Dams.
- The Platte, Niobrara and lower Missouri Rivers represent the southernmost breeding range for Northern Great Plains population of the piping plover. Under migration theory these plovers would travel the shortest distance to and from the wintering grounds on the Gulf and Atlantic Coasts (Newton 2007). These plovers would be anticipated to have a higher survival rate compared to plovers that have to migrate to North Dakota, Montana and Canada.
- Site selection on the Missouri River is an area that is being considered for further study.

49. How does food availability affect piping plovers and least terns?

- Plover chicks gained weight more rapidly in the alkali wetlands than on river segments (Le Fer 2006).
- Compared with cooler water river segments and reservoir segments, invertebrate numbers and biomass were higher in the wetlands and warm water (Gavins River) segment, but plover chick survival was lower on the warm water (Gavins River) segment; thus, piping plovers adapted to a variety of prey densities, and other factors, likely predation, reduced survival rates in the warm water (Gavins River) segment (Le Fer 2006).
- Prey availability plays a role in plover chick survival (heavier chicks were more likely to survive to fledging). However, other factors in addition to prey availability, such as predation pressures, also play a role in reproductive output in the Great Plains population (Le Fer 2006).
- Plover chicks that were larger at early stages (4-5 days and 8-9 days old) were more likely to survive to fledging. However, chick size at 4-5 days and 8-9 days did not vary among sites and, thus, did not explain differential survival among sites (Le Fer 2006).
- Water temperatures, variation in water temperature, less scouring flows, lack of daily water fluctuations, habitat, or food difference may explain the greater number of invertebrates in the warm water (Gavins River) Segment (Le Fer 2006).
- A separate study has been conducted on the availability of forage for least terns within the Gavins Point River segment. Results of this study are pending.

50. How does density-dependence affect piping plovers?

- Piping plovers are territorial and may exhibit aggressive behavior towards other adult and juvenile plovers using the same breeding area (Catlin 2009).
- Piping plover juvenile survival was negatively related to nesting density on the relatively densely populated engineered sandbars (Catlin 2009).
- On the less dense natural sandbars, survival was positively correlated with density (Catlin 2009).
- Adult survival did not appear to be related to density within the study (Catlin 2009).
Juveniles from densely populated engineered sandbars were more likely to leave engineered habitat to nest on natural sandbars than were juveniles hatched on less densely populated engineered sandbars (Catlin 2009).

It is possible that juveniles moved to natural habitats because they were unable to compete with adults for the more desirable engineered habitats (Catlin 2009).

51. How does predation affect terns and plovers?

While conducting research in 1991 and 1992, Kruse and others (1993) documented that raccoon and mink were responsible for most of the known nest predation (77.3%) and great horned owls were responsible for most of the known chick predation (68.2%).

Of the depredated nests monitored by the Corps from 1993 through 2007 with a predator identified, raccoon and mink have been implicated 68.4% (214/313) of the time (USACE 2009-07).

Of the nests monitored by the Corps in the last ten years (1999-2008) on both natural and constructed sandbars on the Missouri River, predators have been directly identified in the loss of 5.1% (292/5,716) of piping plover nests and 6.7% (336/5,052) of least tern nests. These estimates are conservative because they include only nests that were positively identified as being depredated through evidence left at the nest bowl, such as track trails, feces, and feathers (USACE 2009-07).

Monitoring of least tern and piping plover breeding activities on sandbars constructed below Gavins Point Dam showed high productivity in the first nesting season after construction. In subsequent years densities increased and productivity for the three older sandbars dropped. However, apparent nest success for these sandbars remained high for 2004-2008 with 68% of plover nests and 70% of tern nests hatching out at least one egg. The reason for the low productivity on these older bars was due to high chick mortality. In the absence of evidence of chick losses due to weather events, the most likely causes of the recorded high chick mortality were likely predation (USACE 2009-07).

USDA trappers have set pole traps on constructed sandbar complexes to remove great horned owls. Virginia Tech researchers have documented that after an owl is removed piping plover chicks have a higher survival rate.

52. How do weather events affect terns and plovers?

Severe thunder storms and hail storms have been documented to be factors in nest destruction, chick and adult losses on the Missouri River. For example: On July 9, 2009 USGS technicians surveyed the constructed sandbar at RM 791.5 just hours after a severe thunderstorm had passed through the area. The storm was documented to have had high winds and large hail. The USGS crew found on the sandbar the following dead birds: 23 least tern chicks, 5 least tern fledglings, 6 least tern adults, 8 piping plover chicks, 3 piping plover adults. The crew also found a least tern chick and a least tern fledgling that were severely injured and likely did not survive (Sherfy 2009).
**ISP Projects Addressing Questions:**

- Inland Migration Stopovers Used by Piping Plover
- Piping Plover Population Dynamics on Natural and Engineered Sandbars on the Missouri River.
- Population Dynamics of Piping Plovers on the Missouri River, South Dakota
- Piping Plover Foraging Ecology in the Great Plains
- Least Tern and Piping Plover Productivity Monitoring
- A Muddy Question: Assessing Human Recreation and Research Disturbances on Missouri River Sandbars Managed for Endangered Birds
- Evaluation of procedures for Monitoring Productivity and Numbers of Piping Plovers & Least Terns on the Missouri River

**XV. How are factors outside of the Missouri River affecting populations?**

**Service Providers:**

53. **How does immigration/ emigration (use of other nesting habitats) affect Missouri River piping plover populations?**

- Adults and juveniles emigrated from (left) the study area at a higher rate after the 2006 breeding season, a year when water discharge was higher, nesting densities were higher (as a result of reduced habitat availability), and reproductive success was lower (as a result of predation) than in the other years (Catlin 2009).
- Based on population models for terns and plovers, it appears that immigration of birds from outside of the Missouri River contributed to the growth of the Missouri River populations seen between 1998 and 2007.
- Researchers from the Virginia Polytechnic Institute have documented that piping plovers banded on the Missouri River below Gavins Point Dam have been re-sighted on the Missouri River below Fort Randall Dam, on Lewis & Clark Lake, on the Niobrara River, on the Platte River and at the Lake of the Woods Ontario Canada (Daniel Catlin, Joy Felio, Virginia Polytechnic Institute – personal communication).
- Researchers from the Virginia Polytechnic Institute have documented that piping plovers banded on the Platte River as chicks in 2008, nested the following year on the constructed sandbar complex on Lewis & Clark Lake (Felio 2009).

54. **How does survival during migration affect Missouri River populations?**

- Piping plover migration routes may be as short as 1,000 miles (Louisiana-Texas Gulf Coast) to as long as 2,000 miles (Bahamas) between the Missouri River breeding grounds and wintering grounds.
- Piping plover migration duration in not known, but may be relatively quick with birds moving between the breeding and wintering grounds in less than two weeks (Pompei 2007).
- There are no clear migration routes seen on the maps of stopover sites, and no inland sites were used consistently year after year, but it must be noted that shorebird habitat tends to be quite variable at interior sites (Pompei 2007).
- Migrating plovers appear to be somewhat flexible in their stopover site choices, Piping plovers do not seem to stage during migration as many other shorebird species do. This makes them less vulnerable to the loss of important stopover sites (Pompei 2007).
- Findings confirm previous observations that plovers do not migrate in flocks, and it was found that they stay at stopover sites for only a short time. Sites where large numbers of plovers were seen tended to be at or very close to known breeding and wintering sites (Pompei 2007).
- Piping plovers stop at both inland and coastal sites during migration (Pompei 2007).
The predictability of habitat existence and quality during migration is low from year to year, and even within a single season (Pompei 2007).

Least Tern nesting on the Missouri River represents the northernmost range of the interior population and therefore these terns would winter on the southernmost wintering grounds. This may mean a migration as short as 4,000 miles to the Pacific coast of Columbia and as far as 9,000 miles to the Atlantic coast of northern Argentina.

Least tern migration routes in the interior United States are believed to follow major river routes to the Gulf of Mexico after which the route is unknown.

The duration of least tern migration is unknown. The locations of least tern stopover sites during migration are unknown.

Least terns may flock together before beginning migration to the wintering grounds.

55. How does survival on the wintering grounds affect Missouri River populations?

Piping plovers may spend from 9 to 10 months each year on the wintering grounds.

The piping plover wintering range includes the Gulf Coast from Mexico to Florida, the Atlantic Coast from Florida up to North Carolina, the Bahamas, and Caribbean islands.

Threats to piping plover wintering grounds include recreation use, urban development, oil spills and dredging operations.

Studies by Virginia Tech researchers show a year to year high survival rate of piping plover banded below Gavins Point Dam indicating that survival is not a problem on the wintering grounds (Felio 2009).

Survival of piping plovers on the wintering grounds is less frequently monitored than on the breeding grounds.

Least tern wintering grounds locations are only vaguely known to be on the Atlantic and Pacific coasts of South America.

The time least terns spend on migration and on the wintering grounds is between 9 to 10 months, but how much time is spent on migration and how much time is spent on the wintering grounds is unknown.

Wintering grounds threats to survival are largely unknown due to the lack of knowledge as to where the wintering grounds are located.

ISP Projects Addressing Questions:

- Inland Migration Stopovers Used by Piping Plover
- Population Dynamics of Piping Plovers on the Missouri River, South Dakota
- Piping Plover Population Dynamics on Natural and Engineered Sandbars on the Missouri River.
- International Plover Census

XVI. What are the effects of management actions on non-target resources?

Service Providers: ACE GS FS SD U O

56. How do management actions for terns and plovers affect sturgeon?

Steps have been taken to identify potential spawning sites for sturgeon near locations targeted for ESH restoration and avoid them. Some potential projects have been canceled due to this consideration.

57. How do management actions for terns and plovers affect mussels?

Any impacts to mussel communities from ESH restoration would be primarily associated with construction efforts and not the completed projects themselves.
Numerous surveys have been conducted in order to identify the potential impacts of ESH on mussel communities within the Missouri River (primarily the Gavins Point Segment). The most comprehensive study was completed in 2007. This study found that mussels occur at low densities in the Gavins Point segment when compared with other Midwestern rivers. Mussels in the study area were most abundant in areas protected from high current velocity. Species richness was highest in the most upstream 10 miles of the river segment (below Gavins Point dam). This study also noted that ESH construction downstream of river mile 795 was not likely to affect any mussel beds (CPUE>35 mussels/hour), but that some pockets (CPUE between 35 and 15 mussels per hour) may be affected (ESI, 2007).

58. **How do management actions terns and plovers affect riverbank erosion?**

- Monitoring of constructed sites at river miles 761.3 and 770 has not exhibited significant changes in bankline erosion trends following construction of ESH sites.

59. **How do management actions for terns and plovers affect water quality?**

- Post-construction water quality surveys were conducted at River Mile 826.5 in Lewis and Clark Lake, downstream of a constructed sandbar site. No significant adverse affects to water quality were found.

60. **How do management actions for terns and plovers affect turtles?**

- Although there is the potential for negative impacts to native turtle communities during construction, constructed sandbars within the Gavins Point segment have been used by native turtle species and add to their available habitat within the segment.

**ISP Projects Addressing Questions:**

- Characterization of Unionid Communities in the 59-Mile Gavins reach of the Missouri National Recreational River
- Missouri River Restoration Project Water Quality Monitoring Program
- Emergent Sandbar Habitat Evaluation and Monitoring
- Two-Dimensional Hydraulic Model of the Missouri River

**General Bald Eagle / Cottonwood Science Questions:**

XVII. **What are the trends in land cover and cottonwood forests along the Missouri River?**

| Service Providers: | ACE | LAB | GS | MT | MO | NE | SD | IJ | IA | C | O |

61. **What is the current status of cottonwood populations on the Missouri River?**

- In 2007-2009, surveys were conducted to determine the current status of cottonwood forests along the Missouri River. This survey found that 48 to 91 percent of the cottonwood area was greater than 50 years old. Mean tree species richness decreased from downstream to upstream.
  - This survey also measured the approximate acreage of cottonwood forest per river mile in some priority segments and their maturity:
    - Garrison River Segment – 270 acres / river mile; 85% mature (50+ years old); low recruitment
    - Oahe Dam to Big Bend Dam - 20 acres / river mile; 91% mature; >1% young (>15 years old)
    - Fort Randall River Segment - 68% mature
    - Lewis and Clark Lake – >50% mature
    - Gavins Point River Segment – Majority under 50 years old
62. **What are the trends in Bald Eagle Populations?**

- Bald Eagle populations in the United States have increased from a low of 417 nesting pairs in 1963 to 9,789 pairs in 2007. This exceeds the Recovery goal of 3,900 pairs which resulted in de-listing of the species on August 30 2007.

### ISP Projects Addressing Questions:
- Cottonwood Management Plan
- State/NPS Monitoring

### General Mitigation Questions:

**XVIII. What are the trends in land cover at Mitigation sites?**

**XIX. What are the effects of mitigation sites on floodplain ecosystems?**

#### Service Providers:

63. **How much habitat has been restored?**

- Under the Missouri River Fish and Wildlife Mitigation Project the Corps is authorized by Congress to acquire 166,750 acres along the lower 735 miles of the Missouri River from Sioux City, Iowa to the mouth near St. Louis, Missouri to offset the impacts to fish and wildlife resources resulting from the construction, operation and maintenance of the Missouri River Bank Stabilization and Navigation Project.
- As of July 2010 there are 57 specific mitigation sites totaling 57,459.51 acres. This represents approximately 34% of the authorized acres.
- Comparing baseline conditions at time of purchase to 2009 mapping at 29 of our mitigation sites, totaling 39,989.88 acres, the following trends were noted:
  - Cultivated lands on these areas decreased from 24,221.26 acres to 11,806.05 acres.
  - Forested wetlands from 309.80 acres to 1039.57 acres,
  - Increased scrub shrub wetland from 490.67 acres to 855.10 acres
  - Increased forested areas from 7,112.03 acres to 10,113.34 acres.

64. **What is the quality of restored habitat?**

- Chutes and backwaters provided habitat for different fish communities. Chutes were found to have more riverine species while these species were lacking in backwaters. Contiguous backwaters had greater species diversity and richness than those that were impounded. This connection to the river allowed species to access these areas that they otherwise could not have.
- Chutes that were located farther up the Missouri River tended to benefit different species than those on the lower end of the river.
- The benefit of a chute to the overall fish community probably depended on if the chute provided something different from what was already found in the main channel.
- More diverse fish communities were found in the older constructed and natural chutes.
- Overall, the fish communities in most sites were dominated by juveniles of most species.
- Predictive models indicated that chutes had different probabilities of presence for target species. In general, chutes that were relatively longer, wider, shallower and had greater sinuosity were more likely to have target species present.
Backwater and chute habitats appear to be beneficial to the biodiversity of the Missouri River system; however, it is important to note that different reaches of the river have different needs.

65. **What are indicators of mitigation success? (Reptiles, amphibians, birds)?**

- Important predictor variables for species presence were year (85% of species models), water depth (80%), turbidity (65%), water temperature (60%), month (60%) and water velocity (50%).
- An ongoing wetlands functional assessment is studying the occurrence of reptiles and amphibians at wetlands (both natural and constructed) on Mitigation sites.
- Diversity of habitats used by these species may make them good indicators of floodplain quality (primarily wetlands) at these sites.

**ISP Projects Addressing Questions:**
- Missouri River Mitigation Wetland Restoration Functional Assessment Project ‘Herp Study’
- Missouri River Chute Sediment Monitoring
- Fish Community Monitoring and Habitat Assessment of Off-Channel Mitigation Sites “Chute Study”
Literature Cited:
Allen, T.C., Q.E. Phelps, R.D. Davinroy, and D.M. Lamm. 2007. A laboratory examination of substrate, water depth, and light use at two water velocity levels by individual juvenile pallid (Scaphirhynchus albus) and shovelnose (Scaphirhynchus platorynchus) sturgeon. Journal of Applied Ichthyology 23: 375-381.


Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System. U.S. Army Corps of Engineers – Omaha & Kansas City Districts. 76 p.


Appendix C

Land Acquisitions for the Missouri River Recovery Program/Mitigation Project
## Missouri River Recovery Program and Mitigation Project

**Current Acquisition by Site, OMAHA DISTRICT**

**Acquisitions through October 1, 2010**

<table>
<thead>
<tr>
<th>SITE/County/State</th>
<th>State</th>
<th>River Miles</th>
<th>Fee Acreage</th>
<th>Public Fee Easement Acres</th>
<th>Date Acquired</th>
<th>Fiscal Year Acquired</th>
<th>Site Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Bend</td>
<td>IA</td>
<td>648-652</td>
<td>420</td>
<td></td>
<td>7-Apr-99</td>
<td>1999</td>
<td>IDNR</td>
</tr>
<tr>
<td>Tyson Bend</td>
<td>IA</td>
<td>651-653</td>
<td>697.66</td>
<td></td>
<td>24-Mar-99</td>
<td>1999</td>
<td>Will be IDNR</td>
</tr>
<tr>
<td>Sandy Point</td>
<td>IA</td>
<td>668-669</td>
<td>281.6</td>
<td></td>
<td>18-Nov-99</td>
<td>2010</td>
<td>UNKNOWN AT THIS POINT</td>
</tr>
<tr>
<td>Little Sioux</td>
<td>IA</td>
<td>37.57</td>
<td>16.68</td>
<td></td>
<td>13-Jun-99</td>
<td>2006</td>
<td>UNKNOWN AT THIS POINT</td>
</tr>
<tr>
<td>Louisville Bend</td>
<td>IA</td>
<td>682-885</td>
<td>32.89</td>
<td></td>
<td>7-Jun-94</td>
<td>1984</td>
<td>IDNR</td>
</tr>
<tr>
<td>Middle Decatur Bend</td>
<td>NE</td>
<td>657-069</td>
<td>622</td>
<td></td>
<td>6-Aug-96</td>
<td>1986</td>
<td>IDNR</td>
</tr>
<tr>
<td>Blackbird Bend</td>
<td>IA</td>
<td>694-597</td>
<td>72.05</td>
<td></td>
<td>19-Nov-97</td>
<td>1995</td>
<td>IDNR</td>
</tr>
<tr>
<td>Tieville Bend</td>
<td>NE</td>
<td>694-597</td>
<td>1013.75</td>
<td></td>
<td>27-Sep-96</td>
<td>1996</td>
<td>IDNR</td>
</tr>
<tr>
<td>Upper Decatur Bend</td>
<td>IA</td>
<td>694-597</td>
<td>635.56</td>
<td></td>
<td>15-Jun-00</td>
<td>2000</td>
<td>CORPS</td>
</tr>
<tr>
<td>Hole-in-the-Rock</td>
<td>NE</td>
<td>50</td>
<td>90</td>
<td></td>
<td>3-Sep-10</td>
<td>2010</td>
<td>CORPS</td>
</tr>
<tr>
<td>Glover's</td>
<td>NE</td>
<td>711-713</td>
<td>965</td>
<td></td>
<td>15-Nov-04</td>
<td>2005</td>
<td>CORPS</td>
</tr>
<tr>
<td>Upper Dakota Bend</td>
<td>IA</td>
<td>722-723</td>
<td>21.4</td>
<td></td>
<td>1-Feb-07</td>
<td>2007</td>
<td>IDNR</td>
</tr>
<tr>
<td><strong>Total OD Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

- **IDNR** indicates the site managed by the IDNR.
- **CORPS** indicates the site managed by the CORPS.
### Appendix C

#### Missouri River Recovery Program and Mitigation Project

**Current Acquisition by Site, KANSAS CITY DISTRICT**

<table>
<thead>
<tr>
<th>SITE/County/State</th>
<th>State</th>
<th>River Miles</th>
<th>Fee Acreage</th>
<th>Public Fee Easement Acres</th>
<th>Date Acquired</th>
<th>Fiscal Year Acquired</th>
<th>Site Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia Bottoms</td>
<td>MO</td>
<td>6-5</td>
<td>4108.15</td>
<td>4108.15</td>
<td>24-Jun-02</td>
<td>2002</td>
<td>Missouri Department of Conservation (MDC)</td>
</tr>
<tr>
<td>St. Louis County, MO</td>
<td></td>
<td></td>
<td>110.85</td>
<td>110.85</td>
<td>17-Mar-03</td>
<td>2003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>7.19</td>
<td>7.19</td>
<td>17-Mar-03</td>
<td>2003</td>
<td></td>
</tr>
<tr>
<td>Confluence Point</td>
<td>MO</td>
<td>3-Jan</td>
<td>520.891</td>
<td>456</td>
<td>10-Apr-07</td>
<td>2007</td>
<td>Missouri Department of Natural Resources (MDNR)</td>
</tr>
<tr>
<td>St. Charles County, MO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Island</td>
<td>MO</td>
<td>8-Mar</td>
<td>1238</td>
<td>25-Jun-08</td>
<td></td>
<td>2006</td>
<td>Permitted to the U.S. Fish and Wildlife Service (USFWS)</td>
</tr>
<tr>
<td>St. Charles County, MO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berger Bend</td>
<td>MO</td>
<td>91-93</td>
<td>416.23</td>
<td>416.23</td>
<td>27-Sep-95</td>
<td>1995</td>
<td>Proposed for USFWS</td>
</tr>
<tr>
<td>Franklin County, MO</td>
<td></td>
<td></td>
<td>58.16</td>
<td>20-Nov-98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heckman Island</td>
<td>MO</td>
<td>104-108</td>
<td>400</td>
<td>24-Jul-08</td>
<td></td>
<td>2008</td>
<td>Proposed for USFWS</td>
</tr>
<tr>
<td>Montgomery County, MO</td>
<td></td>
<td></td>
<td>143</td>
<td>24-Jul-08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tate Island/Morrison Bend</td>
<td>MO</td>
<td>110-113</td>
<td>403</td>
<td>13-Oct-94</td>
<td></td>
<td>1985</td>
<td>Licensed to MDC</td>
</tr>
<tr>
<td>Callaway County, MO</td>
<td></td>
<td></td>
<td>19.41</td>
<td>24-Oct-94</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providence Bend</td>
<td>MO</td>
<td>162-168</td>
<td>579</td>
<td>22-Oct-07</td>
<td></td>
<td>2006</td>
<td>Proposed for USFWS</td>
</tr>
<tr>
<td>Boone County, MO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eagle Bluffs CA</td>
<td>MO</td>
<td>171-176</td>
<td>571</td>
<td>15-Nov-00</td>
<td></td>
<td>2001</td>
<td>Licensed to MDC</td>
</tr>
<tr>
<td>Boone County, MO</td>
<td></td>
<td></td>
<td>211</td>
<td>5-Dec-06</td>
<td></td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

---

**Total MRRP Acres**: 58,984.80

**Total Mitigation Acres**: 56,055.10

**Total Rec River Acres**: 2,929.70
<table>
<thead>
<tr>
<th>SITE/County/State</th>
<th>State</th>
<th>River Miles</th>
<th>Fee Acreage</th>
<th>Public Feb/</th>
<th>Date Acquired</th>
<th>Fiscal Year Acquired</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acworth County, KS</td>
<td>KS</td>
<td>414-60</td>
<td>147.72</td>
<td></td>
<td>29-May-00</td>
<td>1993</td>
<td></td>
</tr>
<tr>
<td>KS</td>
<td></td>
<td></td>
<td>472.55</td>
<td></td>
<td>15-Nov-94</td>
<td>1995</td>
<td></td>
</tr>
<tr>
<td>Elwood Bottoms</td>
<td>KS</td>
<td>485</td>
<td>335.1</td>
<td></td>
<td>31-Jul-06</td>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>Doniph County, KS</td>
<td>KS</td>
<td>95.11</td>
<td>29-Jan-06</td>
<td></td>
<td>29-Jan-06</td>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>KS</td>
<td></td>
<td>50</td>
<td>22-Mar-07</td>
<td></td>
<td>22-Mar-07</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td>KS</td>
<td></td>
<td>189</td>
<td>22-Aug-07</td>
<td></td>
<td>22-Aug-07</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td>Worthwire Island CA</td>
<td>MO</td>
<td>548-80</td>
<td>544.82</td>
<td></td>
<td>6-Sep-01</td>
<td>2001</td>
<td>MDC (lease)</td>
</tr>
<tr>
<td>Andrew County, MO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monkey Mountain Addition</td>
<td>MO</td>
<td>464-486</td>
<td>560.8</td>
<td></td>
<td>21-Aug-03</td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>Holt and Andrew County, MO</td>
<td></td>
<td>95.11</td>
<td>21-Aug-03</td>
<td></td>
<td>21-Aug-03</td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>(Jay and Chiva Nare Wildlife Area)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burr Oak</td>
<td>KS</td>
<td>484-488</td>
<td>152.93</td>
<td></td>
<td>9-Jul-09</td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>Doniph County, KS</td>
<td>KS</td>
<td>79.4</td>
<td></td>
<td></td>
<td>19-Oct-10</td>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wolf Creek Bend</td>
<td>MO</td>
<td>477-482</td>
<td>503</td>
<td></td>
<td>4-Jun-04</td>
<td>2004</td>
<td></td>
</tr>
<tr>
<td>Holt County, MO</td>
<td>MO</td>
<td>205.6</td>
<td>12-Dec-05</td>
<td></td>
<td>12-Dec-05</td>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>257.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>9.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rush Bottom Bend</td>
<td>MO</td>
<td>498-502</td>
<td>287.65</td>
<td></td>
<td>22-Sep-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>Holt County, MO</td>
<td>MO</td>
<td>143.66</td>
<td></td>
<td></td>
<td>3-Jan-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>111.09</td>
<td></td>
<td></td>
<td>11-Jan-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>83.4</td>
<td>22-Sep-99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>80.3</td>
<td>2-Aug-98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>386</td>
<td>26-Sep-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>37.2</td>
<td>5-Aug-98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>92</td>
<td>12-Sep-98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>21.49</td>
<td>15-Apr-99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>5.4</td>
<td>16-Jan-99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>2.5</td>
<td>31-Dec-98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>425.5</td>
<td>3-Jun-99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thurnau Addition</td>
<td>MO</td>
<td>558-521</td>
<td>293.51</td>
<td></td>
<td>16-Mar-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>Holt County, MO</td>
<td>MO</td>
<td>49.5</td>
<td></td>
<td></td>
<td>16-Feb-99</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>634.33</td>
<td></td>
<td></td>
<td>25-Feb-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>172.5</td>
<td></td>
<td></td>
<td>9-Feb-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>285.7</td>
<td></td>
<td></td>
<td>25-Aug-00</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>16.91</td>
<td></td>
<td></td>
<td>16-Apr-01</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heminale Bend/</td>
<td>MO</td>
<td>512-517</td>
<td>745.3</td>
<td></td>
<td>26-Jan-01</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>Coming Site</td>
<td>MO</td>
<td>116.8</td>
<td></td>
<td></td>
<td>25-May-06</td>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>Holt County, MO</td>
<td>MO</td>
<td>241.8</td>
<td></td>
<td></td>
<td>26-Feb-02</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>329.86</td>
<td></td>
<td></td>
<td>29-Oct-01</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>123.98</td>
<td></td>
<td></td>
<td>24-Jan-02</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>250.57</td>
<td></td>
<td></td>
<td>12-Oct-00</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>228</td>
<td></td>
<td></td>
<td>21-Jan-02</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td></td>
<td>46</td>
<td></td>
<td></td>
<td>28-Sep-09</td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delecta Bend</td>
<td>MO</td>
<td>516-521</td>
<td>1038.88</td>
<td></td>
<td>18-Apr-01</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>License to: MDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>SITE/County/State</th>
<th>State</th>
<th>River Miles</th>
<th>Fee Acres</th>
<th>Public Fee Easement Acres</th>
<th>Date Acquired</th>
<th>Fiscal Year Acquired</th>
<th>Site Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overton Bottoms, Cooper &amp; Monroe Counties, MO</td>
<td>MO</td>
<td>178-181</td>
<td>738.26</td>
<td>68.26</td>
<td>22-Mar-95</td>
<td>1995</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>292.32</td>
<td>16-Jun-94</td>
<td>1994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>350.44</td>
<td>11-Feb-97</td>
<td>1997</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>205.71</td>
<td>26-Apr-96</td>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>317.34</td>
<td>26-Aug-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>216.27</td>
<td>29-Jun-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>14.45</td>
<td>11-Jun-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>269.5</td>
<td>19-Oct-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>476.1</td>
<td>17-Nov-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>251.86</td>
<td>19-Jan-96</td>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>108</td>
<td>26-Apr-96</td>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>35.25</td>
<td>16-Sep-96</td>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>131.34</td>
<td>26-Apr-96</td>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>2.16</td>
<td>26-Aug-96</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>152.2</td>
<td>17-Nov-95</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>0.02</td>
<td>26-Aug-96</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>15.7</td>
<td>29-Oct-99</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>75</td>
<td>13-Mar-00</td>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>331.07</td>
<td>26-Oct-99</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td>79.32</td>
<td>13-Jan-10</td>
<td>2010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Rockcreek Cave Boone County, MO | MO | 183 | 23 | 25-Apr-02 | 2002 |
| | | | | Licensed to MDC |

| Cambridge Bend Chantilly, MO | MO | 237-234 | 168.1 | 13-Jun-08 | 2008 |
| | | | | Proposed for USFWS |

| Grand River Bend Saline County, MO | MO | 246-252 | 280 | 13-Oct-09 | 2010 |
| | | | | Corps |

| Grand Pass CA Saline County, MO | MO | 268-271 | 0.37 | 16-Dec-91 | 1992 |
| | | | | Licensed to MDC |

| Tampico Bend Carroll County, MO | MO | 271-281 | 368 | 16-Sep-09 | 2009 |
| | | | | Proposed for USFWS |

| Baldes Bend Saline County, MO | MO | 278-290 | 239 | 1-Dec-08 | 2009 |
| | | | | Proposed USFWS |

| Baltimore Bend Lafayette County, MO | MO | 297-305 | 42 | 18-May-07 | 2007 |
| | | | | To be permitted to USFWS |

| Weston Bend State Park Platte County, MO | MO | 403 | 12 | 5-Apr-04 | 2004 |
| | | | | Managed by MOWR |

| Kickapoo Island Platte County, MO | MO | 496-497 | 244 | 23-Mar-07 | 2007 |
| | | | | Corps |

| Dalias Bottoms Atchison County, KS | KS | 415-419 | 502 | 8-Nov-07 | 2008 |
| | | | | Licensed to Kansas Dept of Wildlife and Parks (KDWP) |

| | | | 1085 | 16-Oct-07 | 2009 |
| | | | 30.6 | 3-Sep-09 | 2009 |
# Missouri River Recovery Program and Mitigation Project

## Current Acquisition by Site, KANSAS CITY DISTRICT

<table>
<thead>
<tr>
<th>SITE/County/State</th>
<th>State</th>
<th>River Miles</th>
<th>Fee Acres</th>
<th>Public Fee Easement Acres</th>
<th>Date Acquired</th>
<th>Fiscal Year Acquired</th>
<th>Site Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acclivation Bend</td>
<td>MO</td>
<td>525-529</td>
<td>171.21</td>
<td>1.01</td>
<td>12-Sep-96</td>
<td>2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>12</td>
<td></td>
<td>7-Dec-07</td>
<td>2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>93</td>
<td></td>
<td>30-Jun-10</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nishnabotina River</td>
<td>MO</td>
<td>537-546</td>
<td>555.53</td>
<td>1.01</td>
<td>17-Oct-96</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Mouth</td>
<td>MO</td>
<td>725</td>
<td>0.33</td>
<td></td>
<td>30-Oct-96</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>500</td>
<td></td>
<td>12-Oct-96</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>651</td>
<td></td>
<td>12-Oct-96</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td>Lower Humburg Bend</td>
<td>MO</td>
<td>540-544</td>
<td>340.84</td>
<td>2.87</td>
<td>2-Jul-98</td>
<td>1998</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>111</td>
<td></td>
<td>9-Oct-98</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>112</td>
<td></td>
<td>28-Aug-98</td>
<td>1998</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>250</td>
<td></td>
<td>29-Feb-99</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MO</td>
<td></td>
<td>260</td>
<td></td>
<td>20-Jun-97</td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

Licensed to MOCD

**Total KCD Acres:** 25,390.99

## Appendix C

Page 6
Appendix D

MRRIC
Recommendations and Responses
Recommendation #1 - MRERP - MRRIC Engagement Strategy

The following describes MRRIC's recommended strategy for engaging in continued consultation with the lead agencies about MRERP. Given the duration and complexity of the MRERP study, MRRIC recognizes that the planning process and, therefore, this engagement strategy needs to be flexible. (See following diagram for a visual presentation of the recommended engagement strategy. More detail is provided for the current year. Similar detail will be added in one year increments, as the process unfolds.)

Recommendations:

1. MRRIC requests that the consultation between the Committee and the lead agencies about MRERP be ongoing throughout the duration of the study process. This consultation will take different forms at different times during the study, with substantive recommendations planned at key decision points and other types of engagement such as information sharing or process recommendations at other times.

2. MRRIC’s fundamental objective, around which this strategy for engaging in consultation with the lead agencies on MRERP is organized, is to make a substantive recommendation on what MRRIC recommends that the lead agencies should select as the preferred alternative for the restoration plan.

3. To achieve this objective, MRRIC also intends to make recommendations at several key decision points in the MRERP process that the Committee understands are important steps leading to the selection of a preferred alternative and the eventual record of decision. These include, but are not limited to: [Note: The specific language and step numbers refer to the Revised Draft Work Plan for the Missouri River Ecosystem Restoration Plan and Environmental Impact Statement dated May 2009. The specific step numbers and description of these steps may change over time. ]

- Key social economic and cultural issues situation analysis (Step 4.2)
- Plan objectives (Step 5.2)
- Alternative plans and implementation approaches (Step 5.4)
- Adaptive management (Steps 5.6, 5.7, and 5.8)
- Preferred alternatives description (Step 7.1)
- Draft MRERP EIS (Step 8.1)
- Response to comments package (Step 9.1)

4. Finally, MRRIC also recognizes the importance of keeping itself informed in an ongoing way about the MRERP process and what is being learned and, thus, recommends information sharing sessions occur at each MRRIC meeting. MRRIC members and constituents also are encouraged to attend public scoping sessions to understand the views of others in the basin and to provide input. This shall be as a representative of their interest, not as a representative of MRRIC.
Graphic Representation of MRERP Engagement Strategy

MRRIC Info sharing → Process Rec → Substantive Rec → Transition → Final → Peer Review

<table>
<thead>
<tr>
<th>JULY '09</th>
<th>SEPT '09</th>
<th>NOV '09</th>
<th>WINTER '10</th>
<th>SPRING '10</th>
<th>SUMMER '10</th>
<th>FALL '10</th>
</tr>
</thead>
</table>

2.1 Plan

Engagement
Strategy

May – Dec 2009

Public Scoping – scope, purpose and need, future scenarios, etc.

Winter 2011 Peer Review – Final Natural Resources, and Conceptual Model

Creative information sharing

WINTER '11 | SPRING '11 | SUMMER '11 | FALL '11 | WINTER '12 | SPRING '12 | SUMMER '12 |
|-----------|-----------|------------|----------|------------|------------|------------|

4.2 Lit. Analysis

Plan

Alternative

5.1 Plan

Objectives

5.2 Plan

Objectives

Winter 2011

Public Scoping – Final Nat Rec, social values, etc.

Creative information sharing

FALL '12 | WINTER '13 | SPRING '13 | SUMMER '13 | FALL '13 | WINTER '14 | SPRING '14 |
|---------|-----------|------------|------------|---------|------------|------------|

5.4 Alternative

Plan & Impl. Approaches

5.0, 5.7 and 5.8 Mitigation & Impact Process

Spring 2011 Peer Review – Final Nat Rec, Scoping Options, Impact Mitigation Process

Creative information sharing

SUMMER '14 | FALL '14 | 2015 | 2016 |
|-----------|---------|------|------|

9.1 Draft EIS

Public Scoping – Draft Plan and EIS

Fall 2015 Peer Review – Draft Plan with EIS

Creative information sharing

Winter 2015

Public Scoping – Draft Plan and EIS

Appendix D
Response to Recommendation # 1 - MRERP - MRRIC Engagement Strategy - was a formal response given?

Response to MRERP – MRRIC Engagement Strategy?
July 30, 2009

Mr. Rowan W. Gould, Acting Director
U.S. Fish and Wildlife Service
1849 C Street, N.W.
Washington, DC 20240

Dear Director Gould:

I am writing you on behalf of the Missouri River Recovery Implementation Committee (MRRIC or committee). The MRRIC has nearly 70 members comprised of States, Tribes, Federal Agencies and Stakeholders associated with Missouri River resources. It was authorized by Congress in Section 5018 of the Water Resources Development Act of 2007 and established in 2008 by the Assistant Secretary of the Army for Civil Works. The duties of this committee include providing guidance to the Secretary of the Army and any affected Federal Agency, State agency or Indian Tribe regarding a study of the Missouri River ecosystem to recover federally listed species under the Endangered Species Act of 1973.

This recommendation is directed to the U.S. Fish and Wildlife Service (USFWS) in response to a letter received by the committee from that agency on December 5th, 2008 and in connection with the study being carried out to determine actions required to recover federally listed species. Pursuant to Section 5018 (b)(3)(A) the committee may provide guidance to any affected federal agency regarding actions that fall within the scope of this study.

One of the first items presented to the MRRIC by the USFWS for consideration was the status of the draft rule providing the shovelnose sturgeon threatened species status under the Similarity of Appearance (SOA) provisions of the Endangered Species Act (ESA). Subsequent to the USFWS presentation, the MRRIC has diligently gathered and reviewed relevant information and vigorously discussed this issue through multiple MRRIC meetings and its Integrated Science Program Work Group. This review and discussion culminated in the MRRIC hosting a panel discussion on this issue March 3, 2009 in Overland Park, Kansas.

The panel included presentations from and discussion with two individuals representing commercial shovelnose sturgeon fishers in Missouri and Illinois and five representatives from the USFWS Law Enforcement, USFWS Pallid Sturgeon Recovery, Missouri
Department of Conservation Law Enforcement, Missouri Department of Conservation Fisheries Division, and the Illinois Department of Natural Resources Fisheries Division. MRRIC does not include stakeholder representation from the commercial fishing business. If adoption of the rule causes economic damage to the commercial shovelnose sturgeon fishing industry, MRRIC encourages avoidance, minimization, and/or mitigation of adverse impacts.

MRRIC understands the SOA focuses solely on harvesting of shovelnose sturgeon associated with commercial shovelnose sturgeon fishing. It is the consensus recommendation of MRRIC that the USFWS expedite release of the SOA Notice of Proposed Rulemaking (NPRM) for public comment.

Thank you and please contact me with any question regarding this recommendation.

Sincerely,

/s/ John E. Thorson

JOHN E. THORSON
Chair, MRRIC
(406) 826-0500
johnethorson@mac.com

Cc:

Honorable Ken Salazar
Secretary of the Interior
1849 C Street, N.W.
Washington, DC 20240

Brigadier General William E. Rapp
Commander and Division Engineer
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870

Stephen Guertin
Regional Director
U.S. Fish and Wildlife Service, Region 6
P.O. Box 25486 - DFC
Denver, CO 80225-0486

David J. Ponganis
Acting Program Director
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870
USFWS Response to Recommendation #2

DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
50 CFR Part 17
RIN 1018–AW27
AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service or USFWS), propose to treat the shovelnose sturgeon (Scaphirhynchus platorynchus) as threatened under the “Similarity of Appearance” provisions of the Endangered Species Act of 1973, as amended (Act). The shovelnose sturgeon (Scaphirhynchus platorynchus) and the endangered pallid sturgeon (Scaphirhynchus albus) are difficult to differentiate in the wild and inhabit overlapping portions of the Missouri and Mississippi River basins. Four States where the two species commonly coexist allow for commercial fishing of shovelnose sturgeon which is in demand for its roe (eggs sold as caviar). The close resemblance in appearance between the two species creates substantial difficulty for fishermen, State regulators, and law enforcement personnel in differentiating between shovelnose and pallid sturgeon, both whole specimens and parts (including flesh and roe). This similarity of appearance has resulted in the documented take of pallid sturgeon and is a threat to the species. The determination that the shovelnose sturgeon should be treated as threatened due to similarity of appearance will substantially facilitate law enforcement actions to protect and conserve pallid sturgeon. We also propose a special rule to define activities that would and would not constitute take of shovelnose sturgeon under section 9 of the Act.

DATES: We will accept comments received or postmarked on or before November 23, 2009. We must receive requests for public hearings, in writing, at the address shown in

ADDRESSES: You may submit comments by one of the following methods:

• U.S. mail or hand-delivery: Public Comments Processing, Attn: FWS–R6–ES–2009–0027; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, Suite 222; Arlington, VA 22203. We will not accept e-mail or faxes.

We will post all comments on http://www.regulations.gov. This generally means that we will post any personal information you provide us (see the Public Comments section below for more information).

FOR FURTHER INFORMATION CONTACT:
Pallid Sturgeon Recovery Coordinator, Billings Field Office, 2900 4th Avenue North, Room 301, Billings, Montana 59101 (telephone 406/247–7365; facsimile 406/247–7364). Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800/877–8339, 24 hours a day, 7 days a week.
SUPPLEMENTARY INFORMATION:
Public Comments You may submit your comments and materials concerning this proposed rule by one of the methods listed in the ADDRESSES section. We will not accept comments sent by e-mail or fax or to an address not listed in the ADDRESSES section. If you submit a comment via http://www.regulations.gov, your entire comment—including your personal identifying information—will be posted on the Web site. If you submit a hardcopy comment that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy comments on http://www.regulations.gov.

Above is the Summary of the Proposed Rule. Go here for a PDF Version of the complete 6-page Federal Register Notice of the Proposed Rule To List the Shovelnose Sturgeon as Threatened Due to Similarity of Appearance. ¹

July 30, 2009

Mr. David J. Ponganis
Acting Program Director
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870

Re: Purpose & Need Statement

Dear Dave:

As you know, the Missouri River Recovery Implementation Committee (MRRIC) is working closely with Northwestern Division staff in the preparation of the Missouri River Ecosystem Restoration Plan and Environmental Impact Statement (EIS).

I am pleased to send you the Purpose and Need Statement approved, by consensus as a substantive recommendation by MRRIC at its meeting last week in Pierre, South Dakota. I urge the Corps of Engineers to give full consideration to these recommendations as the plan and EIS are completed.

As you also know, the MRRIC Charter provides: “Once recommendations and guidance are delivered by the Committee to the Secretary, it is requested that s/he, in coordination with other participating Federal Agencies, agrees to provide the official federal position on the issue and outline the steps to implement the recommendations by an agreed upon date or provide the reason(s) for not implementing the recommendation.” (Section 6(d)(i)(5))

Please contact me if you or your staff would like to discuss the Section 6(d)(i)(5) provision or any other matter pertaining to our recommendation.

Thank you for your continued dedication to this work and the continuing, professional efforts of your staff.
Sincerely,

/s/ John E. Thorson

JOHN E. THORSON
Chair, MRRIC
(406) 826-0500
johnethorson@mac.com

Enc.: Purpose & Need Statement

Cc (by e-mail): Mary Roth
              Randy Sellers
              Jennifer Switzer
              Henry Maddux
MISSOURI RIVER RECOVERY IMPLEMENTATION COMMITTEE

Adopted by Consensus on July 23, 2009

Recommendations on Purpose and Need

Introduction/General Comments

The Missouri River Recovery Implementation Committee (MRRIC) appreciates the opportunity to provide comments on the draft Purpose and Need (P&N) Statement for the Missouri River Ecosystem Restoration Plan (MRERP) in accordance with Section 5018 of the Water Resources Development Act of 2007 (WRDA), which states that the Secretary shall conduct MRERP “in consultation with the Missouri River Recovery Implementation Committee.” MRRIC understands that the U.S. Army Corps of Engineers (Corps) also is seeking comments from cooperating agencies, tribes, and the general public. Given the unique role authorized in Section 5018 for MRRIC to provide guidance to the Secretary on the study, MRRIC recommends that the Secretary rely on MRRIC as the principal forum for discussing and seeking consensus on provisions of this coordinated, basin-wide plan such as the P&N Statement. Thus, we look forward to discussing how all these comments are reflected in the next version of the draft P&N Statement later this year.

MRRIC hopes that the recommendations below will contribute to what is in the one or two page P&N Statement itself, but understands that some of the specific ideas or language may fit better in the elaboration that is part of a longer Purpose and Needs Chapter.

In addition, MRRIC discussed the question of how broadly or narrowly the P&N Statement should be written. On reflection, our interest is more in how well focused the P&N Statement is, both with respect to the scope of the study and the clarity of the desired outcome. We note that the July 1, 2008 guidance from the Assistant Secretary of the Army for Civil Works provides the following direction that “The study … should follow a watershed approach consistent with the geographic scope and complexity of issues within the Missouri Basin. However, the study should not be a broad multi-purpose effort; rather, its focus should be on addressing opportunities for mitigation of lost aquatic and terrestrial habitat, recovery of ESA listed species and restoration of degraded aquatic ecosystems.”

MRRIC believes it is very important to give the public a clear and compelling vision of the purpose and need for the study. We expect that the study will help us define together the problems that must be addressed.
Finally, MRRIC understands from the Corps that the eventual Record of Decision for the MRERP will not, in itself, change either the Biological Opinion or the Master Manual for the Missouri River. Changes to either of these documents, if any, would require separate and formal procedures.

**Recommendations**

1. The following language is provided as a recommended starting point for the P&N Statement. Our rationale for this recommendation and our thoughts about what it means are described below.

   “To determine the actions required to the Missouri River and Tributaries to mitigate losses of aquatic and terrestrial habitat; to recover federally-listed species under the Endangered Species Act; and to restore the ecosystem to prevent further declines among other native species in harmony with the Congressionally-authorized purposes of the mainstem of the Missouri River, Congressionally-authorized purposes on its tributaries, cultural resource values, and social and economic needs for current and future generations.”

MRRIC understands that a P&N statement should not be written so narrowly as to predetermine the eventual decisions made. However, we believe flexibility in how the goals are achieved does not mean that the goals themselves should be open-ended. The Committee offers two recommendations in this regard.

- First, MRRIC recommends that the scope of the study be tied to those issues where there is linkage to the mitigation, recovery and ecosystem restoration of the Missouri River and its tributaries identified in WRDA.

- Second, MRRIC recommends that the Corps clearly define purpose and need, so that the lead and cooperating agencies, and the stakeholders in the basin, can develop and evaluate alternatives with a common understanding of what those alternatives are meant to accomplish. MRRIC also recommends that the definitions for the terms “recovery” and “restoration” in the approved Charter for MRRIC are a good starting point.

MRRIC recognizes that the current Missouri River system is highly modified, providing many benefits to the residents of the Missouri River Basin. Thus, we recommend that the P&N statement encompass both environmental and social, economic and cultural needs, combining the goals for the natural environment set out in WRDA 2007 and the benefits of the Congressionally-authorized purposes for the management of the Missouri River. MRRIC understands that the P&N statement needs to be broad enough to allow consideration of all reasonable alternatives to address the objectives of the study identified by Congress in WRDA 2007. At the same time, these alternatives also should be judged in part by the ability to be accomplished in harmony with the Congressionally-authorized purposes of the mainstem of the Missouri River, the Congressionally-authorized uses of tributaries, cultural resource values, and social and economic needs for current and future generations.
MRRIC also recognizes the impacts of modifications to the Missouri River on the Tribes in the basin and recommends that the MRERP P&N statement should consider the Tribes’ values, cultural resources including burial grounds, restoration objectives, and water use issues.

2. MRRIC recommends the following initial list for study:
   a. Steps to restore the ecosystem to prevent declines of federally-listed and other native species.
   b. Natural resources of cultural significance to Tribes, such as the loss of tribal medicinal and cultural plants, riparian trees, and other plant species, birds, and aquatic health related to the loss of native riparian habitat.
   c. Invasive species.*
   d. Sediment and river morphology dynamics throughout the basin, including such issues as channel degradation, sediment levels below the reservoirs, and the relationship of sediment deposition on the functionality of reservoirs.
   e. Water quality, including understanding of the impact of temperature and composition changes on basin recovery.
   f. Water quantity, including current and anticipated future water demands and taking into account multiple scenarios from droughts to floods.
   g. Impacts of recovery and restoration activities on social, economic and cultural benefits of the Missouri River System, including impacts to local economies due to recovery and restoration activities.
   h. How to improve local support for recovery and restoration activities.
   i. Impacts of recovery and restoration activities on bank stabilization and channelization structures that negatively or positively affect the continued functionality of the channel for navigation and flood conveyance and how proposed recovery and restoration activities could be incorporated with the continued maintenance and operation of the navigation channel to its present authorized configuration, river stage, depth and flow.

* Note: An official definition for invasive species can be found in Executive Order 13112 dated February 3, 1999

3. Finally, MRRIC believes that the MRERP study provides an exceptional opportunity for and, in fact, requires a coordinated, basin-wide approach between Federal, Tribal, State and Stakeholder interests throughout the basin.
   a. We suggest including language from the July 1, 2008 guidance memo in the P&N statement directing that the study “… should identify a single, comprehensive and integrated plan to guide the implementation of programs associated with mitigation, recovery and restoration activities in the Missouri River Basin.” Given the unique role authorized in Section 5018 for MRRIC to provide guidance to the Secretary on the study, MRRIC recommends that the Secretary rely on MRRIC as the principal forum for discussing and seeking
consensus on the provisions of this coordinated, basin-wide plan.

b. As a part of developing the plan, the Committee also believes that there is a need for a better understanding of the hydro-biological and physical processes of the river. We recommend that the needs statement include the development or identification of a comprehensive, multi-jurisdictional watershed model that can be used as decision-making tool to engage and enable basin stakeholders, states, Tribes and the federal government to make informed choices on and evaluate mitigation, restoration and recovery activities in the context of specific cultural resource values and social and economic needs throughout the basin.
May 26, 2010

Programs Directorate

Mr. John E. Thorson, Chair
Missouri River Recovery Implementation Committee
376 River Road West
Plains, MT 59859

Dear Mr. Thorson:

Thank you for your letter of July 23, 2009 which transmitted the consensus recommendations of the Missouri River Recovery Implementation Committee (Committee) regarding the Purpose and Need Summary for the Missouri River Ecosystem Restoration Project (MRERP) Study. In response to the recommendations of the Committee, the U.S. Army Corps of Engineers, as the lead agency for the study, and the U.S. Fish and Wildlife Service, as a cooperating agency, have partnered to provide this letter and its associated enclosures which respond to the Committee’s recommendations.

Both agencies have worked together to fully consider each of the recommendations of the Committee and to incorporate the Committee’s recommendations into the attached Purpose and Need Summary. While in some cases the recommendations have not been incorporated verbatim, we believe the Purpose and Need Summary does address substantively all the recommendations made by the Committee. In addition to the Purpose and Need Summary, and as a supplement to the presentation we provided at the April, 2010 Committee meeting in Bismarck, North Dakota, we have also enclosed for your information a document which specifically describes how each of the Committee’s recommendations have been addressed in the Purpose and Need Summary. The Purpose and Need Summary will be incorporated into the Draft Environmental Impact Statement for the MRERP Study.

On behalf of both the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service we would like to express our sincere appreciation to the Committee for their work in developing consensus recommendations on the Purpose and Need Summary as well as for their continued commitment and dedication to this Basin-wide process. We look forward to further engagement with the Committee on the MRERP and the Missouri River Recovery Program.
Should you have any questions, please feel free to contact Mr. Witt Anderson, Programs Director, U.S. Army Corps of Engineers, at 503-808-3730, or Mr. Stephen Guertin, Regional Director, Region 6, U.S. Fish and Wildlife Service, at 303-236-7920.

Sincerely,

Witt Anderson, SES
Director, Programs
Northwestern Division
U.S. Army Corps of Engineers

4 Jan 2010
(date)

Stephen D. Guertin
Regional Director, Region 6
U.S. Fish and Wildlife Service

6/8/10
(date)

Enclosures
Enclosure 1: Responses to MRRIC Purpose and Need Recommendations

The Missouri River Recovery Implementation Committee (MRRIC) provided three recommendations:

- 1st Recommendation—5 parts: 1(a) – 1(e)
- 2nd Recommendation—9 parts (addressed in whole)
- 3rd Recommendation—2 parts (a and b), the first of which has two parts: (3(a1) and 3(a2)), and 3(b).

MRRIC recommendations are repeated and U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS) responses are provided below. Each response provides an indication of concurrence or non-concurrence and a reference to how and where within the preliminary final purpose and need summary the USACE/USFWS has incorporated the recommendation.

Recommendations and Responses

MRRIC Recommendation 1(a)
The MRRIC letter stated:

The following language is provided as a recommended starting point for the P&N Statement. Our rationale for this recommendation and our thoughts about what it means are described below.

To determine the actions required to the Missouri River and Tributaries to mitigate losses of aquatic and terrestrial habitat; to recover federally-listed species under the Endangered Species Act; and to restore the ecosystem to prevent further declines among other native species in harmony with the Congressionally-authorized purposes of the mainstem of the Missouri River, Congressionally-authorized purposes on its tributaries, cultural resource values, and social and economic needs for current and future generations.

USACE/USFWS Response 1(a)
USACE and USFWS concur with the recommendation; however, the wording has not been incorporated verbatim. We expanded the starting point provided by MRRIC and incorporated public, Tribal and cooperating agency input.

The purpose statement, as found in the text box in Section 4.1 on page 13, reads as follows:

The purpose of the Missouri River Ecosystem Restoration Plan is to determine the actions required to

- mitigate losses of aquatic and terrestrial habitat,
• recover federally listed species under the Endangered Species Act, and

• restore the ecosystem to prevent further declines among other native species.

This purpose is intended to be broad enough to allow consideration of all reasonable alternatives required by the study authorization. The alternatives should be judged in part by their ability to be accomplished in harmony with the congressionally authorized purposes of the mainstem of the Missouri River, other relevant authorized purposes, cultural resource values, and social and economic needs for current and future generations by engaging the public and in consultation with Tribes, states, other federal agencies and the Missouri River Recovery Implementation Committee.

**MRRIC Recommendation 1(b)**

The MRRIC letter stated:

MRRIC understands that a P&N statement should not be written so narrowly as to predetermine the eventual decisions made. However, we believe flexibility in how the goals are achieved does not mean that the goals themselves should be open-ended. The Committee offers two recommendations in this regard.

First, MRRIC recommends that the scope of the study be tied to those issues where there is linkage to the mitigation, recovery and ecosystem restoration of the Missouri River and its tributaries identified in WRDA.

**USACE/USFWS Response 1(b)**

USACE and USFWS concur. The Purpose and Need Summary addresses this recommendation in two ways:

1. **General.** Section 4.0, Purpose (pages 13–17), links the terms mitigate, restore, and recover to the species and habitats of the Missouri River. Also, Appendix A further elaborates and emphasizes the linkages by providing detailed species and habitat information.

2. **Scope.** The Scope section of the Purpose and Need Summary can be found in Section 2.0, page 3 of the Purpose and Need summary. That section binds MRERP to the Missouri River and its tributaries and reads as follows:

   Project scope is one of the key aspects to fully and accurately defining a project’s purpose and need, problems and opportunities. The project’s scope provides the important parameters for what is
and is not included within the project or study. Scope is defined in three different manners:

- temporal scope—the time horizon for the plan
- spatial or geographic scope—the area of the plan under analysis and consideration
- substantive scope—the purpose and focus of the plan

For the purpose of Missouri River Ecosystem Restoration Plan, the temporal scope is 50 years. The geographic scope consists of the Missouri River from bluff to bluff, and its tributaries in the states of Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota and Wyoming. The extent to which the Missouri River Ecosystem Restoration Plan addresses tributaries in each state will be based on the ecological connectivity shared between tributaries and the Missouri River mainstem. The geographic scope will be based on a manageable and reasonable nexus between mitigation, recovery and restoration and the mainstem of the Missouri River.

The substantive scope includes the Missouri River natural resources required to achieve mitigation of the losses of aquatic and terrestrial habitat, recovery of federally listed species and restoration of the ecosystem to prevent further declines among other native species.

**MRRIC Recommendation 1(c)**

The MRRIC letter stated:

Second, MRRIC recommends that the Corps clearly define purpose and need, so that the lead and cooperating agencies, and the stakeholders in the basin, can develop and evaluate alternatives with a common understanding of what those alternatives are meant to accomplish. MRRIC also recommends that the definitions for the terms “recovery” and “restoration” in the approved Charter for MRRIC are a good starting point.

**USACE/USFWS Response 1(c)**

USACE and USFWS concur. We consulted the MRRIC charter in defining the terms mitigation, recovery, and restoration, and we defined these terms on pages 15–17 of the Purpose and Need Summary. The Purpose and Need summary did not use the MRRIC charter as a citation though. Rather, the Purpose and Need Summary has used lead agency policy documents for citations. Our assessment indicates that these definitions are consistent.

Additionally, much overlap exists between all of the definitions. In order to fully understand the scope of mitigation, recovery, and restoration, it is necessary to consider them in an integrated
manner. These terms and definitions should be considered together for the purpose of working toward an ecosystem approach.

Further, a full understanding of what the alternatives are meant to accomplish will require consideration of goals and objectives, which are yet to be developed.

Following are excerpts from the Purpose section where the definitions are found:

### 4.1.1.1 Mitigation (page 15)

Mitigation consists of measures to avoid, minimize, or compensate for adverse impacts to the environment. The U.S. Army Corps of Engineers follows mitigation provisions including the Water Resources Development Act of 1986, Water Resources Development Act of 2000, Water Resources Development Act of 2007 (33 USC 2283), and Council on Environmental Quality regulations (40 CFR 1500–1508) implementing the National Environmental Policy Act. The Council on Environmental Quality regulations (40 CFR 1508.20) provide the basis of mitigation as a means to avoid or minimize environmental harm. This includes measures to rectify, reduce, eliminate, or compensate for the impacts caused by the action.

### 4.1.2.1 Recovery (page 16)

Section 5018(a) of the Water Resources Development Act of 2007 states that the Missouri River Ecosystem Restoration Plan study is to determine actions required to “…recover federally listed species under the Endangered Species Act…” For purposes of the Missouri River Ecosystem Restoration Plan study, a federally listed species is any species of fish, wildlife, or plant that has been determined to be endangered or threatened under Section 4 of the Endangered Species Act. This section of the Act defines an endangered species as any species in danger of extinction throughout all or a significant portion of its range and a threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 USC §1533).

One of the purposes of the Endangered Species Act is to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved” (16 USC §1531(b)).

- The Endangered Species Act defines the term conserve as using “all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this
chapter are no longer necessary” (16 USC §1532(3)). This point is known as recovery.

- **Recovery** is defined as “improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act” (50 CFR 402.02).

### 4.1.3.1 Restoration (page 17)

**Ecosystem restoration** consists of separable features undertaken to return a degraded condition to a less degraded condition (ER 1105-2-100, Appendix C, Corps Planning Guidance Notebook (USACE 2000)). The U.S. Army Corps of Engineers’ civil works ecosystem restoration policy (ER 1165-2-501 (USACE 1999)) states that “the purpose of Civil Works ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. Ecosystem restoration efforts will involve a comprehensive examination of the problems contributing to the system degradation, and the development of alternative means for their solution. The intent of restoration is to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system.” The intent of ecosystem restoration is to reverse the adverse impacts of human activity and restore ecological resources, including fish and wildlife habitats, to previous levels of productivity but not a higher level than would have existed under natural conditions in the absence of human activity or disturbance (ER 1105-2-100, Appendix C (USACE 2000)).

**MRRIC Recommendation 1(d)**

The MRRIC letter stated:

MRRIC recognizes that the current Missouri River system is highly modified, providing many benefits to the residents of the Missouri River Basin. Thus, we recommend that the P&N statement encompass both environmental and social, economic and cultural needs, combining the goals for the natural environment set out in WRDA 2007 and the benefits of the Congressionally-authorized purposes for the management of the Missouri River. MRRIC understands that the P&N statement needs to be broad enough to allow consideration of all reasonable alternatives to address the objectives of the study identified by Congress in WRDA 2007. At the same time, these alternatives also should be judged in part by the ability to be accomplished in harmony with the Congressionally-authorized purposes of the mainstem of the
Missouri River, the Congressionally-authorized uses of tributaries, cultural resource values, and social and economic needs for current and future generations.

**USACE/USFWS Response 1(d)**
USACE and USFWS concur. This recommendation is accomplished in the purpose statement (Response 1(a)) and in Section 4.1.4 Harmony with Social, Cultural and Economic Resources (page 17). This section defines the assessment and consideration of impacts to the entire human environment.

**MRRIC Recommendation 1(e)**
The MRRIC letter stated:

MRRIC also recognizes the impacts of modifications to the Missouri River on the Tribes in the basin and recommends that the MRERP P&N statement should consider the Tribes’ values, cultural resources including burial grounds, restoration objectives, and water use issues.

**USACE/USFWS Response 1(e)**
USACE and USFWS concur. The purpose statement, as found in the text box in Section 4.1 on page 13 of the Purpose and Need Summary, includes the phrase, “and in consultation with Tribes, states, other federal agencies and the Missouri River Recovery Implementation Committee.” Additionally, Section 4.1.4, page 18, includes the statement,

The plan will be developed in government-to-government consultation with Tribes to understand individual Tribes’ values and cultural resources, including burial grounds, restoration objectives and water use issues. Also, it will be developed by engaging the public and in consultation with the Missouri River Recovery Implementation Committee, whose membership includes Tribes, states, federal agencies and basin stakeholders, as required in Section 5018 of the Water Resources Development Act of 2007.

**MRRIC Recommendation and USACE/USFWS Response 2**
MRRIC’s second recommendation includes a 9-item list, recommended for the study. USACE and USFWS concur with the study recommendations. Each of the 9 recommendations and the corresponding steps of the MRERP process that would address each recommendation follows:

a. **MRRIC Recommendation.** “Steps to restore the ecosystem to prevent declines of federally-listed and other native species.”

USACE/USFWS Response. This will be addressed in Step 5: Formulate Restoration and Adaptive Management Alternatives, and Step 6: Compare Impacts of Alternatives.
b. MRRIC Recommendation. “Natural resources of cultural significance to Tribes, such as
the loss of tribal medicinal and cultural plants, riparian trees, and other plant species,
birds, and aquatic health related to the loss of native riparian habitat.”

USACE/USFWS Response. This will be addressed in Step 3: Assess Resource
Conditions, Step 5: Formulate Restoration and Adaptive Management Alternatives, and
Step 6: Compare Impacts of Alternatives.

c. MRRIC Recommendation. “Invasive species.”

USACE/USFWS Response. This will be addressed in Step 3: Assess Resource
Conditions, and Step 5: Formulate Restoration and Adaptive Management Alternatives.

d. MRRIC Recommendation. “Sediment and river morphology dynamics throughout the
basin, including such issues as channel degradation, sediment levels below the reservoirs,
and the relationship of sediment deposition on the functionality of reservoirs.”

USACE/USFWS Response. This will be addressed in Step 3: Assess Resource
Conditions, Step 5: Formulate Restoration and Adaptive Management Alternatives, and
Step 6: Compare Impacts of Alternatives.

e. MRRIC Recommendation. “Water quality, including understanding of the impact of
temperature and composition changes on basin recovery.”

USACE/USFWS Response. This will be addressed in Step 3: Assess Resource
Conditions, Step 5: Formulate Restoration and Adaptive Management Alternatives, and
Step 6: Compare Impacts of Alternatives.

f. MRRIC Recommendation. “Water quantity, including current and anticipated future
water demands and taking into account multiple scenarios from droughts to floods.”

USACE/USFWS Response. This will be addressed in Step 3: Assess Resource
Conditions, Step 5: Formulate Restoration and Adaptive Management Alternatives, and
Step 6: Compare Impacts of Alternatives.

g. MRRIC Recommendation. “Impacts of recovery and restoration activities on social,
economic and cultural benefits of the Missouri River System, including impacts to local
economies due to recovery and restoration activities.”

USACE/USFWS Response. This will be addressed in Step 5: Formulate Restoration and
Adaptive Management Alternatives, and Step 6: Compare Impacts of Alternatives.

h. MRRIC Recommendation. “How to improve local support for recovery and restoration
activities.”

USACE/USFWS Response. Formal scoping periods are planned for Step 2: Establish
Study Rationale and Focus, Step 4: Evaluate Future Issues and Situation, Step 5:

i. MRRIC Recommendation. “Impacts of recovery and restoration activities on bank stabilization and channelization structures that negatively or positively affect the continued functionality of the channel for navigation and flood conveyance and how proposed recovery and restoration activities could be incorporated with the continued maintenance and operation of the navigation channel to its present authorized configuration, river stage, depth and flow.”

USACE/USFWS Response. This will be addressed in Step 5: Formulate Restoration and Adaptive Management Alternatives, and Step 6: Compare Impacts of Alternatives.

**MRRIC Recommendation 3(a1)**

The MRRIC letter stated:

Finally, MRRIC believes that the MRERP study provides an exceptional opportunity for and, in fact, requires a coordinated, basin-wide approach between Federal, Tribal, State and Stakeholder interests throughout the basin. We suggest including language from the July 1, 2008 guidance memo in the P&N statement directing that the study “… should identify a single, comprehensive and integrated plan to guide the implementation of programs associated with mitigation, recovery and restoration activities in the Missouri River Basin.

**USACE/USFWS Response 3(a1)**

USACE and USFWS concur. In Section 4.2, Comprehensive Ecosystem Approach (page 18) of the Purpose and Need Summary, USACE states:

The Assistant Secretary of the Army for Civil Works directed that the study “should identify a single, comprehensive and integrated plan to guide the implementation of programs associated with mitigation, recovery, and restoration activities in the Missouri River Basin.”

As stated throughout the previous sections, the Missouri River Ecosystem Restoration Plan will take a systems approach to restoring the structure, function, and dynamic processes of the Missouri River. This approach essentially precludes the need for separable increments or alternatives to address each of the three individual mandates directed in Section 5018 of the Water Resources Development Act of 2007.

By improving or reestablishing the structural components and functions of the Missouri River such as habitats, the fish and wildlife species dependent upon them and functionally related to them, are expected to benefit. The ecosystem approach considers
interrelationships of plant and animal communities and their habitats in a connected context rather than incrementally, or for a single species. Therefore, interactions among all ecosystem components, as detailed above, will be addressed for the Missouri River Ecosystem Restoration Plan as the foundation for mitigation, recovery, and restoration actions collectively.

A single, integrated Missouri River Ecosystem Restoration Plan requires coordination among the multiple sovereigns, stakeholders and federal agencies conducting activities on the river. The Missouri River Recovery Implementation Committee, Tribes, and cooperating agencies will be needed to reach ecosystem restoration goals.

**MRRIC Recommendation 3(a2)**

The MRRIC letter stated:

Given the unique role authorized in Section 5018 for MRRIC to provide guidance to the Secretary on the study, MRRIC recommends that the Secretary rely on MRRIC as the principal forum for discussing and seeking consensus on the provisions of this coordinated, basin-wide plan.

**USACE/USFWS Response 3(a2)**

USACE and USFWS concur. The Purpose and Need Summary, Section 4.1, Ecosystem Restoration Plan Purpose (page 13) identifies the connection to MRRIC and recognizes the requirement to prepare the study in consultation with MRRIC as follows:

The U.S. Congress directed the Secretary of the Army through Section 5018(a) of the Water Resources Development Act of 2007 to conduct a study of the Missouri River and its tributaries in consultation with the Missouri River Recovery Implementation Committee (or the Committee).

The purpose of the Missouri River Ecosystem Restoration Plan is to determine the actions required to

- mitigate losses of aquatic and terrestrial habitat,

- recover federally listed species under the Endangered Species Act, and

- restore the ecosystem to prevent further decline among other native species…

As stated above, the study is also to be prepared “in consultation with the Missouri River Recovery Implementation Committee.”
Formally established in July of 2008, the Committee was charged with providing guidance and recommendations to the Secretary of the Army regarding this study.

Also, as discussed in Response 1(a), Section 4.1.4 of the Purpose and Need Summary (page 18),

...it [MRERP] will be developed by engaging the public and in consultation with the Missouri River Recovery Implementation Committee, whose membership includes Tribes, states, federal agencies and basin stakeholders, as required in Section 5018 of the Water Resources Development Act of 2007.

**MRRIC Recommendation 3(b)**

The MRRIC letter stated:

As a part of developing the plan, the Committee also believes that there is a need for a better understanding of the hydro-biological and physical processes of the river. We recommend that the needs statement include the development or identification of a comprehensive, multi-jurisdictional watershed model that can be used as a decision-making tool to engage and enable basin stakeholders, states, Tribes and the federal government to make informed choices on and evaluate mitigation, restoration and recovery activities in the context of specific cultural resource values and social and economic needs throughout the basin.

**USACE/USFWS Response 3(b)**

USACE and USFWS concur. However, the recommendation is more directly applicable in defining the affected environment and conducting the impact analysis. The extent of information needed for a better understanding of the hydro-biological and physical processes of the river will be addressed as the affected environment and the impact of various alternatives are studied in the plan. We plan to use, verify, and coordinate existing models to understand the river processes and assess impacts as a result of any proposed actions to mitigate, recover, and restore.
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
PORTLAND OR 97208-2870

USFWS and USACE Response to Recommendation # 5 -
Transmittal of MRERP Values Workshop Summary

September 21, 2010

Programs Directorate

Mr. John E. Thorson, Chair
Missouri River Recovery Implementation Committee
376 River Road West
Plains, MT 59859

Dear Mr. Thorson:

Thank you for your letter of August 2, 2010 which transmitted a recommendation from the Missouri River Recovery Implementation Committee (Committee) to the U.S. Army Corps of Engineers (Corps) and U.S. Fish and Wildlife Service (USFWS) concerning social, economic, tribal and cultural values for characterizing existing conditions for the Missouri River Ecosystem Restoration Plan (MRERP) and Environmental Impact Statement (EIS). This letter constitutes the Corps’s and USFWS’ response to that recommendation according to the Committee’s Charter.

Specifically, the Committee recommended that “perspectives included in the attached summary be considered by the Corps and the USFWS as the agencies develop the list of social, economic, tribal, and cultural values for characterizing existing conditions for the MRERP and EIS.” The agencies understand from the letter that “the values described in the summary are the opinions of individual Committee members and alternates and are not, themselves, a consensus recommendation of the Committee. Rather, the Committee considers this an adequate summary of the discussion to date and has reached a consensus that it wishes the views of its members, as reflected in the summary, to be considered in the MRERP process.”

The Committee’s recommendation and summary document are sincerely appreciated and come at an ideal time for the MRERP. Currently our team is preparing a list of social, economic, tribal, and cultural resources to be considered and characterized during this planning effort. The values provided by the Committee will be utilized to develop the list of resources. Further, the description of those values will also be considered in characterizing those resources. Although we understand the individual opinions shared in the summary do not represent a consensus opinion by the Committee, sharing them does ensure that our team is aware of the resources of value to the members. Sharing them also provides context for understanding the significance of these resources. As requested, we will “fact check” before utilizing any information provided.
In addition, the Committee anticipates an opportunity to review “a list of ‘Key Social, Economic and Cultural Values’ produced by the Corps to characterize existing conditions in the basin for the MRERP process”, and indicated it “may comment on the completeness of that list for future values baseline studies.” Based on this request, the Corps will plan to share an initial list of resources to be considered in characterizing existing conditions at the February 2011 Committee meeting.

On behalf of both the Corps and the USFWS, we would like to express our sincere appreciation to the Committee for their work in developing the values summary. We look forward to further engagement with the Committee on the MRERP and the Missouri River Recovery Program.

Should you have any questions, please feel free to contact Mr. Witt Anderson, Programs Director, U.S. Army Corps of Engineers, at 503-808-3730, or Mr. Stephen Guertin, Regional Director, Region 6, U.S. Fish and Wildlife Service, at 303-236-7920.

Sincerely,

Witt Anderson  
Director, Programs  
Northwestern Division  
U.S. Army Corps of Engineers  

21 Sept 2010 
(date)

Stephen D. Guertin  
Regional Director, Region 6  
U.S. Fish and Wildlife Service  

9 29 10 
(date)
August 2, 2010

Brigadier General John R. McMahon
Commander and Division Engineer
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870

Dear General McMahon:

I am writing you on behalf of the Missouri River Recovery Implementation Committee (MRRIC or the Committee). The MRRIC has nearly 70 members comprised of States, Tribes, Federal Agencies, and Stakeholders associated with Missouri River resources. It was authorized by Congress in Section 5018 of the Water Resources Development Act of 2007 and established in 2008 by the Assistant Secretary of the Army for Civil Works (Secretary). The duties of this committee include providing guidance to the Secretary regarding the existing Missouri River recovery and mitigation plans, including recommendations on the annual work plan and budget.

I am pleased to provide you with MRRIC’s recommendation on the Fiscal Year 2011 work plan (FY 2011).

As Congress moves forward in allocating funds for FY 2011, the operating budget for the Missouri River Recovery Program (MRRP) will be finalized. As you well know, the President’s budget proposes a mix of work packages aimed at providing the minimum level of funding to meet normal expectations of progress outlined by the Biological Opinion (BiOp) and other controlling documents. As part of those efforts, $18 million has been programmed in FY 2010 specifically for the Yellowstone Intake Diversion Dam Modification project, a congressionally authorized project through WRDA 2007, Section 3109. As of April 3, 2010, the U.S. Army Corps of Engineers has a project construction solicitation and it is understood that the Corps intends to move forward with the construction of the project and therefore these recommendations do not address the Yellowstone Intake Diversion Dam Modification project.
If Congress appropriates less than the President’s budget for FY 2011, MRRIC recommends the Corps of Engineers exercise its best professional judgment to allocate these resources in the manner which will least damage the efforts to meet the requirements of the Biological Opinion with emphasis placed on maintaining: 1) the Integrated Science Program (ISP) at the highest possible levels; and 2) construction of Emergent Sandbar Habitat (ESH), including ESH on tribal lands.

If Congress appropriates more than the President’s budget for FY 2011, MRRIC recommends these additional funds be used to aggressively pursue the ISP and increase support for the development and implementation of the Adaptive Management process. MRRIC recommends that ESH receive an increased level of funding, including ESH on Tribal Lands.

Further, MRRIC recommends that the Corps facilitate an increased understanding among the MRRIC (e.g., through webinars, information sharing session, documents) of the Project Work Request development process and how/when the MRRIC (and individual stakeholders, states, and Tribes) need to engage.

The ISP is integral to the desires of stakeholders, will inform an overall adaptive management strategy, and is essential to achieving the long-term goals of the Recovery Program. With appropriate funding the ISP will provide data and a sound basis for making fiscally and environmentally responsible decisions. Also, funding the ISP will allow the Corps to complete meta-population studies of interior least terns and piping plovers to determine regional population dynamics. This information will be useful in addressing more effective recovery actions for the birds and ESH requirements.

Recent findings from the studies performed by the Corps indicate that habitat creation for pallid sturgeon through the Shallow Water Habitat effort are on track and considerable numbers of pallid sturgeon are approaching sexual maturity. As these fish become sexually mature it provides the opportunity for the ISP to better assess means and methods of restoring natural propagation of the species.

However, recent observations of terns and plovers have not been as promising as those for pallid sturgeon. The gains seen in the Missouri River populations of both bird species have been reversed as the basin has moved out of the recent drought. Also, analysis performed by the Corps indicates that ESH creation efforts are falling well short of the Bi-Op goals, making it imperative that the Emergent Sandbar Habitat effort receive priority funding. Funding ESH projects, including research into the potential for out-of-channel habitat for the birds, will advance the portion of the Recovery Program that is most behind schedule.

We thank you for the opportunity to provide input on the budget and hope you thoughtfully consider our suggestions. Please contact me with you have any questions.
Sincerely,

/s/ John E. Thorson

JOHN E. THORSON
Chair, MRRIC
(406) 826-0500
johnethorson@mac.com

Cc:

Witt Anderson
Director of Programs
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870
September 21, 2010

Programs Directorate

Mr. John E. Thorson  
Chair, Missouri River  
Recovery Implementation Committee  
1616 Capitol Avenue  
Omaha, Nebraska 68102-4901

Dear Mr. Thorson:

Thank you for your letter dated August 2, 2010 detailing the recommendations from the Missouri River Recovery Implementation Committee (Committee) on the Missouri River Recovery Program (MRRP) fiscal year 2011 (FY11) work plan. The U.S. Army Corps of Engineers (Corps) appreciates the time and effort put forth by the Committee’s members to provide guidance regarding existing Missouri River recovery and mitigation plans, specifically the annual work plan. The Committee’s recommendations provide valuable information to the Corps and will be useful for strategic planning purposes both in the immediate future and beyond. This letter constitutes the Corps’ response to your recommendation in accordance with the Committee’s Charter.

Currently the MRRP project delivery team is implementing the FY10 work plan and finalizing the FY11 work plan for implementation beginning October 1, 2010. As outlined in your letter, the FY11 work plan recommendations provide the MRRP project delivery team with an increased understanding of the implementation priorities from the perspective of the Committee’s members. The Committee’s recommendations, including strategies for accomplishing the activities should funding be different than the President’s Budget, will factor into the team’s assessment. Each element of the Committee’s FY11 recommendations are outlined below with the Corps proposed course of action.

a. If Congress appropriates less than the President’s Budget for FY11, the Committee recommends the Corps exercise its best professional judgment to allocate resources in the manner which will least damage the efforts to meet the requirements of the Biological Opinion (BiOp) with emphasis placed on maintaining: 1) the Integrated Science Program (ISP) at the highest possible levels; and 2) construction of Emergent Sandbar Habitat (ESH), including ESH on Tribal lands.
(1) The Corps will strive to incorporate to the fullest extent possible the Committee's two priority subprograms, the ISP and the ESH, into the FY11 work plan should appropriated funds be less than the President's Budget of $78.4 million. The degree to which these subprograms can be maintained from the President's Budget Work Plan will depend upon many factors, primarily how much less funding is received than the President's Budget.

(2) Additionally, the Corps will continue to seek opportunities to work with Tribes on potential ESH projects on Tribal lands along the Missouri River. For example, the Corps has been working with the Yankton Sioux Tribe to develop projects adjacent to, or on their lands. While these ESH projects on Tribal lands are a priority, construction will not be initiated until all Tribal concerns have been addressed appropriately.

(3) Following receipt from Congress of the MRRP's FY11 appropriations, the Corps will provide an update to the Committee on how these recommendations were incorporated into finalization of the FY11 work plan. The Corps, based on the timeframe of the receipt of MRRP FY11 appropriation, will schedule a briefing to the Committee to outline the finalized FY11 work plan.

b. If Congress appropriates more than the President's Budget for FY11, the Committee recommends these additional funds be used to aggressively pursue the ISP and increase support for the development and implementation of the Adaptive Management process. The Committee also recommends the ESH receive an increased level of funding, including ESH on Tribal lands.

(1) The Corps will seek to advance the progress of the ISP, including the development and implementation of the Adaptive Management process, and increase the level of funding to support the ESH, including the ESH on Tribal lands if the MRRP FY11 appropriation is greater than the President’s Budget of $78.4 million. The subprograms identified by the Committee have work packages included in the Capability FY11 work plan to advance progress towards accomplishment of the BiOp requirements.

(2) Specifically, the applied science summary and analysis and the habitat assessment and monitoring program are two work packages to promote a more robust monitoring, assessment, and evaluation for the implementation of the adaptive management process within the MRRP. The Corps will investigate the potential for initiating the piping plover metapopulation study designed to better understand the factors affecting productivity of the Missouri River piping plover population. If additional funds are available for creation of the ESH, several design and construction projects for habitat would be pursued, including potential ESH projects on Tribal lands along the Missouri River. For example, the Corps will continue to work with Tribes to develop ESH projects adjacent to, or on their lands.

(3) Following receipt from Congress of the MRRP's FY11 appropriations, the Corps will provide an update to the Committee on how these recommendations were incorporated into
finalization of the FY11 work plan. The Corps, based on the timeframe of the receipt of MRRP FY11 appropriation, will schedule a briefing to the Committee to outline the finalized FY11 work plan.

c. The Committee recommends that the Corps facilitate an increased understanding among the Committee of the Project Work Request development process and how/when the Committee (and individual stakeholders, states, and Tribes) need to engage.

   (1) The Corps will continue to seek opportunities to facilitate an increased understanding of the processes utilized to develop the annual work plan including the Project Work Request documentation tool. For example, the Corps hosted a Project Work Request webinar on June 14, 2010 for the Committee. The Recovery Work Group also continues to develop information sharing forums such as face-to-face meetings for open dialogue with Corps staff. Communication tools to aid the Committee’s understanding of the work plan development process continue to be refined and enhanced.

   (2) The Corps will continue to identify engagement opportunities with the Committee and individual stakeholders, states, and Tribes for input into the development of the MRRP work plans. The existing timeline for development of the work plan is a phased process over several months. The Recovery Work Group is currently working with Corps staff to develop an engagement strategy for the FY12 and out-year work plans.

On behalf of the MRRP project delivery team, I would like to express our sincere appreciation to the Committee for its work in developing the recommendations for the FY11 work plan. We look forward to continued engagement with the Committee on the MRRP.

Should you have any questions, please feel free to contact me at 503-808-3730, or Ms. Teresa Reinig, Acting Senior Program Manager for the Missouri River Recovery Program, at 402-995-2721.

Sincerely,

[Signature]

Witt Anderson, SES
Programs Director
Dear General McMahon & Director Guertin:

I am writing you on behalf of the Missouri River Recovery Implementation Committee (MRRIC or the Committee). The MRRIC has nearly 70 members comprised of States, Tribes, Federal Agencies, and Stakeholders associated with Missouri River resources. It was authorized by Congress in Section 5018 of the Water Resources Development Act of 2007 and established in 2008 by the Assistant Secretary of the Army for Civil Works (Secretary). The duties of this Committee include providing guidance regarding the existing Missouri River recovery and mitigation plans, including recommendations on the Corps annual work plan.

I am pleased to provide you with MRRIC’s recommendation for a project work request to be included in the 2012 Corps Work Plan, and future Work Plans, and how USFWS can help to facilitate its implementation.

The MRRIC believes ensuring adequate availability of nesting habitat for terns and plovers (e.g., emergent sandbar habitat (ESH)) is of particular importance. As such, the MRRIC recommends Federal agencies expeditiously initiate work on the steps required to implement one to three pilot projects to create nesting habitat for terns and plovers in areas adjacent to the channel (within the floodplain) and/or within reservoirs instead of only using the current approach of creating habitat within the channel (and Lewis and Clark Lake). In order to assist with implementation of this recommendation, MRRIC further recommends the USFWS give the Corps credit for successful creation of nesting habitat in areas adjacent to the channel (within the floodplain) and/or within reservoirs.
**Rationale:**
Interior least terns and piping plovers nest on ESH and other suitable habitats on the Missouri River and around the reservoirs. The goal in the 2003 Amended Biological Opinion is that there needs to be 12,000 acres of ESH by 2015. The Corps has mechanically created ESH within the channel of the Missouri River in un-channelized river reaches downstream of dams. This habitat has been very successful for bird productivity.

The current approach of mechanical construction of ESH is falling short of the Biological Opinion acreage goals. ESH creation opportunities beyond the current approach to create habitat may assist in meeting acreage goals and increasing bird productivity.

**Challenges:**
While developing nesting habitat outside the channel has been done on other rivers such as the Platte River in Nebraska, it has not been done on the mainstem of the Missouri River. The ESH goals in the Biological Opinion are for habitat within the channel. The action area for the Biological Opinion is within the channel of the mainstem of the Missouri River; therefore, the Federal agencies would need to examine the impacts of expanding the action area, as well as the feasibility of created acres meeting Biological Opinion metrics.

**Steps/Timeline:**
In preparing this recommendation we asked the Federal agency personnel who work closely with MRRIC to provide their sense of a timeline for implementing the recommendation. This estimate is as follows:¹

1. Requirements Determination (USFWS / USACE) [9 -12 months]
2. Project Initiation [3 months]²
3. Site Selection [12 – 18 months]
4. Project Planning Phase [9 – 18 months]
   a. Develop Conceptual Plan
   b. Project Implementation Report (PIR)
5. Project Implementation Phase [18 – 42 months]
   a. Design
   b. Construction
   c. Project Closeout
6. Project Operations and Maintenance Phase [project life]

¹ Steps are sequential. Step 1 is essential to determine whether to proceed with a pilot project. Depending on many factors, the first PWR would likely be in or after FY13 for step 4.a.
² Cost estimate to be developed by the Corps after Steps 1 and 2 are completed.
While we appreciate their efforts and understand their rationale for the timeline, the MRRIC believes these efforts are of enough importance that the Federal agencies should prioritize this recommendation and look to implement these steps in a timelier manner. In particular, we recommend that Step 1 be prioritized such that the Federal agencies be able to respond to the full MRRIC on the requirements determination and provide an updated timeline for the other steps at the October 2010 MRRIC meeting.

We thank you for the opportunity to provide this recommendation and hope you thoughtfully consider our suggestions.

Sincerely,

/s/ John E. Thorson
JOHN E. THORSON
Chair, MRRIC
(406) 826-0500
johnethorson@mac.com

Cc:

Henry Maddux
Geographic Supervisor
U.S. Fish and Wildlife Service, Region 6
P.O. Box 25486 - DFC
Denver, CO 80225-0486

Witt Anderson
Director of Programs
U.S. Army Corps of Engineers
Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870
USFWS Letter to USACE Re: Recommendation # 7 - Non-Traditional Tern and Plover Habitat Pilot Projects

Brigadier General John McMahon
U.S. Army Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208-2870

Dear General McMahon:

This letter is provided for your consideration in response to the Missouri River Recovery Implementation Committee’s (MRRIC or Committee) consensus recommendation that was reached during the October 2010 MRRIC meeting. That recommendation is for the Federal agencies to “initiate work on the steps required to implement one to three pilot projects to create nesting habitat for terns and plovers in areas adjacent to the channel (within the floodplain) and/or within reservoirs instead of only using the current approach of creating habitat within the channel (and Lewis and Clark Lake).” The Committee recognized that the Federal agencies have faced challenges in constructing emergent sandbar habitat (ESH) at the pace and geographic scale anticipated in the U.S. Army Corps of Engineers’ (Corps) 2003 Biological Assessment and subsequent 2003 Amended Biological Opinion (2003 Amended BiOp) from the U.S. Fish and Wildlife Service (Service). The Service proposes consideration of the final consensus recommendation reached at the October MRRIC meeting.

As indicated in the 2003 Amended BiOP, construction of ESH should be geographically dispersed to mitigate for losses experienced throughout the Missouri River Mainstem Reservoir System (System). The consequences of this year’s Missouri River operation and natural weather events have driven home the need for more sandbar habitat in more locations throughout the System. Adequate habitat at dispersed locations will help to ensure that fledge ratios and adult population goals for both the interior least tern and piping plover are more likely to be met, even under extreme conditions.

Considering the low productivity of the piping plover populations this year and the need for more habitat dispersed throughout the System, the Service supports the MRRIC’s final consensus recommendation to implement a pilot project to create ESH outside of our current in-channel habitat creation approach.
We also recommend that you consider the following actions as we consider the future operation of the Missouri River:

(1) Develop a plan to shape future needs to evacuate water from the system to allow the largest possible benefit to existing and newly created habitat.

(2) Pursue the following experimental ESH projects outside of the traditional Missouri River in-channel work:

a. A demonstration project located within one of the Missouri River reservoirs other than Lewis and Clark Lake. We recommend that the Corps work on a project in Lake Sharp with the Lower Brule Sioux Tribe or Lake Oahe.

b. A greater effort to devegetate sandbars in the Garrison Reach. We assume that the flows from Garrison Dam will be much higher next year and work in this reach could be much more difficult.

c. A demonstration project in the Kenslers Bend area.

d. A demonstration project located in the floodplain adjacent to the river (but currently off-channel). One option may be on one of the recently purchased tracts of land below Gavins Point Dam.

While uncertainties exist related to any restoration effort, we believe that developing these projects, under the adaptive management process, will result in providing additional ESH required for successful tern and plover production rates and hopefully lead toward recovery of these species. If these projects are successful, as jointly determined by the Corps and Service, we will work with the Corps to ensure they count toward meeting the measures contained in the 2003 Amended BiOp.

We remain committed to working with the Corps for the recovery of the least tern and piping plover populations within the Missouri River basin, and offer our assistance in developing these specific recommended projects and how they will meet the 2003 Amended BiOp goals.

If you have any questions or comments, please contact Mike Olson, the Missouri River Coordinator, at 701-250-4481.

Sincerely,

[Signature]

Regional Director
Mr. John Thorson  
Chair, Missouri River Recovery Implementation Committee  
1616 Capitol Avenue  
Omaha, Nebraska 68102-4901

Dear Mr. Thorson:

Thank you for your letter dated November 18, 2010 conveying a recommendation from the Missouri River Recovery Implementation Committee (MRRIC) for the U.S. Army Corps of Engineers (Corps) in consultation with the U.S. Fish and Wildlife Service (USFWS). The MRRIC recommends the agencies consider implementing one to three pilot projects to create nesting habitat for the federally protected interior least tern and piping plover in areas adjacent to the channel (within the floodplain) and/or within reservoirs. The MRRIC recommendation also suggests a timeline for implementation. The Committee’s interest in the Emergent Sandbar Habitat (ESH) Program is both valued and appreciated. This letter constitutes the Corps’ response to the recommendation in accordance with the MRRIC Charter.

In your letter you mention the current approach of mechanical construction of ESH is falling short of the Biological Opinion (BiOp) acreage goals and further state that ESH creation opportunities beyond the current approach to create habitat may assist in meeting acreage goals and increased bird productivity. While the ESH team agrees the BiOp acreage goals are not being met, the team would like to assure you that ESH projects built to date have provided successful habitat for terns and plovers. Every created sandbar has been utilized by the birds and has successfully fledged birds. The current approach to sandbar creation is working. The limiting factor in reaching BiOp goals to date has been funding availability and the resulting level of habitat creation.

In November 2010, the USFWS indicated to the Corps its support for this MRRIC recommendation. Additionally, the USFWS identified several locations for experimental ESH projects outside of the traditional Missouri River in-channel work, and depending on the success of these projects, offered to work with the Corps to ensure they count toward meeting the measures contained in the 2003 Amended BiOp.

As a result of your recommendation, and support by the USFWS, the ESH multi-agency team is currently exploring pilot habitat creation activities outside the channel. Locations and sites under consideration are discussed below, but the exact pilot locations will be determined.
following technical analysis that includes factors such as availability of adequate, suitable substrate and material for creation.

a. A sandbar creation project is being evaluated in upper Oahe Reservoir just inside the North Dakota boundary. The exact site has not yet been determined as the team is waiting to assess the condition of current shallowly submerged sandbars following the winter decrease in releases. In the coming months, the ESH multi-agency team will select a site for detailed study.

b. The ESH team will also look into potential sites in Lake Sharpe. A site visit will be planned for early 2011 and the ESH team will work with the Lower Brule Sioux Tribe on site selection.

c. Other off-channel sandbar creation activities are also being considered, including the potential for ESH development at two tracts of land below Gavins Point Dam the Corps purchased: Audubon Bend and North Alabama Bend. A multi-agency team will convene in early 2011 to discuss off-channel sandbar creation opportunities at these sites with a subsequent public scoping meeting to be held.

Another endeavor of the ESH multi-agency team for 2011, as requested in the BiOp, is a comprehensive reservoir habitat study. The reservoir habitat study will identify, evaluate and prioritize all habitat creation opportunities in the reservoirs. The study began in late summer 2010 with initial site visits to Lake Sakakawea, Lake Oahe, and Lake Francis Case. Future activities will include visits to Lake Sharpe with Lower Brule Sioux Tribal representatives, and Lewis & Clark Lake. Information gathered during the site visits will be compiled into a comprehensive report of habitat creation opportunities at all the reservoirs. Scoping activities in 2011 will determine the scope and schedule for the Reservoir Habitat Study.

In the “Challenges” section of your letter you reference the importance of examining the impacts of expanding the action area to include off-channel sites. As part of an adaptive management strategy, the Corps will begin evaluation of pilot projects, as mentioned above. The success of these projects will be evaluated through monitoring, and comparison against set objectives, and will be assessed on an annual basis. Fortunately, results would be anticipated within the first couple years after construction as the birds have shown an immediate response to created habitat thus far. The Corps will work with the USFWS and the MRRIC to consider the potential for the inclusion of more off-channel sites for future budget years, but efforts will depend on the success of the initial sites and discussions regarding credit for the habitat creation with the USFWS. The results will be communicated with the MRRIC annually as part of the Missouri River Recovery Program Annual Report.

Finally, in your recommendation you suggest the Federal agencies prioritize this MRRIC recommendation and look to implement this recommendation in a more timely manner than the
estimated timeline you included in your letter. Based on the identification of potential pilot project areas, the initial draft schedule has been revised as follows.

a. Requirements Determination (USFWS/USACE) – Ongoing.

b. Project Initiation (3 months) – Ongoing and concurrent with above.

c. Site Selection (3 months) – Ongoing and concurrent with above.

d. Project Planning Phase (9-18 months) – Complete in Fiscal Year (FY) 2012.
   
   (1) Develop Conceptual Plan.

   (2) Project Implementation Report.

   e. Project Implementation Phase (18-42 months) – Potential to start construction in late FY12 or FY13.

   (1) Design.

   (2) Construction.

   (3) Project Closeout.

   f. Project Operations and Maintenance Phase for the project life.

Again, the Corps would like to thank the MRRIC for their proactive suggestions for pilot projects to create nesting habitat for terns and plovers in areas adjacent to the channel (within the floodplain) and/or within reservoirs. If you have any questions, please feel free to contact Steven Fischer, Missouri River Recovery Program Manager, at (816) 389-3220 or Kelly Crane, ESH Program Manager, at (402) 995-2505.

Sincerely,

W. D. Anderson
Witt Anderson, SES
Director, Programs
November 16, 2010

Brigadier General John R. McMahon  
Commander and Division Engineer  
U.S. Army Corps of Engineers  
Northwestern Division  
P.O. Box 2870  
Portland, OR 97208-2870

Stephen Guertin  
Regional Director  
U.S. Fish and Wildlife Service, Region 6  
P.O. Box 25486 - DFC  
Denver, CO 80225-0486

Dear General McMahon & Director Guertin:

I am writing you on behalf of the Missouri River Recovery Implementation Committee (MRRIC or Committee). The MRRIC has nearly 70 members comprised of States, Tribes, Federal Agencies and Stakeholders associated with Missouri River resources. The Committee was authorized by Congress in Section 5018 of the Water Resources Development Act of 2007 (WRDA) and established in 2008 by the Assistant Secretary of the Army for Civil Works. The duties of this committee include providing guidance to the Secretary of the Army and any affected Federal Agency, State agency or Indian Tribe regarding a study of the Missouri River ecosystem to recover federally listed species under the Endangered Species Act of 1973.

I am pleased to transmit to you a substantive recommendation (“Recommendation on Government-to-Government Consultation”) reached by consensus of MRRIC members present during our recent meeting in South Sioux City, Nebraska.

Thank you for your consideration of this recommendation. Please contact me with you have any questions.

Sincerely,

/s/ John E. Thorson

JOHN E. THORSON  
Chair, MRRIC  
(406) 826-0500  
johnethorson@mac.com

Enc.

1616 Capitol Avenue  •  Omaha, Nebraska 68102-4901  •  (402) 995-2919  •  info@MRRIC.org  •  www.MRRIC.org
Recommendation on Government-to-Government Consultation

Final Consensus Reached by MRRIC on October 19, 2010

The MRRIC recommends that the USACE and the USFWS jointly conduct government-to-government consultation with as many of the 28 Missouri River basin Tribes as possible between the end of October 2010 and the first MRRIC meeting of 2011. The formal consultation will include sharing opportunities for involvement in MRRIC and gathering information on Tribal obstacles to participating in the MRRIC.
Programs Directorate

Mr. John E. Thorson, Chair
Missouri River Recovery Implementation Committee
376 River Road West
Plains, MT 59859

Dear Mr. Thorson:

Thank you for your letter of November 16, 2010 which transmitted a recommendation from the Missouri River Recovery Implementation Committee (MRRIC) that the U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS) conduct government-to-government consultation with Tribes. Specifically, the recommendation is for USACE and USFWS to consult with as many of the 28 Missouri River basin Native American Indian Tribes as possible before the first MRRIC meeting of 2011 (February 14-17) to share opportunities for the Tribes to participate in the MRRIC and gather information on obstacles to participating in the MRRIC.

Both the USACE and the USFWS would like to express our sincere appreciation to the Committee for its work in developing this recommendation. Our agencies, as well as all of the federal agencies that make up the Federal Working Group (FWG), take our responsibilities toward the Tribes very seriously. We are continuously seeking ways to improve our communication with basin Tribes and will use the MRRIC’s recommendation as an additional vehicle to reach out to them. We agree that greater Tribal participation in the MRRIC would not only benefit the Tribes, but also would make the Committee a more robust and influential organization.

The USACE and the USFWS agree with the MRRIC that government-to-government consultation is appropriate at this time. Our staffs will work diligently with those Tribes that desire to participate in this process and carry out as many government-to-government consultations as possible by the February MRRIC meeting. We are currently developing a Plan of Action on how best to expedite and execute these consultations. However, we would like the MRRIC to be aware that our previous experience in setting up government-to-government consultations is that these consultations are dependent on the interest level of individual Tribes, as well as the availability of federal and Tribal funds. We anticipate that because of the number of Tribes in the basin, despite our best efforts, these consultations will probably continue beyond the February meeting.
We are providing other FWG agencies the opportunity to participate with us in the consultation process. Government-to-government consultations are conducted in confidence between the federal agencies and the Tribal sovereigns and are not a public process. While we are not at liberty to share specific information about or resulting from any consultations, the USACE and the USFWS will provide the Tribal Subcommittee and the MRRIC a report at the conclusion of this process detailing general themes from these consultations, along with any other information the Tribes have indicated we can share with the Committee.

We look forward to further engagement with the Committee on the Missouri River Recovery Program.

Should you have any questions, please feel free to contact Mr. Witt Anderson, Programs Director, U.S. Army Corps of Engineers, at 503-808-3730, or Mr. Stephen Guertin, Regional Director, Region 6, U.S. Fish and Wildlife Service, at 303-236-7920.

Sincerely,

Witt Anderson, SES
Director, Programs
Northwestern Division
U.S. Army Corps of Engineers

17 Oct 2010
(date)

Stephen D. Guertin
Regional Director, Region 6
U.S. Fish and Wildlife Service

12 Jan 10
(date)