

# Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Program



## Barney Bend Chute at Lower Hamburg Mitigation Site

Draft Project Implementation Report

January 2007



**US Army Corps  
of Engineers**  
Kansas City District

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**U.S. Army Corps of Engineers**

Kansas City District  
601 East 12<sup>th</sup> Street  
Kansas City, Missouri 64106

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DEPARTMENT OF THE ARMY  
KANSAS CITY DISTRICT, CORPS OF ENGINEERS  
700 FEDERAL BUILDING  
KANSAS CITY, MISSOURI 64106-2896

## **Finding of No Significant Impact**

### **U.S. Army Corps of Engineers, Kansas City District, Proposed Barney Bend Chute at the Lower Hamburg Missouri River Fish and Wildlife Mitigation Project, Atchison County, Missouri**

#### **Project Summary**

The Corps of Engineers proposes to develop fish and wildlife habitat and construct a flow-through chute at Barney Bend, an area of the Lower Hamburg Bend Mitigation Site, as part of the Missouri River Fish and Wildlife Mitigation Program. The site is located in Atchison County, Missouri and is adjacent to the left descending bank of the Missouri River, river miles 546.5 to 550.

The Single-Entrance alternative would include the construction of a flow-through chute with one inlet at the upstream end of Barney Bend and a single outlet at the downstream end of Barney Bend. This would result in one main chute reach. Inlet construction would require notching the existing stone revetment at the inlet location. One rock grade control structure would be placed at five feet below CRP. No dike structures would be removed or modified at the chute exit.

The constructed base width of the chute reach would be a minimum of 85 feet. Spoil material less than 3 inches in diameter from the chute excavation would be discharged into the Missouri River channel. Spoil area would be provided landward for material greater than 3 inches in diameter. Excavation of the chute would result in immediate aquatic habitat however the "as-built" chute would not represent the final habitat condition. The chute would be designed to erode to a channel design width of approximately 200 feet over time. Therefore, aquatic habitat created by the project would increase over time.

The area of Barney Bend that would become an island after construction of the chute would be planted with warm season grasses prior to chute construction. The remainder of the site would either be planted to native terrestrial vegetation (warm season grasses or trees) or allowed to develop through natural succession.

Along with the methods used to create fish and wildlife habitat on Barney Bend, monitoring activities would be conducted to determine the quality of the restored aquatic and terrestrial habitat and would be used to adaptively manage Barney Bend. Although

the Corps would not fund or construct recreation features, it would work with other agencies or organizations interested in developing recreational or public use facilities at their own expense. Barney Bend would be open to the public for a variety of uses including bird watching, hiking, fishing, boating, and hunting.

## **Alternatives**

Three alternatives were considered: (1) the Split-Entrance alternative,; (2) the Single-Entrance alternative(**RECOMMENDED**); and (3) the No Development alternative (no action).

Both Alternative 1 and 2 were deemed technically feasible. However, Alternative 2 would best maximize benefits for fish and wildlife habitat development at Barney Bend while considering concerns of adjacent private property owners. As such, Alternative 1 was not recommended as the preferred alternative.

The No Development alternative (3) is not recommended because it would not meet the project purpose and need of creating a flow-through chute and maximizing aquatic and terrestrial fish and wildlife habitat. The No Development alternative would have no permanent or temporary construction related impacts.

## **Recommended Plan**

The recommended plan is Alternative 2 as stated above and described in detail in the PIR. Of the three alternatives considered, this plan is recommended because it provides maximum benefits to fish and wildlife habitat at the site and best meets the project purpose and need for creating fish and wildlife habitat while minimizing any potential impacts to adjacent property owners. The Single-Entrance alternative would not adversely affect navigation or adjacent landowners.

## **Summary of Environmental Impacts**

Construction of the flow-through chute would result in a loss of soils and existing terrestrial habitat to excavation. The amount of terrestrial habitat converted to aquatic habitat would be minimal relative to that available on the site. There would be a net increase in quality terrestrial habitat at Barney Bend. The adverse effects associated with the project are short-term/minor and related to project construction. The impacted timber will be left on-site and used to provide habitat for fish and wildlife. Soils disturbed will be returned to the river as sediments or used on-site for berm construction. The benefits of habitat development, including the creation of shallow water habitat upon project completion, would offset these minor adverse effects.

The U.S. Army Corps of Engineers, Kansas City District's, proposed fish and wildlife habitat development at Barney Bend would result in environmental benefits and adverse effects are typically minor/long-term and minor/short-term construction related. Minor

long-term impacts associated with these projects are typically well outweighed by the overall long-term environmental benefits.

## **Mitigation Measures**

The recommended plan will result in a minor amount of timber clearing and soil disturbance at Barney Bend. As described above in the Summary of Environmental Impacts section, the overall environmental benefits associated with this project greatly outweigh the minor permanent and temporary construction-related impacts of the project. Therefore, no additional mitigation measures are warranted or proposed.

## **Public Availability**

A description of the proposed project was circulated to the public and resource agencies through a Public Notice, No. \_\_\_\_\_, dated \_\_\_\_\_, with a thirty-day comment period ending on \_\_\_\_\_. This notice contained a project description, along with information on the Corps' preliminary determination to prepare a Finding of No Significant Impact for the project and a draft Section 404(b)(1) Evaluation. The notice was mailed to individuals/agencies/businesses listed on the NWK-Regulatory Branch's General, State of Missouri and Atchison County mailing lists. The Public Notice was also available for public/agency review and comment on the NWK-Regulatory Branch's webpage and the Mitigation Program web page (<http://www.nwk.usace.army.mil/projects/mitigation/>).

## **Conclusion**

After evaluating the anticipated environmental, economic, and social effects of the proposed activity, it is my determination that construction of the proposed fish and wildlife habitat including a flow-through chute at Barney Bend does not constitute a major Federal action that would significantly affect the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date: \_\_\_\_\_

\_\_\_\_\_  
Michael A. Rossi  
Colonel, Corps of Engineers  
District Commander

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## Acronyms and Abbreviations

ACHP	Advisory Council on Historic Properties
ACT	Agency Coordination Team
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
ASM	Archaeological Society of Missouri
BEA	Bureau of Economic Analysis
BSNP	Bank Stabilization and Navigation Project
C	Celsius
CA	Conservation Area
Corps	U.S. Army Corps of Engineers
CRP	Construction Reference Plane
CWA	Clean Water Act
dbh	Diameter at breast height
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
GIS	Geographic Information Systems
IDNR	Iowa Department of Natural Resources
KDWP	Kansas Department of Wildlife and Parks
M&E	Monitoring and Evaluation
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
mg/l	Milligrams per liter
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Parks Commission
NHPA	National Historic Preservation Act
NLCD	National Land Cover Data Set
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSHS	Nebraska State Historical Society
NWI	National Wetland Inventory
NWP	Nationwide Permit
NWR	National Wildlife Refuge
O&M	Operation & Maintenance
PgMP	Program Management Plan
pH	Potential of Hydrogen
PIR	Project Implementation Report
PL	Public Law
RM	River Mile
ROD	Record of Decision
RPM	Root Pruning Method
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SRA	State Recreation Area

SWPPP Storm Water Pollution Prevention Plan  
USDA United States Department of Agriculture  
USFWS United States Fish and Wildlife Service  
USGS United States Geological Survey  
WMA Wildlife Management Area  
WRDA86 Water Resources Development Act of 1986  
WRDA99 Water Resources Development Act of 1999

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# Chapter 1

## Introduction

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### 1.1 INTRODUCTION

The Missouri River Fish and Wildlife Mitigation Program (Mitigation Program) was authorized by the Water Resources Development Acts of 1986 and 1999 (WRDA86 and WRDA99) to develop fish and wildlife habitat along the lower Missouri River from Sioux City, Iowa, to the mouth near St. Louis, Missouri, to mitigate for the loss of habitat that resulted from construction, operation, and maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP). The Lower Hamburg Mitigation Site (Lower Hamburg) consists of two large parcels of land situated in Atchison County, Missouri and contains approximately 2,586 acres of land owned by the U.S. Army Corps of Engineers (Corps) and managed by the Missouri Department of Conservation (MDC). Lower Hamburg is comprised of a northern and southern parcel of land generally defined by a constriction at River Mile 550 where Federal Levee L-575 comes to within approximately 1/4 mile of the channel at Upper Barney Bend. This Project Implementation Report (PIR) will focus on planned habitat development activities on the southern parcel of Lower Hamburg, known as Barney Bend, generally located between River Miles (RM) 546.5 and 550. Specifically, this PIR will focus on the construction of a flow-through chute at Barney Bend. This PIR includes an Environmental Assessment (EA) consistent with the National Environmental Policy Act (NEPA). It provides an analysis of alternatives and a detailed description of the recommended plan for a flow-through chute at Barney Bend. This PIR also contains an evaluation of environmental impacts consistent with the requirements of pertinent Federal regulations including NEPA, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and Section 404 of the Clean Water Act (CWA).

### 1.1.1 PROJECT AUTHORITY

Barney Bend was acquired by the Corps and is proposed to be developed as part of the Mitigation Program. The Mitigation Program was initially authorized in Section 601(a) of WRDA86 [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 WRDA99 (PL 106-53) modified the Mitigation Program by increasing the amount of acreage to be acquired and/or mitigated by 118,650 acres. Therefore, the total amount of land authorized for mitigation is currently 166,750 acres.

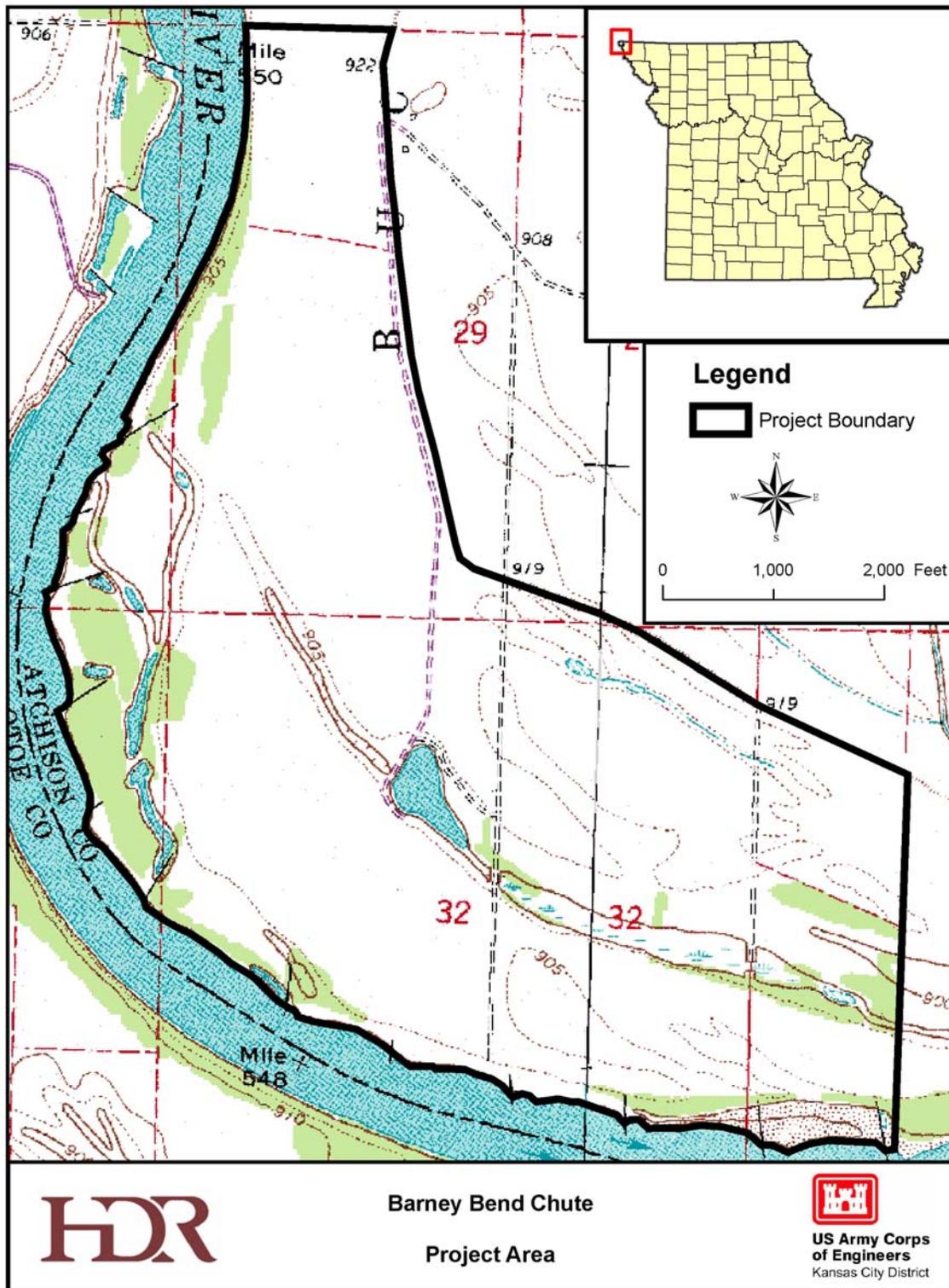
The Corps prepared a *Feasibility Report and Environmental Impact Statement* (Corps 1981) on the original Mitigation Program of 48,100 acres. After Congress modified the Mitigation Program in WRDA99, the Corps initiated a *Supplemental Environmental Impact Statement* (SEIS; Corps 2003a) in September 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.

### 1.1.2 PROJECT DESCRIPTION AND LOCATION

The proposed project would develop fish and wildlife habitat at Barney Bend. The focus of habitat development would be construction of a flow-through chute. Other habitat development activities at the site would include reestablishing native terrestrial habitats. The proposed project is described in more detail in Chapter 2.

Although Barney Bend is part of the larger Lower Hamburg, this PIR will focus on the area of the site defined as Barney Bend, RM 546.5 to 550. Barney Bend is located within rural Atchison County, Missouri and is adjacent to the left descending bank of the Missouri River (Figure 1-1). The site is located in Sections 29, 32, and 33 of T66N, R43W.

Figure 1-1. Barney Bend Project Location.



Lower Hamburg consists of existing public lands acquired by the Kansas City District Corps for the Mitigation Program. The northern parcel has experienced significant habitat development including construction of a chute to reopen a historic channel and enhancement of a backwater slough. Construction of the chute and backwater slough was completed in 2004. Other habitat development activities have occurred on the site including shallow water habitat development, tree planting, warm season grass plantings, food plots and active management by MDC. Barney Bend, the southern parcel, is largely undeveloped and experiencing agricultural leasing and natural succession of terrestrial habitat.

Development of Lower Hamburg, including Barney Bend, is the responsibility of the Corps. The Reaffirmation Report (Corps 1990a) established that for the Mitigation Program the Kansas City District would have responsibility for projects in Missouri and Kansas and the Omaha District would have responsibility for projects in Iowa and Nebraska. MDC manages the site through annual sole source contracts with the Corps. The Corps provides development and management funds and oversight.

### 1.1.3 PREVIOUS RELATED REPORTS

The following previous reports are related to this PIR:

- MDC, 2001. *U.S. Army Corps of Engineers Mitigation Lands Area Plan (Northwest Missouri Region)*.
- Corps, Missouri River Division, 1981. *Missouri River Fish and Wildlife Mitigation Iowa, Nebraska, Kansas, and Missouri Final Feasibility Report and Final Environmental Impact Statement*.
- Corps, Kansas City District, 1990a. *Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project, Reaffirmation Report*.
- Corps, Missouri River Division, 1990b. *Missouri River Bank Stabilization and Navigation, Fish and Wildlife Mitigation Project, Real Estate Design Memorandum #1*.
- Corps, Missouri River Division, 1992. *Missouri River Fish and Wildlife Mitigation Project, Project Management Plan*.

- Corps, Kansas City District, 2000. *Lower Hamburg Bend Mitigation Site, Definite Project Report.*
- Corps, Kansas City and Omaha Districts, 2003a. *Missouri River Fish and Wildlife Mitigation Project, Final Supplemental Environmental Impact Statement and Record of Decision.*
- Corps, Omaha District, 2003b. *Kansas and Nishnabotna Bends, Environmental Assessment.*
- Corps, Kansas City District, 2004. *Nishnabotna Mitigation Site Project Implementation Report.*
- Corps, Kansas City and Omaha Districts, 2005. *Missouri River Fish and Wildlife Mitigation Program, Draft Program Management Plan.*
- U.S. Fish and Wildlife Service (USFWS), 1980. *Missouri River Stabilization and Navigation Project, Sioux City, Iowa to Mouth Detailed Fish and Wildlife Coordination Act Report.*

#### 1.1.4 PROJECT GOALS AND OBJECTIVES

The overall objective for Lower Hamburg as a component of the Mitigation Program is to develop fish and wildlife habitat. Beginning shortly after authorization by WRDA86, the Agency Coordination Team (ACT, discussed in more detail in Section 1.4) has been involved in Mitigation Program guidance and has helped establish overall objectives to:

- Maximize habitat and species diversity;
- Reconnect the river to the floodplain; and
- Develop each site to optimize habitat conditions for that individual site.

In addition to ACT objectives, MDC developed regional goals and objectives specific to the Mitigation Program for MDC northwest Missouri region in 2001 (MDC 2001). These goals and objectives outline specific habitat restoration activities with emphasis on certain species within habitats. Other goals and objectives of the MDC plan focus on public use and land acquisitions. The goals and objectives of the MDC plan help guide and formulate site specific goals and objectives to maximize habitat benefits.

The specific goals for Barney Bend were developed with consideration for ACT and MDC goals to help meet the overall Mitigation Program authorization and to maximize habitat potential for the site. The site-specific goals identified are:

- 1) Construction of a flow-through chute; and
- 2) Maximize terrestrial and aquatic habitat on site.

### 1.1.5 SCOPE OF STUDY

The scope of this study is confined to the project area shown in Figure 1-1. Alternatives considered in this study were limited to those pertaining to construction of a flow-through chute on Barney Bend. An amendment to this PIR would be needed if additional acres are acquired or if significant changes to the preferred alternative are proposed in the future. All permanent project features would be constructed on government-owned lands.

## 1.2 PURPOSE OF AND NEED FOR ACTION

The purpose of the Mitigation Program, and site-specific projects, is to mitigate the loss of fish and wildlife habitat due to the BSNP. The Rivers and Harbors Act of 1912, 1925, 1927, and 1945 authorized the BSNP. The existing BSNP extends 735 miles from Sioux City, Iowa to the mouth near St. Louis, Missouri and maintains a nine-foot deep by 300-foot wide channel. The BSNP consists mainly of revetments along the outsides of bends and transverse dikes along the insides of bends to force the river into a single active channel that is self-maintaining.

The need for the Mitigation Program, and site-specific projects, rests in the loss of a unique floodplain ecosystem that included diverse fish and wildlife habitat and species, and the changing public values that have placed significant importance on reestablishing these important fish and wildlife species and ecological resources. The historic variety and quality of aquatic habitats have been eliminated or altered by construction of the navigation channel. Dikes and revetments have greatly reduced the meandering of the river, and flooding of the river has resulted in accretion of lands that have allowed for expansion of agricultural practices into the historic floodplain. The Corps estimated that by 2003, approximately 522,000 acres of fish and wildlife habitat in the natural channel

and meander belt of the Missouri River would have been lost as a result of the construction, operation, and maintenance of the BSNP (Corps 1981).

Habitat loss and resultant adverse impacts to fish and wildlife resources need to be mitigated as authorized by Congress through WRDA86 and WRDA99. Acquisition and development of lands along the Missouri River need to occur to mitigate the resources lost to channelization and bank stabilization. The Mitigation Program was established to accomplish these needs. Development of Barney Bend for fish and wildlife habitat would contribute to achieving the goals and purpose of the Mitigation Program to mitigate for the loss of habitat that resulted from the BSNP.

### 1.3 SITE SELECTION

The Reaffirmation Report (Corps 1990a) established general criteria for the selection of sites for land acquisition as part of the Mitigation Program. These criteria included the following:

- The land in private ownership could be acquired from willing sellers.
- The size of the area was greater than 100 acres.
- The area would not adversely affect navigation, carrying capacity of existing levees, or flood-carrying capacity of the existing floodway.
- The area was a large contiguous tract suitable for terrestrial woodland, grassland, and wetland development, with a remnant chute and backwater that could be restored.
- Emphasis will be given to acquiring the remaining larger contiguous tracts of bottomland timber, areas of wetland or former wetland that can be restored, areas that can be developed to provide terrestrial forest and grassland habitat, and areas where chutes or backwaters can be restored.
- Acquisition of agricultural land should be limited except where the area has high potential for development or where a willing seller is available.
- Consideration will be given to the establishment or preservation of native floodplain prairie habitats.

- The area was part of the meander belt of the Missouri River.
- Public access to areas will not be a determining factor in acquisition.
- Sites chosen for establishment of wetlands will include enough adjacent land so that excessive sedimentation can be prevented and appropriate terrestrial non-forested habitat can be provided.
- Sites chosen for acquisition or development will be based on state and Federal agency input and support.
- Projected operation and maintenance costs will be considered in the selection of acquisition and development sites.

The Lower Hamburg Site was selected as a potential mitigation site based on review of historic and current aerial photography and on-site evaluations. Lower Hamburg met the above stated criteria. In addition, the site was determined to have several attributes that made it favorable as a mitigation site. These include its location along the Missouri River with opportunities to create backwater areas and restore side channel chutes. After preliminary investigations and studies were completed the area was recommended by MDC for mitigation planning. The property was made available by private willing sellers and the Corps acquired fee title to the land between 1995 and 1998. MDC has been managing the area since that time.

#### **1.4 AGENCY COORDINATION**

The Mitigation Program ACT meets quarterly. Representatives from the USFWS, U.S. Environmental Protection Agency (EPA), Natural Resource Conservation Service (NRCS), Iowa Department of Natural Resources (IDNR), Kansas Department of Wildlife and Parks (KDWP), MDC, and the Nebraska Game and Parks Commission (NGPC) along with the Kansas City and Omaha Districts of the Corps comprise the ACT. The initial responsibility of the ACT was to develop selection criteria for screening and prioritizing general areas to identify willing sellers for potential mitigation sites. The ACT also meets to discuss future activities, priorities, funding, and other issues related to implementing, managing, and monitoring the Mitigation Program. The MDC representatives to the ACT worked with the Kansas City District Corps to identify Lower Hamburg as an area for potential acquisition and habitat development.

Coordination among the Kansas City and Omaha District Corps, and MDC has been occurring throughout the planning process for development of Barney Bend. Agency coordination letters were sent to the appropriate Federal and state resource agencies requesting information and their comment regarding the Proposed Action. The agencies provided information on Federally listed and candidate threatened and endangered species, state species of special concern, and natural communities (Appendix A).

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# Chapter 2

## Alternatives

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### 2.1 INTRODUCTION

This chapter presents the alternatives considered for the development of a flow-through chute at Barney Bend. Three alternatives were considered, and include: Split-Entrance, Single-Entrance, and No Development alternatives. The Split-Entrance and Single-Entrance alternatives are the build alternatives. These alternatives were evaluated against their ability to fulfill the site objectives as previously defined in Section 1.1.4. These alternatives were also evaluated as part of the evaluation of chute configurations included in the engineering report (Appendix B). This chapter includes a description of each alternative, an evaluation of the alternatives, and a detailed description of the recommended alternative.

Some habitat development and site management activities have been previously conducted by MDC. Some aspects of the current site management and habitat development activities (e.g., plantings) are considered to be included in all three alternatives. These activities would likely be modified during development of Barney Bend. In the fall of 1999, root pruning method (RPM) trees and seedlings were planted on the site. Warm season grasses were also planted on the site in the fall of 2001, spring of 2003, and in 2005. Currently, agricultural leasing takes place on the site. This practice maintains open areas in the short-term until habitat improvements can be made and provides food plots for wildlife in the long-term. In addition, it provides protection from wildlife damage to adjacent lands. The following sections describe the alternatives considered for development of a chute at Barney Bend.

## 2.2 ALTERNATIVES

### 2.2.1 SPLIT-ENTRANCE ALTERNATIVE

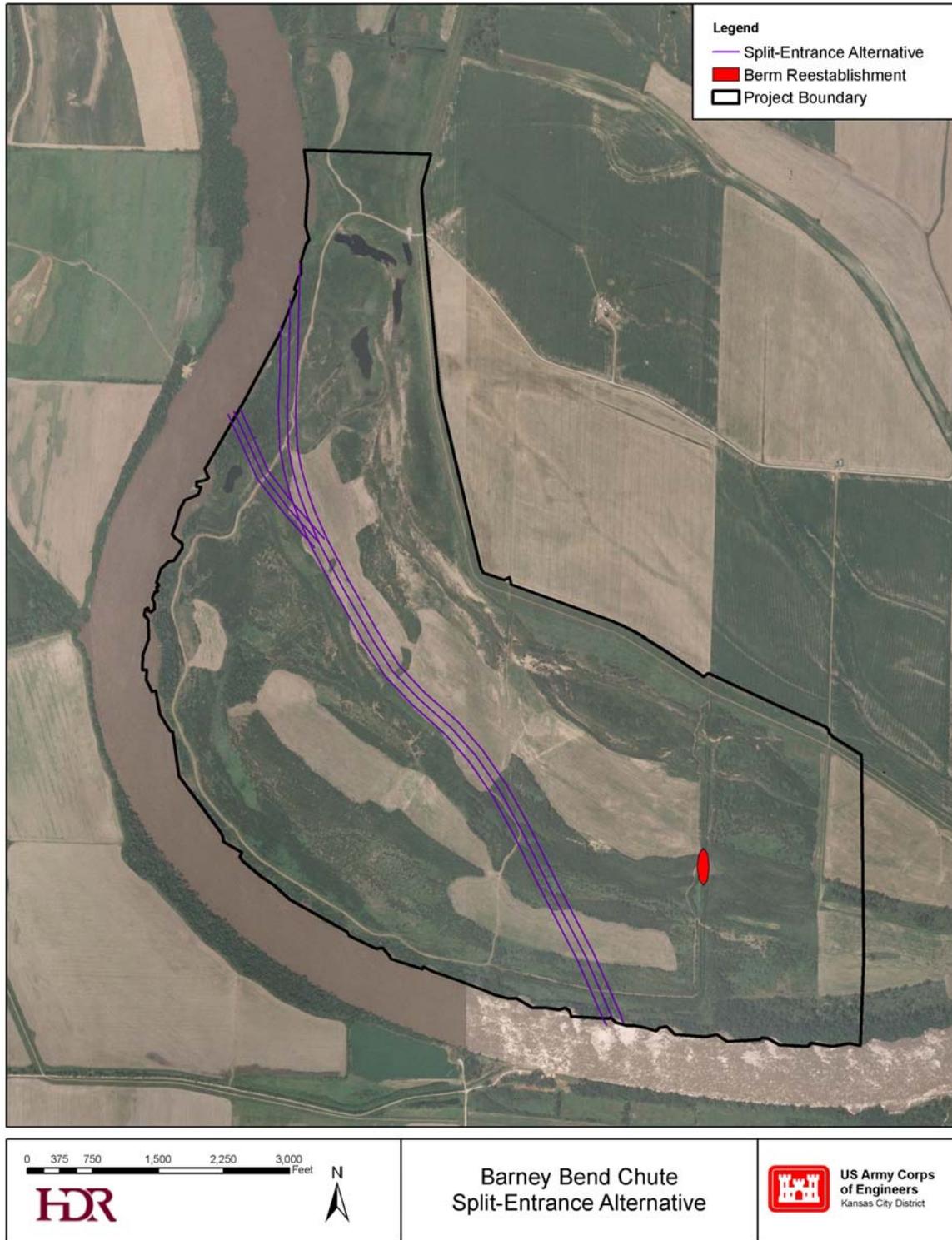
The Split-Entrance alternative would include the construction of a flow-through chute with two inlets at the upstream end of Barney Bend and a single outlet at the downstream end of Barney Bend (Figure 2-1). This would result in three separate chute reaches. Inlet construction would require notching the existing stone revetments at the inlet locations. One rock grade control structure would be placed at five feet below construction reference plane (CRP). An existing dike structure would also be removed at the chute exit.

The constructed base width of the two chute entrance reaches would be a minimum of 70 feet. The constructed base width of the chute exit reach, downstream of the entrance reach junction, would be a minimum of 85 feet. Spoil material less than 3 inches in diameter from the chute excavation would be discharged into the Missouri River channel. Spoil area would be provided landward for material greater than 3 inches in diameter. Excavation of the chute would result in immediate aquatic habitat however the “as-built” chute would not represent the final habitat condition. The chute would be designed to erode to a channel design width of approximately 200 feet over time. Therefore, aquatic habitat created by the project would increase over time.

The areas of Barney Bend that would become islands after construction of the chute would be planted with warm season grasses prior to chute construction. The remainder of the site would either be planted to native terrestrial vegetation (warm season grasses or trees) or allowed to develop through natural succession.

Along with the methods used to create fish and wildlife habitat on Barney Bend, monitoring activities would be conducted to determine the quality of the restored aquatic and terrestrial habitat and would be used to adaptively manage Barney Bend. Although the Corps would not fund or construct recreation features, it would work with other agencies or organizations interested in developing recreational or public use facilities at their own expense. Barney Bend would be open to the public for a variety of uses including bird watching, hiking, fishing, boating, and hunting.

Figure 2-1. The Split-Entrance Alternative.



### **2.2.2 SINGLE-ENTRANCE ALTERNATIVE**

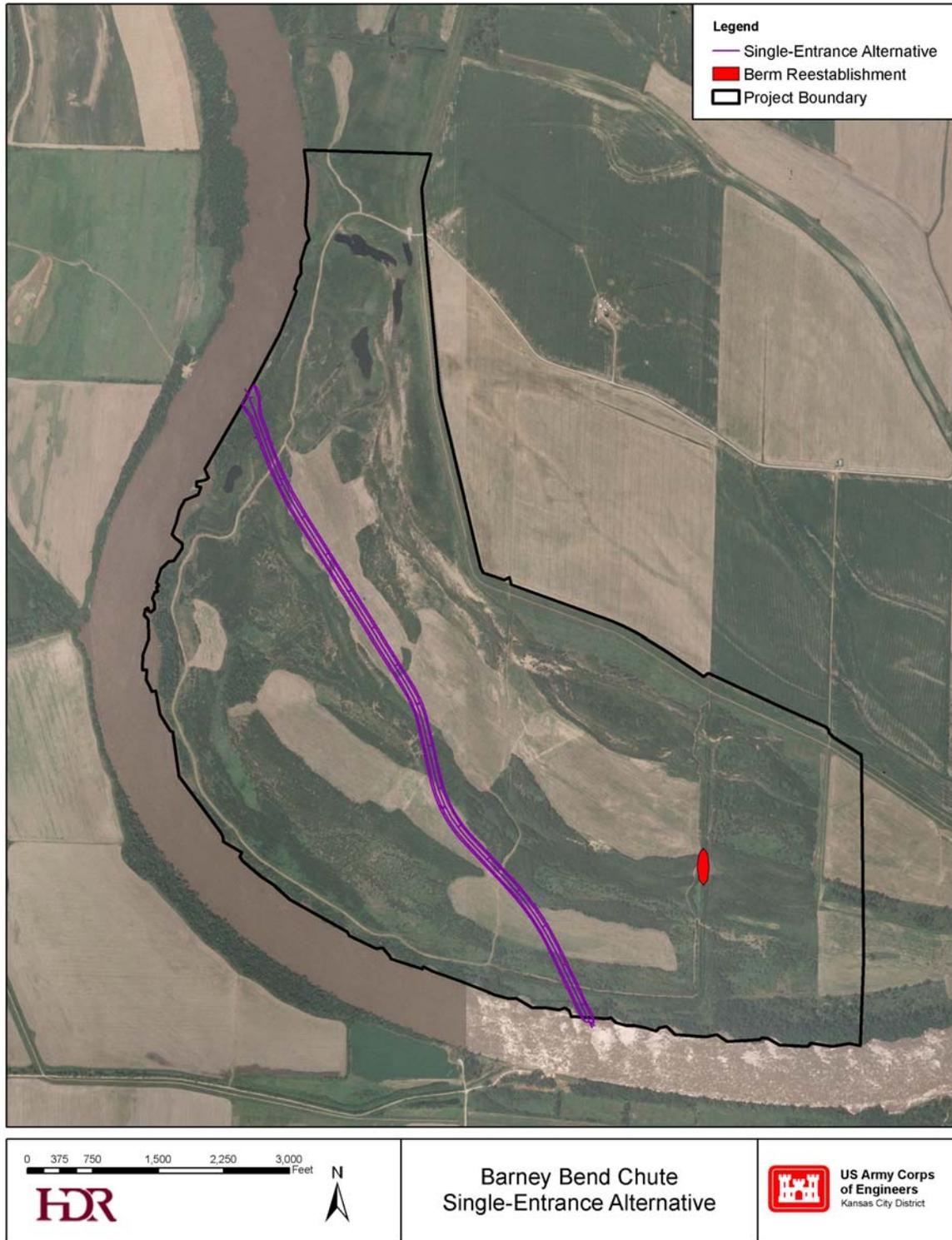
The Single-Entrance alternative would include the construction of a flow-through chute with one inlet at the upstream end of Barney Bend and a single outlet at the downstream end of Barney Bend (Figure 2-2). This would result in one main chute reach. Inlet construction would require notching the existing stone revetment at the inlet location. One rock grade control structure would be placed at five feet below CRP. No dike structures would be removed or modified at the chute exit.

The constructed base width of the chute reach would be a minimum of 85 feet. Spoil material less than 3 inches in diameter from the chute excavation would be discharged into the Missouri River channel. Spoil area would be provided landward for material greater than 3 inches in diameter. Excavation of the chute would result in immediate aquatic habitat however the “as-built” chute would not represent the final habitat condition. The chute would be designed to erode to a channel design width of approximately 200 feet over time. Therefore, aquatic habitat created by the project would increase over time.

The area of Barney Bend that would become an island after construction of the chute would be planted with warm season grasses prior to chute construction. The remainder of the site would either be planted to native terrestrial vegetation (warm season grasses or trees) or allowed to develop through natural succession.

Along with the methods used to create fish and wildlife habitat on Barney Bend, monitoring activities would be conducted to determine the quality of the restored aquatic and terrestrial habitat and would be used to adaptively manage Barney Bend. Although the Corps would not fund or construct recreation features, it would work with other agencies or organizations interested in developing recreational or public use facilities at their own expense. Barney Bend would be open to the public for a variety of uses including bird watching, hiking, fishing, boating, and hunting.

Figure 2-2. The Single-Entrance Alternative.



### 2.2.3 NO DEVELOPMENT ALTERNATIVE

The No Development alternative represents the alternative of no action by the Corps.<sup>1</sup> No additional activities to develop fish and wildlife habitat would be undertaken as part of the No Development alternative; however, terrestrial habitats would undergo natural succession over many years. This alternative could also be considered the natural succession alternative because the habitat that would develop at Barney Bend, over the long-term, would be solely dependent on the processes of natural succession acting on the area.

There would be no increase in shallow water habitat with this alternative. This alternative would not reconnect the river to the floodplain. Agricultural leasing would not continue in this alternative. Agricultural leasing is typically used to maintain open areas until habitat improvements can be made to prevent undesirable woody species succession and to provide some cropland for food plots and to minimize off-site crop foraging and damage from wildlife. Although the Corps would not fund or construct recreation features, it would work with other agencies or organizations interested in developing recreational or public use facilities at their own expense. Barney Bend would be open to the public for a variety of uses including bird watching, hiking, fishing, and hunting.

## 2.3 EVALUATION OF ALTERNATIVES

The Barney Bend alternatives were developed in consideration of several project constraints. The project constraints were that the proposed project design should not adversely affect existing flood control provided by L-575, commercial navigation, existing infrastructure, or private property. These constraints are discussed further in the Engineering Report (Appendix B) and were included in the evaluation and determination of a recommended alternative.

Local private landowners and local levee district representatives participated in a site visit conducted on August 1, 2006. During the site visit, local landowners expressed

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<sup>1</sup> It should be noted that environmental review as required for NEPA and Council on Environmental Quality and Corps regulations for the acquisition of the land was the subject of the SEIS and ROD completed in 2003 (Corps 2003a).

concern that chute construction could direct flows into low-lying swales that eventually run onto adjacent private property. Landowners were supportive of a chute design that would not increase the frequency and magnitude of flow onto local property. Landowners also expressed concern regarding any impacts to an existing levee “plug” from chute construction. A non-federal agricultural levee begins near RM 550 and continues south, generally following the left bank of the Missouri River to approximately RM 547. Although the agricultural levee is generally five feet high, in the vicinity of RM 550 the levee is considerably higher, and in some locations actually higher, than L-575. According to discussions with local landowners and levee district representatives, this higher segment of agricultural levee (referred to as a levee “plug”) was constructed following the 1993 flood event, which had formed several deep scour holes riverward of L-575, to minimize the impacts of Missouri River flood flows on L-575. The landowner concerns identified during the site visit were taken into consideration during the evaluation of chute alternatives and determination of a recommended (preferred) alternative.

All three alternatives would fulfill the overall program goal of providing fish and wildlife habitat; however each alternative would provide varying degrees of habitat and diversity. Both the Split-Entrance and Single-Entrance alternatives would provide important aquatic habitat through construction of a flow-through chute. Construction of a chute would require some existing terrestrial habitat be converted to aquatic habitat. All three alternatives would result in benefits to terrestrial habitat at Barney Bend. These benefits would occur over a longer timeframe with the No Development alternative because no plantings would be performed. The No Development alternative would not achieve the stated goal of constructing a flow-through chute at Barney Bend and therefore would also not maximize aquatic habitat development at the site. The No Development alternative would not provide any additional aquatic habitat than what may be created naturally over time. These benefits would be minimal.

Table 2-1 provides a comparison of environmental consequences for the three alternatives evaluated in this PIR. Both build alternatives would result in similar environmental consequences. Environmental consequences of the No Development

**Table 2-1. Comparison of Environmental Consequences of Alternatives Evaluated**

Resource	Preferred Alternative (Single-Entrance Alternative)	Split-Entrance Alternative	No Development Alternative
<b>Geological Resources</b>			
Topography	<b>Beneficial impacts</b> through restoration of historic floodplain features and dynamic changes in surface topography.	<b>Beneficial impacts</b> through restoration of historic floodplain features and dynamic changes in surface topography.	<b>No impacts</b>
Geology	<b>No impacts</b>	<b>No impacts</b>	<b>No impacts</b>
Soils	<b>Insignificant adverse impacts</b> resulting from the loss of soils for chute excavation.	<b>Insignificant adverse impacts</b> resulting from the loss of soils for chute excavation.	<b>No impacts</b>
<b>Prime and Unique Farmland</b>	<b>No impacts</b> to prime farmland. <b>Insignificant adverse impacts</b> resulting from the loss of soils classified as farmland of statewide importance.	<b>No impacts</b> to prime farmland. <b>Insignificant adverse impacts</b> resulting from the loss of soils classified as farmland of statewide importance.	<b>No impacts</b>
<b>Biological Resources</b>			
Aquatic Resources	<b>Short-term insignificant adverse impacts</b> resulting from disturbance during inlet/outlet construction and increases in turbidity impacting water temperatures and dissolved oxygen content. <b>Minor short-term beneficial impacts</b> resulting from increased sediment load simulating historic conditions and increased temporary habitat enhancements. <b>Long-term beneficial impacts</b> resulting from construction of a flow-through chute.	<b>Short-term insignificant adverse impacts</b> resulting from disturbance during inlet/outlet construction and increases in turbidity impacting water temperatures and dissolved oxygen content. <b>Minor short-term beneficial impacts</b> resulting from increased sediment load simulating historic conditions and increased temporary habitat enhancements. <b>Long-term beneficial impacts</b> resulting from construction of a flow-through chute.	<b>No impacts.</b> No benefits to aquatic resources would be realized.
Terrestrial/Wetland Resources	<b>Insignificant adverse impacts</b> resulting from disturbance during construction and conversion to aquatic habitat. <b>Long-term beneficial impacts</b> resulting from a net increase in quality terrestrial and wetland habitat.	<b>Insignificant adverse impacts</b> resulting from disturbance during construction and conversion to aquatic habitat. <b>Long-term beneficial impacts</b> resulting from a net increase in quality terrestrial and wetland habitat.	<b>Long-term beneficial impacts</b> resulting from natural succession of terrestrial habitat.
Wildlife	<b>Short-term insignificant impacts</b> resulting from disturbance during construction. <b>Long-term beneficial impacts</b> through the creation of wildlife habitat.	<b>Short-term insignificant impacts</b> resulting from disturbance during construction. <b>Long-term beneficial impacts</b> resulting from the development of wildlife habitat.	<b>Long-term beneficial impacts</b> resulting from the development of wildlife habitat through natural succession.

Resource	Preferred Alternative (Single-Entrance Alternative)	Split-Entrance Alternative	No Development Alternative
Threatened and Endangered Species	<b>Short-term insignificant adverse impacts</b> resulting from disturbance to species during construction. <b>Long-term beneficial impacts</b> resulting from the creation of important aquatic and terrestrial habitat.	<b>Short-term insignificant adverse impacts</b> resulting from disturbance to species during construction. <b>Long-term beneficial impacts</b> resulting from the creation of important aquatic and terrestrial habitat.	No benefits to aquatic species would be realized. <b>Long-term beneficial impacts</b> resulting from the increase of terrestrial habitat through natural succession.
<b>Land Cover</b>	<b>No impacts</b>	<b>No impacts</b>	<b>No impacts</b>
<b>Cultural Resources</b>			
Historic Properties and Archaeological Sites	<b>No impact</b> to historic properties. <b>No archaeological site impacts</b> on accreted lands; <b>Phase I survey on non-accreted lands</b> prior to construction. Measures would be taken to avoid or minimize any impacts.	<b>No impact</b> to historic properties. <b>No archaeological site impacts</b> on accreted lands; <b>Phase I survey on non-accreted lands</b> prior to construction. Measures would be taken to avoid or minimize any impacts.	<b>No impact</b>
Steamboat Wrecks	<b>No impact</b>	<b>No impact</b>	<b>No impact</b>
<b>Water Quality</b>	<b>Short-term insignificant adverse impacts</b> resulting from increased sediment load. <b>Long-term beneficial impacts</b> resulting from decrease in agricultural runoff.	<b>Short-term insignificant adverse impacts</b> resulting from increased sediment load. <b>Long-term beneficial impacts</b> resulting from decrease in agricultural runoff.	<b>Long-term beneficial impacts</b> resulting from decrease in agricultural runoff.
<b>Air Quality</b>	<b>Short-term insignificant adverse impacts</b> resulting from increased emissions (fugitive dust) during construction. <b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.	<b>Short-term insignificant adverse impacts</b> resulting from increased emissions (fugitive dust) during construction. <b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.	<b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.
<b>Noise</b>	<b>Short-term insignificant adverse impacts</b> resulting from increased noise during construction. <b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.	<b>Short-term insignificant adverse impacts</b> resulting from increased noise during construction. <b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.	<b>Long-term beneficial impacts</b> resulting from decreased agricultural practices.
<b>Socioeconomic Resources</b>			
Population and Income	<b>Minor beneficial impacts</b> to local economy during and after construction through increased spending.	<b>Minor beneficial impacts</b> to local economy during and after construction through increased spending.	<b>Minor beneficial impacts</b> to local economy through increased recreational spending.

Resource	Preferred Alternative (Single-Entrance Alternative)	Split-Entrance Alternative	No Development Alternative
Recreation and Aesthetics	<b>Short-term insignificant adverse impacts</b> resulting from the inaccessibility of the site during construction. <b>Long-term beneficial impacts</b> resulting from increased recreational activities, habitat, and greater diversity of features.	<b>Short-term insignificant adverse impacts</b> resulting from the inaccessibility of the site from during construction. <b>Long-term beneficial impacts</b> resulting from increased recreational activities, habitat, and greater diversity of features.	<b>Long-term beneficial impacts</b> resulting from increased in habitat available for recreation.
Navigation	<b>No impact</b>	<b>No impact</b>	<b>No impact</b>

alternative would differ due to the lack of land-disturbing activities associated with chute construction. None of the alternatives would impact geology of the site or existing flood control provided by L-575. The Split-Entrance and Single-Entrance alternatives would both result in a loss of soils due to chute excavation; this loss would be greater with the Split-Entrance alternative. There would be an insignificant loss of farmland of statewide importance resulting from the build alternatives; however none of the alternatives would impact prime farmland. All alternatives would have long-term beneficial impacts to biological resources. There would be significant beneficial impacts to aquatic resources under the build alternatives from construction of a flow-through chute. The No Development alternative would not result in any increase in aquatic habitat other than what may occur naturally and would therefore have limited benefits to aquatic resources. All alternatives would result in a net increase in quality terrestrial habitat that would provide long-term benefits. Wildlife and threatened and endangered species would experience long-term beneficial impacts resulting from increased habitat. Temporary disturbance to wildlife would occur from construction activity and loss of existing habitat. No impacts to cultural resources are anticipated from any alternative. Short-term impacts to air, noise, and water quality would occur with the build alternatives; however long-term impacts to these resources would be beneficial. All three alternatives would result in beneficial impacts to recreational opportunities on Barney Bend. These beneficial impacts would vary by alternative mainly due to the amount and diversity of quality habitats created and the period of time required for the habitats to develop. It is anticipated that there would be an increase in outdoor activities over time. The construction of a chute under the build alternatives would introduce additional boating and fishing opportunities at the site. Under the No Development alternative, recreational uses would be dependent on natural succession and thus would be realized at a slower rate. None of the alternatives would affect navigation on the Missouri River.

The Single-Entrance alternative was selected as the recommended alternative for implementation of the Mitigation Program at Barney Bend. This alternative was recommended because it fulfills all of the program and site-specific goals for Barney Bend while taking into consideration the concerns of adjacent landowners regarding the project. The Single-Entrance alternative would result in no significant adverse impacts to the environment. Section 2.4 contains a detailed description of the recommended alternative.

## 2.4 DESCRIPTION OF RECOMMENDED ALTERNATIVE

The Single-Entrance alternative is the recommended alternative for implementation at Barney Bend. The following features would be part of the recommended alternative.

- Barney Bend has good access from multiple locations. Signage for Barney Bend and parking for public use opportunities may be implemented to increase public awareness of Barney Bend's location and access points.
- The Corps would seek to obtain permanent easement or fee title on any lands that are adjacent to Lower Hamburg and Barney Bend that may enhance the site for fish and wildlife. If any of the landowners were to become a willing seller in the future, the Corps would pursue acquisition of these properties.
- The area of Barney Bend that would become an island following chute construction (Figure 2-2) would be planted with warm season grasses prior to construction of the chute.
- A flow-through chute would be constructed following the chute alignment shown in Figure 2-2. The constructed base width of the chute would be a minimum of 85 feet with a design width of 200 feet. Dredging would be the preferred construction method. As previously described, material less than 3 inches diameter would be spoiled into the Missouri River to create temporary habitat enhancements. Material greater than 3 inches diameter would be disposed of in identified landward spoil areas. Additional engineering details of the chute are included in the Engineering Report (Appendix B). The recommended alternative is represented by Scenario 4 in the Engineering Report.
- Disturbed areas would be re-vegetated with native plant species, as necessary.

- The remaining area of Barney Bend would be allowed to develop into native terrestrial habitats. Tree or grass plantings may also occur in these areas or they may be allowed to develop through natural succession. Additional plantings in these areas would be at the recommendation of MDC and approval of the Corps through the Annual Management Plan process.
- An existing berm near the downstream end of Barney Bend would be reestablished using spoil material from chute excavation to help ensure there would be no increase in flood frequency or magnitude on adjacent property owners. This would also provide opportunities for opportunistic wetland areas and other habitat development.
- Agricultural leasing on Barney Bend would be eliminated and existing agricultural land would be converted to native terrestrial habitats. Limited agricultural plantings for use as wildlife food plots may continue.
- Long-term maintenance of existing and newly created habitats would be performed.
- Monitoring of the habitat improvements would be conducted by MDC and the Corps. Monitoring and evaluation of Barney Bend is discussed further in Section 5.2, Monitoring and Evaluation (M&E) Plan.
- Adaptive management of Barney Bend would be performed as necessary. For purposes of this PIR and the management of Barney Bend, adaptive management would be defined as the adaptation of techniques to better meet the desired results for the site. Adaptive management would be used to help achieve the desired conditions identified for Barney Bend, not to change the goals identified for the site.
- The Corps would not fund or construct recreation features, but, they would work with any agency or organization interested in developing recreational or public use facilities at their own expense as the site would be open to the public for a variety of uses including bird watching, hiking, fishing, and hunting. The Corps would repair/replace any existing recreation features or access in-kind if any were damaged or destroyed during construction of project habitat features.

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# Chapter 3

## Affected Environment

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### 3.1 INTRODUCTION

This chapter presents the affected environment for Barney Bend. The affected environment is the baseline against which potential beneficial and adverse impacts caused by the action are evaluated. The existing conditions described in this chapter for Barney Bend are based on the current state of the site and not as the site was at the time of purchase by the Corps (1995-1998). Various sources of information were used to compile the affected environment presented in this chapter including field investigations, geographic information systems (GIS) data, literature searches, review of maps and aerial photography, and previous reports.

### 3.2 HISTORY OF THE PROJECT AREA

Prior to construction of the BSNP, the lower Missouri River was uncontrolled and it meandered across the floodplain creating a highly dynamic environment through the physical processes of erosion, deposition, and accretion. The historical lower Missouri River consisted of numerous islands, channels, sandbars, and slack water supporting vegetation in various stages of succession. Historically, Barney Bend would have consisted of an area where the meander of the Missouri River across the floodplain would have resulted in a dynamic area where the proportions of habitat types would have been constantly changing due to the physical processes mentioned previously.

Following construction of the BSNP, accreted lands in the area of Barney Bend were created, claimed and converted to cropland. At the time of purchase by the Corps, Barney Bend was primarily cropland with some trees. The lands were purchased from

**Table 3-1. History of Management Activities at Barney Bend.**

Year	Management Activities
Fall 1999	Planted RPMs and seedlings
Fall 2001	Warm season grass plantings
Spring 2003	Warm season grass plantings
2005	Warm season grass plantings

willing sellers during a period from 1995 to 1998. MDC has managed the site since 1999. Table 3-1 summarizes management activities that have been performed to date at Barney Bend.

### 3.3 GEOLOGICAL RESOURCES

Geological resources include the physical surface and subsurface features of Barney Bend such as topography, geology, and soils.

#### 3.3.1 TOPOGRAPHY

Generally, the topography of Barney Bend is level, a characteristic of a floodplain, with only minor relief due to erosion and deposition from flooding. Drainage for Barney Bend is controlled by ditches and Federal levee L-575. The land area between RM 546.5 to 550 generally ranges from 895 feet above mean sea level (AMSL) to 910 feet AMSL. Topography along the levee system within the project area ranges from 910 feet to 922 feet AMSL.

#### 3.3.2 GEOLOGY

Barney Bend lies within the Dissected Till Plains (Missouri River Alluvial Plains subsection) of the Central Lowlands physiographic province [U.S. Geological Survey (USGS) 2003]. Barney Bend is situated within a complex system of alluvial deposition and erosion from the changing course of the Missouri River through geologic time; however, construction of the BSNP caused significant amounts of human induced alluvial deposition and erosion to occur in a relatively short time period (less than 100 years). The site is located within the lower reaches (below the mouth of the Platte River in Nebraska) of the Missouri River Valley where the valley generally ranges from five to seven miles wide (Dahl 1961). The Missouri River flows across Pennsylvanian strata in

the general area of the site. Pennsylvanian strata are comprised of sandstone, shale, limestone, clay and coal deposits (Schaper 2004).

Overlying the bedrock in the general area of Barney Bend are typically alluvial clays; sand and gravels, with a few poorly consolidated sandstones; glacial (ice deposited) tillites and gravels; and eolian (wind blown) clays and loess of the Tertiary/Quaternary Period (Shaper 2004).

The floodplain deposits in the river valley bottom consist of geologically recent unconsolidated alluvium. In general, the alluvium can consist of upper zones of fine-grained clays and silts and deeper zones of coarser grained sands. Past river meanders have left a system of remnant channels, many of which have been filled in with river sediments and by man. An accreted lands analysis showed that approximately 47.1 percent of Barney Bend consists of both natural and human-induced land accretion. The complete analysis is included in the Cultural Resources Report in Appendix C.

### **3.3.3 SOILS**

Soils of Barney Bend are in the Onawa-Paxico-Haynie association. These soils make up approximately 7 percent of the soils in Atchison County, Missouri [U.S. Department of Agriculture (USDA) 1994]. The Haynie and Sarpy soil series are located on Barney Bend. The Haynie series consists of very deep, nearly level, moderately well drained soils on high and low floodplains along the Missouri River. Permeability is moderate in the upper part of the profile and rapid in the lower part. The Sarpy series consists of very deep, excessively drained soils on high, convex natural levees on low floodplains along the Missouri River. Permeability is rapid in the Sarpy soil. Surface runoff is slow and available water capacity is low (USDA 1994). The soil mapping units as shown in the Soil Survey of Atchison County, Missouri (USDA 1994) on Barney Bend are the Haynie silt loam, sandy substratum, frequently flooded and Sarpy loamy fine sand, frequently flooded. Both of these soil units are classified as hydric soils by the USDA (2005).

## **3.4 PRIME AND UNIQUE FARMLAND**

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, oilseed crops, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and

without intolerable soil erosion [7 U.S.C. 4201 (c)(1)(A)]. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding (USDA 1993). The Farmland Protection Policy Act (PL 97-98; 7 U.S.C. 4201 et seq.) was passed by Congress with the stated purpose of minimizing the unnecessary and irreversible conversion of farmland to nonagricultural uses by Federal programs.

There are no prime farmlands on Barney Bend. The Haynie silt loam, sandy substratum, frequently flooded soil unit is classified as prime farmland if protected from flooding or not frequently flooded during the growing season. The Barney Bend soils are not protected from flooding as they are located riverward of the L-575; therefore they would not be classified as prime farmlands in this instance. The Sarpy loamy fine sand, frequently flooded soil unit is classified as a farmland of statewide importance (USDA/NRCS 2004).

### **3.5 BIOLOGICAL RESOURCES**

Biological resources include the native or introduced plants and animals and their habitats. This section discusses aquatic resources including fisheries; terrestrial/wetland resources including vegetation communities, wildlife populations; and species that are candidates for, or listed as, threatened or endangered.

#### **3.5.1 AQUATIC RESOURCES**

Aquatic resources include aquatic habitat, fisheries, and other aquatic biota of Barney Bend. Aquatic habitat associated with Barney Bend is limited to the Missouri River and several scour holes created by the 1993 flood. The Missouri River borders the site on the south and west.

Typically, fish spawning areas associated with the Missouri River are located along the shoreline, in backwaters, and behind channel control structures. Suitable nursery areas in the Missouri River are limited due to high velocity, turbulent flows, and silt and sand loads (Corps 1994). Construction of dikes and revetments have narrowed and deepened the channel into a fixed location, which has greatly eliminated shallow water habitat and increased water depth and current velocity (National Research Council

2002). Existing shallow water habitat<sup>2</sup> was estimated for Barney Bend (Appendix D). Shallow water habitat available ranged from 9.4 – 17.4 acres (five feet above and below the elevation associated with the median August discharge). The shallow water habitat analysis is included in Appendix D. In the channelized reaches of the river, fish are associated with revetments and dikes (Corps 2001).

Principal fish species in the lower Missouri River include emerald shiner (*Notropis atherinoides*), river carpsucker (*Carpionodes carpio*), channel catfish (*Ictalurus punctatus*), gizzard shad (*Dorosoma cepedianum*), red shiner (*Notropis lutrensis*), shorthead redhorse (*Moxostoma macrolepidotum*), carp (*Cyprinus carpio*), and goldeye (*Hiodon alosoides*). Pallid (*Scaphirhynchus albus*) and shovelnose sturgeon (*Scaphyrhynchus platyrhynchus* and paddlefish (*Polyodon spathula*) are also found in the lower Missouri River (Corps 2001).

Sport fish include channel catfish, crappie (*Pomoxis* spp.), sauger (*Stizostedion canadense*), flathead catfish (*Pylodictus olivaris*), white bass (*Morone chrysops*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), walleye (*Stizostedion vitreum*), northern pike (*Esox lucius*), and paddlefish (Corps 1995). Species important to the commercial fishery on the lower Missouri River include buffalo (*Ictiobus* spp.), carp, carpsucker, and freshwater drum (*Aplodinotus grunniens*) (Corps 1995).

The two most common plankton in the lower Missouri River were *Fragilaria* and *Pediastrum*, comprising 23 and 26 percent of the total plankton. Nematodes made up about 16 percent of total plankton. Common zooplankton included rotifers and nauplii (Berner 1951). Within the Missouri River, the areas most productive of a true benthos were near the steep banks which averaged 2.17 pounds per acre. Areas downstream of pile dikes supported about 1.27 pounds per acre (Berner 1951). The most common organisms in the benthos included Diptera larvae and Chironomidae larvae (Berner 1951).

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<sup>2</sup> Shallow water habitat is considered by the USFWS for pallid sturgeon recovery as shallow open water areas (e.g. submerged sandbars, main channel/side channel convergence areas, island tips, etc.) connected to the Missouri River channel that are less than five feet deep and have a variable velocity of flow.

### 3.5.2 TERRESTRIAL/WETLAND RESOURCES

At the time of purchase, Barney Bend consisted predominantly of agricultural land. Since that time, Barney Bend has remained largely undeveloped and has experienced agricultural leasing and natural succession of terrestrial habitat. Figure 3-1 shows the existing land cover and habitat types at Barney Bend. Table 3-2 includes the acres of existing habitat types.

**Table 3-2. Land Cover at Barney Bend**

<b>Baseline Habitat Type</b>	<b>Code</b>	<b>Acres</b>
Scour/Blow Holes	L1	6.7
Scrub-shrub Wetlands	PSS	8.7
Barren	30	7.7
Forest	40	519.9
Shrubland	50	36.2
Grassland	70	172.7
Cultivated, Levees	80	224.6
<b>Total</b>		<b>976.5</b>

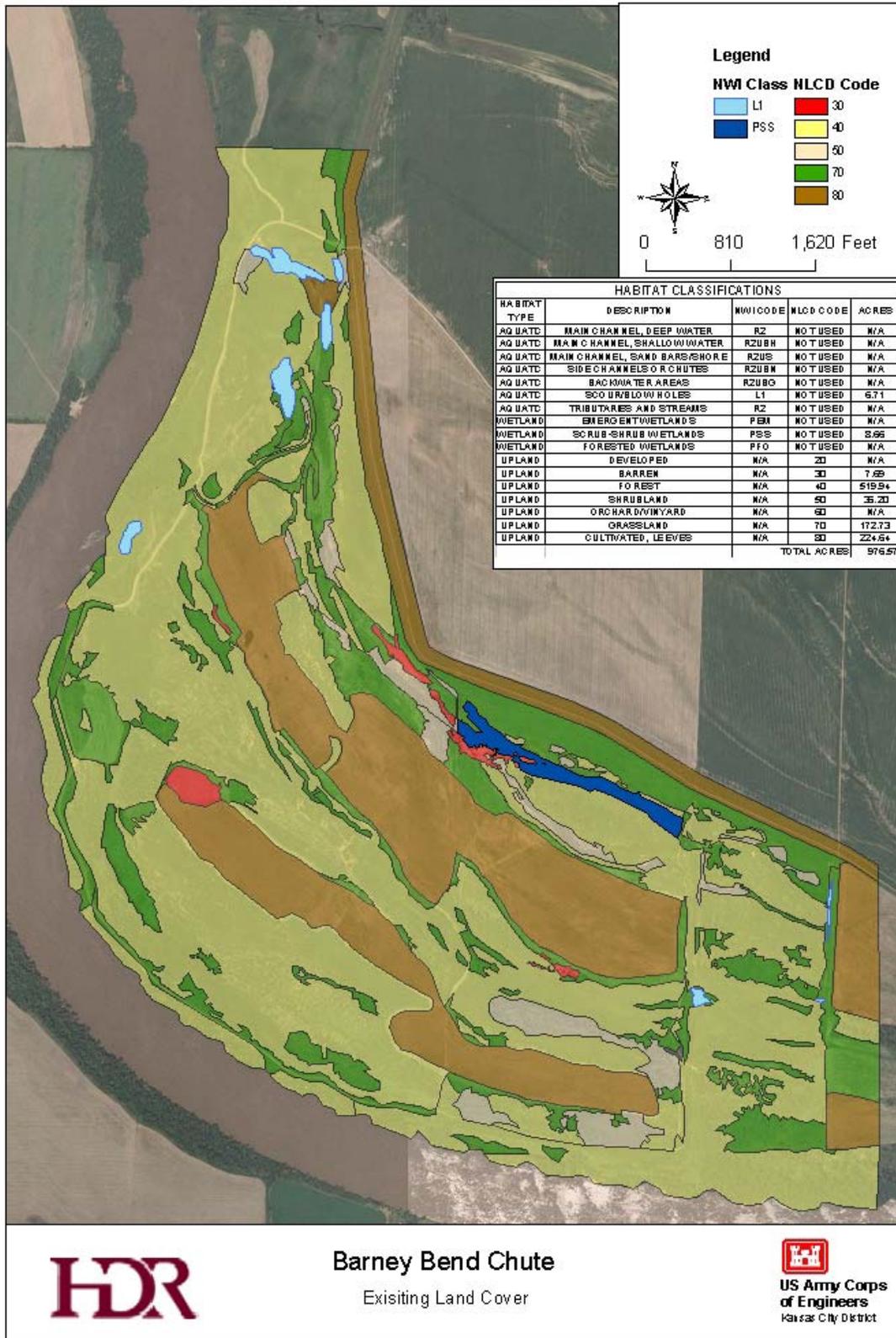
### 3.5.3 WILDLIFE

Barney Bend provides habitat for numerous wildlife species. Common mammalian species likely to occur in remnant bottomland forest and agricultural fields within the site include; gray squirrel (*Sciurus carolinensis*), cottontail rabbit (*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*) and white-tailed deer (*Odocoileus virginianus*).

Common furbearers likely to occur along the Missouri River's bank within the site include; mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), otter (*Lontra canadensis*), and raccoon (*Procyon lotor*). Other furbearers expected to occur within the site include; opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and long-tailed weasel (*Mustela frenata*).

Upland game birds expected to occur within the site include ring-necked pheasant (*Phasianus colchicus*), bobwhite quail (*Colinus virginianus*), and wild turkey (*Meleagris gallopavo*). Songbirds likely to occur within the site include mourning dove (*Zenaidura macroura*), American robin (*Turdus migratorius*), eastern kingbird (*Tyrannus tyrannus*), American goldfinch (*Carduelis tristis*), red-winged blackbird (*Agelaius phoeniceus*),

Figure 3-1. Existing Land Cover at Barney Bend.



eastern bluebird (*Sialia sialis*), northern cardinal (*Cardinalis cardinalis*), northern oriole – Baltimore race – (*Icterus galbula*), and brown thrasher (*Toxostoma rufum*), among others.

The Missouri River Valley is an important nesting and feeding area along the Central Flyway for many migratory waterfowl species including wood duck (*Aix sponsa*), blue-winged teal (*Anas discors*), green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), Canada goose (*Branta Canadensis*), and snow goose (*Chen caerulescens*), among others.

#### 3.5.4 THREATENED AND ENDANGERED SPECIES

USFWS and MDC were contacted to request information regarding Federal and state listed threatened, endangered, candidate species, or species of special concern that have potential to occur at Barney Bend. Comment letters from MDC and USFWS are included in Appendix A. Table 3-3 includes the listed species identified by USFWS and MDC.

American bitterns are uncommon migrants that rest and forage in marshes, wet meadows, and marshy shorelines of lakes and ponds (Jacobs 2001). The species is an extremely rare and local breeder in Missouri marshes.

Bald eagles are common migrants and winter residents throughout Missouri and uncommon breeders along some of the major rivers and larger reservoirs in the state. During winter, they congregate near rivers and reservoirs with open water and often near

**Table 3-3. Federal and state listed species with potential to occur within Atchison County and Barney Bend.**

Common Name	Scientific Name	Status
American Bittern	<i>Botaurus lentiginosus</i>	State Endangered
Bald eagle	<i>Haliaeetus leucocephalus</i>	Federally Threatened
Flathead Chub	<i>Platygobio gracilis</i>	State Endangered
Indiana bat	<i>Myotis sodalist</i>	Federal Endangered
King rail	<i>Rallus elegans</i>	State Endangered
Northern leopard frog	<i>Rana pipiens</i>	S2 (State Imperiled)
Pallid sturgeon	<i>Scaphirhynchus albus</i>	Federally Endangered
Peregrine falcon	<i>Falco peregrinus</i>	State Endangered

large concentrations of waterfowl. Bald eagles are currently listed as threatened; however, the species was proposed for delisting in 1999. The decision for delisting has been delayed until the USFWS determines how the species would be managed if delisted. No bald eagle nests are known to exist on Barney Bend.

Flathead chub may be found in pools of small creeks with moderately clear water over gravel and bedrock bottom, or in large, turbid rivers with swift current and bottom of fine sand and gravel. It occurs in the Missouri and Mississippi rivers; however, populations have declined drastically since the 1960's (MDC 2006).

Indiana bats hibernate in caves in the Ozarks and Ozark Border Natural Divisions from late fall through winter. During the spring and summer, Indiana bats use living, injured, dead, or dying trees for roosting throughout Missouri (USFWS 2006).

King rails are rare migrants in Missouri and are usually observed foraging in marshes, swamps, and prairie sloughs (Jacobs 2001). They are rare and local summer residents most frequently reported in cattail marshes on the Mississippi and Missouri River floodplains.

Northern leopard frogs inhabit marshes, sloughs, streams, ponds, ditches, and waterholes adjacent to grassy areas. There is a record of the species approximately one mile northeast of the start of the flow-through chute (MDC 2006).

The pallid sturgeon is found primarily in the Missouri River and the Mississippi River downstream of its confluence with the Missouri River. Limited data is available concerning preferred habitats in the Missouri River, but adults of the species have been captured across many river habitats including tributary mouths, sandbars, along main channel borders, deep holes (winter) and along revetments. Small sturgeon have been captured in areas with shoals, island tips, and secondary channels (USFWS 2006).

Peregrine falcons are currently considered extirpated from Missouri; however restoration projects have been initiated in St. Louis and Kansas City. Historically, peregrine falcons nested on bluffs along the Mississippi, Missouri, and Gasconade rivers (MDC 2006).

### **3.6 LAND COVER**

Land cover at Barney Bend was primarily cropland at the time of purchase by the Corps. In 2002, approximately 276,612 acres of land cover in Atchison County was cropland (USDA-NASS 2002); whereas in 1997 approximately 255,799 acres of land cover in

Atchison County was cropland (Corps 2003a). This represents an increase of 20,813 acres of cropland in Atchison County over a five-year period. A majority of the land use adjacent to and around Barney Bend is agricultural land and cropland aside from the area of Lower Hamburg. Figure 3-1 and Table 3-2 summarize existing land cover at Barney Bend.

### 3.7 CULTURAL RESOURCES

Cultural resources include sites, structures, buildings, objects, landscapes, districts, and events, etc. that would have, archaeological, historical, cultural, Native American, or scientific value to a culture or community. A records search was conducted for Barney Bend. The results of the records search are included in Appendix C.

#### 3.7.1 HISTORIC PROPERTIES AND ARCHAEOLOGICAL SITES

There are no properties in the immediate vicinity of Barney Bend listed or eligible for listing on the National Register of Historic Places (NRHP). The Archeological Survey of Missouri (ASM), Missouri State Historic Preservation Office (SHPO), and the Nebraska State Historical Society (NSHS) were consulted for recorded sites.

#### 3.7.2 STEAMBOAT WRECKS

A review of information regarding steamboat wrecks along this area of the Missouri River indicated that no steamboat wrecks are in the vicinity of the Area of Potential Effect (APE). The remains of the *Bishop, Kansas*, and *Ontario* steamboats are documented to be located well east of the APE.

#### 3.7.3 ACCRETED LANDS

A review of the 1803 – 1804 Lewis and Clark Missouri River map, the 1856 GLO plat of T7N R15E, 1879 and 1893 Missouri River channel maps [Missouri River Commission (MRC) 1891 – 1895], 1910 USDA soil survey map for Atchison County, Missouri, 1940 Corps topographic survey map of the Missouri River, 1940 Corps alluvial plain map, 1947 USGS topographic map of the Missouri River, 1968 Corps hydrographic survey map, 1974 Corps Missouri River channel map, and aerial photographs from 1993 and 2000 was performed to assess the extent of accretion occurring in the limits of the Barney Bend APE. River channel maps and the aerial photographs were digitized and overlaid onto the modern USGS 7.5' quadrangles to show areas in which erosion and

deposition has occurred due to natural or man-induced meandering by the Missouri River.

Between 1803 and 2000 a large amount of erosion and deposition of land occurred along Barney Bend. Approximately 47.1 percent (432.2 acres) of the APE has been accreted since 1803 whereas the remaining 52.9 percent (484.8 acres) of the APE may be non-accreted land prior to 1803 (Appendix C, Figure 18).

### 3.8 WATER QUALITY

The most recent water quality data available was collected by the Corps for the low flow studies for the update of the *Missouri River Master Water Control Manual*, July 1994 (Corps 1994). The point of data collection nearest to Barney Bend was at the mouth of the Nishnabotna River (approximate RM 542).

Temperature, pH, dissolved oxygen, and total suspended solids were measured twice over a two-week period in August and September 1990. Temperature ranged from 27.5 degrees Celcius (°C) to 25 °C; pH was 8.1 to 8.3; dissolved oxygen was 6.0 milligrams per liter (mg/l) to 7.4 mg/l; and total suspended solids were measured at 539 mg/l and 75 mg/l (Corps 1994). These results were fairly consistent with those from other collection points along the Missouri River; however, there was no explanation provided for the large differences in total suspended solids between the two sampling events at this particular location. These parameters have an effect on the fisheries in the Missouri River. High temperatures decrease the amount of dissolved oxygen. The temperature for the Missouri River in Missouri must not be above 32.2 °C and the dissolved oxygen concentration must not be below 5.0 mg/l based on Federally approved water quality standards (Corps 1994).

### 3.9 AIR QUALITY

Air quality in a given location is described by the concentrations of various pollutants in the atmosphere. The quality of the air is measured against National Ambient Air Quality Standards (NAAQS) set by the EPA. Barney Bend is located in an attainment area, which is an area wherein the concentrations of all criteria pollutants meet the NAAQS.

### 3.10 NOISE

Sounds that disrupt normal activities or otherwise diminish the quality of the environment are designated as noise. Noise can be stationary or transient and intermittent or continuous. Barney Bend is located in a rural setting. The predominant source of noise in the area is that generated from agricultural activities on adjacent lands, such as operation of farm equipment. Interstate 29 and a rail line are located approximately 4.5 miles east of Barney Bend. Hunting activities are a source of intermittent noise. Approximately 9 potential noise receptors are located within one mile of the site in the state of Missouri.

### 3.11 SOCIOECONOMIC RESOURCES

Socioeconomic resources are the part of the human environment that includes the economic, demographic, and social characteristics of individuals and communities.

#### 3.11.1 POPULATION AND INCOME

Barney Bend is located in Atchison County, Missouri. The 2000 estimated population for Atchison County was 6,430. Atchison County experienced a population decline of 13.8 percent from 1990 to 2000 (U.S. Census Bureau 2004).

In 2000, per capita personal income in Atchison County was \$24,225. This ranked 17<sup>th</sup> in the state of Missouri and was 88 percent of the state average (\$27,493) and 81 percent of the national average (\$29,760). In 1990 the per capita personal income for Atchison County was \$14,349 and ranked 32<sup>nd</sup> in the state. The 1990-2000 average annual growth rate of per capita personal income was 5.4 percent in the county. The average annual growth rate for the state was 4.4 percent and for the nation was 4.4 percent (BEA 2004). Farming ranked second in earnings by industry in Atchison County at less than 25 percent of the total (BEA 2000).

The closest community to Barney Bend is the town of Hamburg, Iowa located approximately five miles to the east. The 2000 estimated population of Hamburg, Iowa was 1,240 (U.S. Census Bureau 2006).

Minorities comprised 3.4 percent of the population of Atchison County in 2000 compared to 15.7 percent of the population of Missouri (U.S. Census Bureau 2004). Persons 65 years old and over comprised 21.1 percent of the Atchison County population compared to 13.5 percent of the state of Missouri population (U.S. Census Bureau 2004).

### **3.11.2 RECREATION AND AESTHETICS**

Barney Bend is part of the larger Lower Hamburg that is managed by MDC as a conservation area. MDC allows approved recreational activities for the public at the site including bird watching, hiking, nature study, boating, and hunting (when in season). In 2004, construction was completed on a side channel on the northern portion of Lower Hamburg, which provides new water-based recreational opportunities.

The visual aesthetics of Barney Bend are typical of many rural areas along the Missouri River. Agricultural lands, riparian woodlands, wetlands, and grasslands are typical of the area and surrounding landscape. The Missouri River and associated riverine areas are an important visual resource.

### **3.11.3 NAVIGATION**

Missouri River flows are managed in part, for commercial navigation on the Missouri River. Navigation on the Missouri River is limited to the normal ice-free season, with a full-length flow support season of 8 months (Corps 2001). At Sioux City, the full-length support season extends from March 23 to November 22 and at St. Louis the full-length support season extends from April 1 to December 1 (Corps 2001). In 1994, approximately 50 percent of the commercial tonnage moved on the Missouri River was in the Omaha to Kansas City reach. This reach was also the origin or destination for about 40 percent of Missouri River commercial tonnage (Corps 2001).

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# Chapter 4

## Environmental Consequences

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### 4.1 INTRODUCTION

This chapter presents the evaluation of beneficial and adverse impacts of the three alternatives including if there is the potential for significant impacts of the Federal action on the environment. The Federal action would be the implementation of the proposed Mitigation Program at Barney Bend as described in the Single-Entrance alternative. The analysis focused on identifying types of impacts and estimating their potential significance in various environmental and socioeconomic resource areas. The environmental impacts of the implementation and site selection process for the Mitigation Program were previously evaluated and documented in the *Feasibility Report and Environmental Impact Statement* (Corps 1981) and the *Supplemental Environmental Impact Statement* (Corps 2003a). Thus, this PIR only evaluated those impacts anticipated from the construction and operation of the three alternatives specific to Barney Bend.

The concept of “significance” used in this chapter encompasses several factors, including the magnitude of change from existing conditions and the likelihood of the change to occur. An impact is considered adverse when the outcome of the action results in undesirable effects. A beneficial impact can result if the current condition is improved or if an existing undesirable effect is lessened.

Adverse impacts can be mitigated by different means such as through avoidance or minimization of adverse effects. Beneficial and adverse impacts, including unavoidable adverse effects, are discussed in each resource section of this chapter.

## 4.2 GEOLOGICAL RESOURCES

Geological resources are limited, non-renewable resources whose characteristics can easily be degraded by physical disturbances. An adverse impact to geological resources would be significant if it depletes a regional or local resource, affects the rate of erosion, changes the characteristics of the soil, or becomes a less natural condition. Geological resources on Barney Bend would be affected from ground disturbances associated with river structure modifications and excavation of the flow-through chute.

### 4.2.1 TOPOGRAPHY

The topography of Barney Bend would be affected by construction of a flow-through chute under either build alternative. Due to the relatively level topography of the area, any impacts to topography would be considered insignificant.

The purpose of the Mitigation Program is to restore Barney Bend to a condition similar to that of the Missouri River floodplain prior to its channelization. Construction of a flow-through chute and allowing erosion of its bank by scour action would result in dynamic changes in surface topography which would be considered a beneficial impact. The resulting shallow water habitat would resemble a more natural topography at the site, similar to that which occurred prior to the BSNP. Therefore, the Single-Entrance and Split-Entrance alternatives would provide beneficial impacts to topography. The No Development alternative would have no affect on topography.

### 4.2.2 GEOLOGY

The build alternatives would include the construction of a flow-through chute on Barney Bend. All activities would only affect alluvial deposits and not underlying bedrock or exposed bedrock outcroppings at the margins of the floodplain. Therefore, none of the alternatives would affect geology.

None of the alternatives would affect L-575. The tow of L-575 is greater than 1,300 feet from the chute alignments.

### 4.2.3 SOILS

Excavating soils for construction of a flow-through chute could cause temporary increases in sediment loads and turbidity. Spoil material less than 3 inches in diameter from chute excavation would be discharged into the river channel in specified spoil areas. The spoil would be placed in-river in a manner to ensure sediments are immediately washed downstream. An estimated 355,100 cubic yards of material would be excavated and placed in-river as part of the Single-Entrance alternative. An estimated 421,900 cubic yards of material would be excavated and placed in-river as part of the Split-Entrance Alternative. The No Development alternative would not affect soils.

Control measures would be implemented to ensure that undesirable pollutants from construction activities would not be discharged in stormwater runoff. Disturbed areas that would not be subject to the scour action would be seeded and stabilized after construction with appropriate mixtures of native seed.

Although excavation would result in the loss of soils at Barney Bend as a result of the development alternatives, the long-term effect of these impacts would be beneficial by restoring and creating additional acres of fish and wildlife habitat through the construction of a flow-through chute. Additionally, the increased sediment load within the river would help simulate the river's historic conditions of continued erosion and deposition.

### 4.3 PRIME AND UNIQUE FARMLAND

None of the alternatives would affect prime farmland. However, the Sarpy loamy fine sand, frequently flooded soil unit is classified as a farmland of statewide importance. As a result of the Single-Entrance alternative, approximately 16.7 acres of this soil type would be lost due to chute excavation and 142.3 acres would be indirectly affected because of lack of access to the area following construction of the chute. As a result of the Split-Entrance alternative, approximately 31.8 acres of this soil type would be lost due to chute excavation and 156.4 acres would be indirectly affected because of lack of access to the area following construction of the chute. The No Development alternative would not affect any farmlands of statewide importance.

## 4.4 BIOLOGICAL RESOURCES

Biological resources include the native or introduced plants and animals and the habitats in which they occur. Aquatic resources include water bodies and fisheries. Terrestrial/wetland resources include vegetation communities and wildlife populations. Species that are candidates for, or listed as, threatened or endangered are included in both aquatic and terrestrial/wetland resources. Impacts to these resources could be from the construction and operation of Barney Bend. An adverse impact would be significant if the viability of a biological resource of the area was jeopardized, with little likelihood of reestablishment to its original state or the action would result in the taking<sup>3</sup> of a listed threatened or endangered species. The significance of the impact would also be dependent upon the importance of the resource and its relative occurrence in the vicinity of the site.

### 4.4.1 AQUATIC RESOURCES

No adverse effects to aquatic resources are expected from any alternative. The fisheries resource associated with the Missouri River at Barney Bend could temporarily be disturbed during construction of the inlet(s) and outlet for the build alternatives. Temporary increases in turbidity could affect water temperatures and dissolved oxygen content; however, any impact would be considered insignificant.

Discharges into the Missouri River are anticipated for the build alternatives. These in-river spoil areas result in temporary habitat enhancements due to an increase in sandbar type habitats important to many species. In addition, an increase in sediment load within the Missouri River would provide benefits such as helping to simulate historic conditions of the river and it would provide additional sediment for downstream deposition and improvement of shallow water habitat conditions. Increased turbidity lowers light transmission into the water, which could benefit species adapted to these conditions.

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<sup>3</sup> The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

The construction of a new side channel under either build alternative would result in an immediate significant beneficial increase in aquatic resources at Barney Bend, as well as significant beneficial long-term impacts as the chute scours to its ultimate design width. The intent of the build alternatives is to create and restore fish and wildlife habitat associated with the Missouri River. Long-term and cumulative beneficial impacts to aquatic habitat outweigh any temporary adverse impacts to the resources that could occur. Populations of fish species, including the endangered pallid sturgeon, that have been declining in numbers, would benefit from shallow water habitat development. Creation of shallow water habitat would provide a beneficial effect to the Missouri River fishery. The No Development alternative would not adversely affect aquatic resources.

#### 4.4.2 TERRESTRIAL/WETLAND RESOURCES

Both build alternatives would result in the conversion of existing terrestrial habitat to aquatic habitat due to construction of a chute. The Single-Entrance alternative would convert 10.1 acres of forest, 3.1 acres of grassland, and 10.4 acres of cultivated land (agricultural) to aquatic habitat. The Spilt-Entrance alternative would convert 19.6 acres of forest, 1.6 acres of shrubland, 7.0 acres of grassland, and 18.9 acres of cultivated land (agricultural) to aquatic habitat. Although there would be a loss of terrestrial habitat, the quality of the remaining terrestrial habitat at Barney Bend would be significantly improved due to native grass plantings and the removal of land from agricultural use. Therefore, under both build alternatives there would be a net increase in terrestrial habitat quality at Barney Bend. This would represent a long-term beneficial impact to terrestrial/wetland resources at Barney Bend.

The No Development alternative would have a beneficial long-term impact to terrestrial and wetland habitat. The removal of land from cultivation and native grass and tree plantings that have already occurred would be a beneficial effect. Because no further development activities would occur, terrestrial habitat and wetlands would develop over a much longer period of time, thus providing both short-term and long-term benefits to the terrestrial ecology of the floodplain.

### 4.4.3 WILDLIFE

Impacts to wildlife inhabiting Barney Bend would occur and are unavoidable. During construction, species would be temporarily displaced, but would likely return to the area after construction is completed. Species with limited mobility could be destroyed. Over the long-term, it is anticipated that wildlife would benefit from the creation of a chute and the associated terrestrial habitats. These benefits would outweigh any adverse impacts during construction.

An elementary principle of wildlife management states that the abundance of a species is positively correlated with the amount of quality habitat available. An increase in terrestrial habitat would provide food, cover, resting, breeding and nesting areas for wildlife. Bottomland forests would provide hollows for nests and dens, and trees for roosting. Additionally, mast-producing trees associated with bottomland forests, such as pin oak (*Quercus palustris*), sycamore (*Platanus occidentalis*) and pecan (*Carya illinoensis*) would provide a food source for wildlife. Likewise, an increase in shallow water habitat would have a positive effect on terrestrial wildlife as the anticipated increase in aquatic species through the development of shallow water habitat would provide a food source for many terrestrial species (Funk and Robinson 1974).

Many species of shorebirds and waterfowl would use the chute. Bird species typically expected to respond to the proposed chute development include great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), Canada goose, wood duck, green and blue-winged teal, mallard, pintail, bald eagle, various sandpipers (Family Scolopacidae), killdeer (*Charadrius vociferous*), bank swallow (*Riparia riparia*), and red-winged blackbird. The conversion of cropland acres to terrestrial habitats via natural succession or plantings would benefit many species of grassland and field nesting birds such as the ring-necked pheasant, eastern (*Sturnella magna*) and western meadowlark (*Sturnella neglecta*), dickcissel (*Spiza americana*), and grasshopper sparrow (*Ammodramus savannarum*). Restoration of forested habitats would benefit many bird species, for example, the yellow (*Dendroica petechia*) and prothonotary warblers (*Protonotaria citrea*) are expected to respond positively as naturally regenerated and planted trees go through succession and mature to forested habitat. Wild turkey

numbers would be expected to increase as woodlands and forest mature and provide more areas for roosting and cover.

Common mammalian species such as the white-tailed deer depend on river margin bottomland forest for cover and foraging. Common furbearers such as the river otter are piscivorous<sup>4</sup> and depend on sloughs, chutes and oxbows. Beaver depend on sloughs and backwaters. Muskrat prefer marshes and quiet, shallow, weedy waters to the Missouri's deep, swift channel devoid of vegetation. Like the muskrat, mink are associated with marshes and quiet backwaters. Additionally, mink population density is positively correlated to the mileage of permanent stream in an area (Funk and Robinson 1974). Quiet backwater areas are desirable feeding areas for raccoon and bottomland forests would provide cover and den sites. Like the mink, a positive relationship exists between population density and the mileage of permanent stream in an area.

#### 4.4.4 THREATENED AND ENDANGERED SPECIES

The proposed project is located in a geographic area with potential habitat and potential presence of the threatened bald eagle, endangered pallid sturgeon, endangered Indiana bat, and several state listed species. An analysis of the impacts to the Federally-listed species is presented in the Biological Assessment found in Appendix E. The goal of the Mitigation Program, of which Barney Bend is a component, is to restore fish and wildlife habitat along the lower Missouri River. In addition, all project features are designed to enhance, create, or restore wetlands, terrestrial, and aquatic habitat at Barney Bend. These activities would result in long-term benefits to all Federally listed species identified. In addition, the state listed species could potentially benefit as well.

The bald eagle would benefit indirectly from construction of the proposed project because the increased aquatic habitat would provide another potential forage base for use while wintering along the Missouri River. Human activity (i.e. construction) in the vicinity of wintering eagles is likely to adversely affect eagles by causing disruptions of normal behavior and by displacing eagles to non-preferred, marginal habitat (Stalmaster and Newman 1978). Chute construction would likely not occur during the winter months,

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<sup>4</sup> The term "piscivorous" means to feed or subsist on fishes.

therefore any disturbance would be avoided, however, if disturbances were to occur they would be temporary in nature and would cease when construction has been completed.

The proposed project would result in long-term beneficial effects to the bald eagle from the restoration of bottomland forest that would provide additional roosting and nesting habitat for the eagle. A field survey would be conducted prior to construction activities to identify existing bald eagle roost/perch/nest sites. If these are discovered the Corps would coordinate with USFWS to establish buffer zones in construction area(s) to prevent adverse impacts to bald eagles.

USFWS indicated that bald eagles are known to prefer trees greater than 11 inches diameter at breast height (dbh) and within 100 to 600 feet of water for perching sites. Eagles also tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood and sycamore are often selected over other trees for perching and roosting (see correspondence in Appendix A). Measures would be taken to minimize the loss of trees matching this description.

Indiana bat roost trees tend to be greater than 9 inches dbh (optimally greater than 20 inches dbh) with loose or exfoliating bark. Most important are structural characteristics that provide adequate space for bats to roost. Preferred roost sites are located in forest openings, at the forest edge, or where the overstory canopy allows some sunlight exposure to the roost tree, which is usually within 0.6 mile of water. Indiana bats forage for flying insects in and around the tree canopy of floodplain, riparian, and upland forests. Both build alternatives would result in the loss of trees for chute excavation. Prior to tree clearance, the Corps would survey for trees suitable for use by Indiana bats. If potential Indiana bat roost trees are determined to be present, the Corps would coordinate with the USFWS to determine survey requirements and avoid adverse impacts to Indiana bats.

The proposed project at Barney Bend would create additional habitat for the pallid sturgeon, thus, the build alternatives are anticipated to result in beneficial effects to the pallid sturgeon. The No Development alternative would not provide additional habitat for the pallid sturgeon and would have no affect on the species.

## 4.5 LAND COVER

No significant adverse impacts to land cover are expected from construction and operation of Barney Bend. Some of the existing cropland would be converted to fish and wildlife habitat; this is not considered a significant impact in relation to the amount of agricultural land currently in the vicinity of the project area or regionally.

The build alternatives are expected to help recreate or mimic land and aquatic habitat conditions present prior to the BSNP and wide spread agricultural crop production. Beneficial effects to the terrestrial land cover are expected over both the short and long-term from all alternatives.

The No Development alternative would not have the relatively short-term positive effects to aquatic habitat from chute construction. The removal of land from cultivation and native grass and tree plantings that have already occurred would be a beneficial effect. Because no further development activities would occur, terrestrial habitat and wetlands would still develop, but over a longer period of time. All alternatives would provide both short-term and long-term benefits to the terrestrial ecology of the floodplain.

## 4.6 CULTURAL RESOURCES

Cultural resources are limited, non-renewable resources whose integrity could be easily diminished by physical disturbances. The proposed project has the potential to impact unrecorded cultural resources within the project APE. In the unlikely event that archeological deposits or other cultural resources are encountered during construction, work in the area of discovery would cease, the discovery investigated and coordinated with Missouri SHPO and Federally recognized Native American tribes.

### 4.6.1 HISTORIC PROPERTIES AND ARCHAEOLOGICAL SITES

No historic properties listed on the NRHP or other recorded archaeological sites are recorded in the project APE. The likelihood of significant adverse impacts to historic or archaeological resources resulting from implementation of the Single-Entrance or Split-Entrance alternatives is minimal because the project is primarily situated on recently accreted lands.

If unanticipated cultural resource sites (including human remains) are encountered during construction or future operation and maintenance, these activities would be halted in the area of discovery and the Corps' District Archeologist would be notified immediately along with the SHPO [36 C.F.R. § 800.11(b)2]. Additionally, the provisions of 36 C.F.R. § 800.6 would be implemented. No unavoidable adverse impacts are anticipated to cultural resources at this time.

#### 4.6.2 STEAMBOAT WRECKS

Results of record searches for cultural resources in the area and a review of literature regarding steamboat wrecks identified no potential sites of concern located in the vicinity of the APE. The remains of the *Bishop*, *Kansas*, and *Ontario* steamboats are documented to be located well east of the APE. None of the alternatives are anticipated to affect steamboat wrecks.

#### 4.6.3 ACCRETED LANDS

Approximately 52.9 percent (484.4 acres) of the APE has not been accreted since the early 19<sup>th</sup> Century. Approximately 47.1 percent (432.2 acres) of the APE are accreted lands caused either by natural or man-induced (i.e. dike field land accretion) sediment deposition. There is little likelihood of adversely affecting unanticipated cultural resources on previously accreted or disturbed areas (e.g. bank revetments and levees) located on non-accreted lands. However, those non-disturbed areas on non-accreted land that would be affected by land disturbing activities should be the focus of a Phase I Archaeological Survey. The chute alignments for both build alternatives would traverse non-accreted lands. A Phase I Archeological Survey is recommended prior to chute construction through these areas.

### 4.7 WATER QUALITY

Physical disturbances during chute construction could have an adverse impact on water quality. Significant impacts would be those impacts that would affect water quality in a manner that would exceed Federal or state standards, including degrading an existing use.

No significant adverse impacts are anticipated to the water quality of the Missouri River as part of the Mitigation Program. Chute construction under either build alternative would temporarily increase sediment load in the Missouri River. Additionally, construction activities could temporarily increase suspended solids and decrease water clarity and light penetration. Thus any impact would be unavoidable but short-term and insignificant. The No Development alternative would have no affect on water quality.

Methods to reduce discharges of pollutants in stormwater runoff from the construction areas would be implemented. Construction of Barney Bend would impact more than one acre, thus requiring compliance with the Corps' general operating permit (MO-G699000) for work pertaining to the Mitigation Program from the Missouri Department of Natural Resources (MDNR). The general permit and associated stormwater pollution prevention plan would address control issues for pollutants during and after construction. These construction activities would also comply with any conditions recommended by the Corps and MDNR in jointly issuing the Section 404 authorization and 401 water quality certification. Construction activities at Barney Bend would not cause an exceedance of Federal or state water quality standards, therefore no significant adverse impacts would result.

#### **4.8 AIR QUALITY**

Direct air quality impacts that would occur at Barney Bend would result from construction activities including excavation, grading, and construction-related traffic. An air quality impact would be considered significant if it results in a violation of NAAQS. No significant adverse impacts are expected to air quality at the site.

Increases in fugitive dust (suspended particulate matter) and increases in exhaust emissions from construction activities would be unavoidable; however, these impacts would be temporary and emission levels would be relatively low. These pollutants are expected to disperse quickly; therefore, any impact would be minimal. When necessary, construction access roads would be watered down to minimize the escape of fugitive dust during high wind speeds and periods of high construction-vehicle activity. The No Development alternative would not experience any construction related air quality effects.

## 4.9 NOISE

Noise impacts from the development alternatives at Barney Bend are related to the magnitude of the noise levels generated by construction activities and the proximity of sensitive noise receptors. A sensitive noise receptor is commonly defined as the occupants of a facility or location where a state of quietness is a basis for use. These locations include residences, churches, and wilderness areas. Some species of protected wildlife are also considered to be sensitive noise receptors, for instance, the bald eagle.

The human response to noise is generally subjective (e.g., annoyance). Temporary increases in ambient noise levels at Barney Bend would be caused by construction activities. No adverse impacts to human sensitive receptors are anticipated because no receptors are within close proximity of the site.

Noise impacts to wildlife vary depending on a species hearing ability, time of year, and physical condition. Species behavior, mating, and feeding activities can be adversely affected due to increases in noise levels. As discussed, construction activities may adversely affect bald eagles that could occur at or near Barney Bend. If bald eagles are found to nest or roost in the area the Corps would coordinate with USFWS as discussed in Section 4.4.4 Threatened and Endangered Species.

## 4.10 SOCIOECONOMIC RESOURCES

Impacts to socioeconomic resources would be associated with construction activities and the operation of Barney Bend as a conservation area. Impacts would be significant if the proposed project would noticeably affect the local economy, labor market, or land use.

### 4.10.1 POPULATION AND INCOME

Impacts from construction and implementation of Barney Bend are not expected to have any impact on population and income of the local area. Population trends and composition in the local area are not anticipated to change. An influx of some construction dollars may provide for temporary increases to the local economy. Any possible increases to the local economy, though beneficial, would be insignificant. Long-

term revenue in the surrounding communities could increase from additional recreational opportunities. Due to the minimal amount of land removed from crop production, any impacts to the local agricultural economy would be insignificant.

#### **4.10.2 RECREATION AND AESTHETICS**

No adverse impacts to recreation facilities or opportunities at Barney Bend are expected. Temporary impacts to recreation opportunities could occur during construction if the Barney Bend would be closed to the public for safety reasons. This could be considered inconvenient to some public users, though it would be insignificant. MDC approved recreational activities for the public at the site include hunting, fishing, nature study, wildlife viewing, photography, and hiking. These recreational activities are expected to increase once the project is complete. Thus, long-term beneficial impacts are expected.

Visual impacts would be temporary and would occur during construction of the recommended alternative; however, no significant adverse impacts to aesthetics and the surrounding landscape are expected. Over the long-term, the visual aesthetic values of the area should improve as a result of the increased habitat and a greater diversity of features on the site and its transformation to a more natural condition.

#### **4.10.3 NAVIGATION**

No adverse impacts to navigation are expected from construction and operation of Barney Bend for any of the alternatives. The U.S. Congress requires the Corps to maintain a 9 feet deep by 300 feet wide navigation channel that would not be adversely affected by the alternatives. The Single-Entrance and Split-Entrance alternatives would divert approximately 3.2 and 2.9 percent respectively of the Missouri River flow at CRP. This is considered an insignificant impact and would not affect navigation.

#### **4.11 CUMULATIVE EFFECTS**

Cumulative effects were previously addressed in the SEIS for the Mitigation Program completed in 2003. However, there are other cumulative effects not addressed in the SEIS that would result from the construction and operation of Barney Bend. These include the following:

- Regional beneficial increases in the land acreage base for fish and wildlife habitat would occur due to this and other public lands (mitigation sites, conservation areas (CA), state parks, wildlife management areas (WMA), national wildlife refuges (NWR), and state recreation areas (SRA) located in Holt and Atchison Counties, Missouri; and Otoe, Nemaha, and Richardson Counties, Nebraska. These sites include, but are not limited to, Bob Brown, Brickyard Hill, Jamerson C. McCormack, Little Tarkio Prairie, Nodaway Valley, Riverbreaks, Star School Hill Prairie, and Tarkio Prairie CAs in Missouri; Aspinwall Bend CA in Nebraska; Deroin Bend, Hamburg Bend, Monkey Mountain, Nishnabotna, Thurnau, Rush Bottom Bend, and Wolf Creek mitigation sites in Missouri; and Hamburg Bend, Kansas Bend, and Langdon Bend mitigation sites in Nebraska. Additional public lands include Big Lake State Park, Payne Landing Access, Squaw Creek NWR in Missouri; and Brownville SRA, Indian Cave State Park, and Peru Boat Ramp WMA in Nebraska. Many of these sites are located within the Missouri River floodplain. Total acres of public lands located within the Missouri River floodplain and within Atchison County, Missouri are summarized in Table 4-1.
- Regional increases in fish and wildlife populations resulting from site specific habitat development activities on the land base. Increases in regional habitat quantity should positively correlate to increased fish and wildlife resources in terms of species and abundance.
- Continued regional benefits from increased flood water retention capacity on the Missouri River floodplain would provide incremental flood protection for residences and properties downstream.
- Overall beneficial increases in aquatic shallow water habitat and terrestrial bottomland forest habitat that support the Federally listed pallid sturgeon, Indiana bat, and bald eagle, respectively. State listed species could potentially benefit as well.
- Regional beneficial improvements in water quality from the reduction in agricultural chemical use.
- Regional increases in public land availability for recreational opportunities.

**Table 4-1. Summary of Public Lands.**

County	Land in County (ac.)	Public Land in County (ac.)	Public Land in County (%)	Floodplain in County (ac.)	Public Land in Floodplain (ac.)	Public Land in Floodplain (%)
Atchison	350,358	7,435	2	80,356	4,324	5

- Long-term and cumulative impacts to wildlife resources are expected to be beneficial because of an increase in valued habitat types and the relative abundance of these habitats.
- Cumulative water quality impacts for all alternatives are expected to be of a long-term benefit because previously farmed lands converted to fish and wildlife habitat would no longer be exposed to the chemical applications for agricultural crop production.
- Cumulative air quality impacts for all alternatives are expected to be of a long-term benefit because suspended particulate matter from annual farming practices would be reduced.
- Cumulative noise impacts for all alternatives are expected to be of a long-term benefit because noise generated from annual farming practices would be reduced.
- No cumulative adverse impacts to cultural resources are anticipated since there is little likelihood of affecting cultural resources through the implementation of the Mitigation Program at Barney Bend.

On a more localized scale, there would be cumulative beneficial effects to fish and wildlife populations that need larger habitat areas due to the close proximity of the Hamburg Bend, Kansas Bend, and Nishnabotna Bend. As an example, the prothonotary warbler needs areas of bottomland forest near rivers and wetlands (Ehrlich et al. 1988) for breeding and migratory resting areas. As bottomland forest continues to develop and mature on Barney Bend, combined with this resource on the Hamburg, Kansas Bend, and Nishnabotna Bend sites, a larger more contiguous forested area would be established. These larger tracts of contiguous habitat would potentially attract larger

numbers of the prothonotary warbler and many other neotropical migrant birds which are known to favor these larger tracts of contiguous habitat. Grassland and open field birds such as the dickcissel, eastern and western meadowlarks, and grasshopper sparrows should also benefit from native prairie grass restoration, fallowed cropland, or browse plantings (such as clover or alfalfa) on these mitigation sites. Another example of more localized benefits from the two sites would be increased feeding and resting areas for migrating waterfowl such as the mallard or other duck species, which have large home range requirements. Over the long-term, as bottomland forest areas develop and mature to later successional stages, there should be an increase in the use of this resource by native bats for roosting and maternal colonies. Local fisheries resources should benefit from the flow-through chute that would be constructed on Barney Bend coupled with the chutes constructed at Hamburg and the upper bend of Lower Hamburg.

#### **4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

Irreversible and irretrievable resource commitments due to construction and operation of Barney Bend include expenditure of Federal funds, labor, energy, and construction materials used to plan, design, construct, and monitor the project. Some soils would be lost as a result of the development alternatives.

#### **4.13 FUTURE WITHOUT-PROJECT CONDITION**

Without construction and operation of Barney Bend, the site would continue to provide terrestrial and limited aquatic and wetland habitat. MDC would continue to manage the mitigation site as a conservation area primarily for terrestrial species, although natural development of terrestrial habitat would be a slow process. The establishment and success of wetlands would be marginal. By taking no action, the mitigation of the aquatic and wetland habitats lost over the years due to the BSNP would occur to a much lesser degree.

#### **4.14 ENVIRONMENTAL COMPLIANCE**

This section summarizes the statutory and regulatory environmental compliance requirements and discusses the major Federal and state permits and clearances that would be required for the approval and implementation process for Barney Bend. The

applicability and status of these environmental requirements is presented in Table 4-2 and a discussion of the most important requirements follows.

#### 4.14.1 ENVIRONMENTAL POLICY

The Corps is preparing a PIR for each mitigation site. The PIR would document the planning for the mitigation site and would provide the information needed to ensure compliance with respect to environmental considerations.

Federal agencies use NEPA [42 USC 4321 et seq.] to evaluate the environmental impacts of a proposed project. Through the NEPA process, public officials and citizens are given opportunity to be involved in the environmental review and receive information about environmental impacts before any decisions are made on Federal actions regarding the proposed projects. This PIR is intended to serve as the documentation necessary to incorporate the NEPA process into the Mitigation Program planning and implementation. If no significant impacts are determined, a Finding of No Significant Impact (FONSI) would be prepared and NEPA compliance would be fulfilled.

#### 4.14.2 WATER RESOURCES

Federal limits on the amounts of specific pollutants that could be discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water are governed by CWA [33 USC 1251 et seq., as amended], National Pollutant Discharge Elimination System (NPDES).

Discharge of stormwater resulting from construction activities that would disturb more than one acre of surface area requires an NPDES permit under Section 402 of the CWA. The MDNR authorizes NPDES permits in the state of Missouri. The Corps has obtained a general operating permit (MO-G699000) for work pertaining to the Mitigation Program. MDNR Form E is still required to be submitted for each individual project under the Mitigation Program. A stormwater permit under Missouri's general permit for land disturbance will be submitted for Barney Bend which would include preparation of a pollution prevention plan. The plan would address practices and measures required to control and reduce the amount of pollutants in stormwater runoff (Appendix F).

**Table 4-2: Compliance of Preferred Alternative with Environmental Protection Statutes and Other Environmental Requirements**

Federal Environmental Requirements	Applicability	Status <sup>a, b, c, d</sup>
Archeological Resources Protection Act, 16 U.S.C. 470, et. seq.	Applicable	Partial Compliance <sup>b</sup>
Clean Air Act, as amended, 42 U.S.C. 7401-7671g, et. seq.	Applicable	Full Compliance <sup>a</sup>
Clean Water Act (Federal Water Pollution Control Act),	Applicable	Partial Compliance
Coastal Zone Management Act, 16 U.S.C. 1451, et. seq.	Not Applicable <sup>d</sup>	Not Applicable
Endangered Species Act, 16 U.S.C. 1531, et. seq.	Applicable	Partial Compliance
Estuary Protection Act, 16 U.S.C. 1221, et. seq.	Not Applicable	Not Applicable
Federal Water Project Recreation Act, 16 U.S.C. 4601-12, et. seq.	Applicable	Full Compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et. seq.	Applicable	Partial Compliance
Land and Water Conservation Fund Act, 16 U.S.C. 4601-4, et. seq.	Not Applicable	Not Applicable
Marine Protection Research and Sanctuary Act, 33 U.S.C. 1401, et. seq.	Not Applicable	Not Applicable
National Environmental Policy Act, 42 U.S.C. 4321, et. seq.	Applicable	Partial Compliance
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470a, et. seq.	Applicable	Partial Compliance
Rivers and Harbors Act, 33 U.S.C. 403, et. seq.	Applicable	Partial Compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et. seq.	Not Applicable	Not Applicable
Wild and Scenic River Act, 16 U.S.C. 1271, et. seq.	Not Applicable	Not Applicable
Farmland Protection Policy Act, 7 U.S.C. 4201, et. seq.	Applicable	Partial Compliance
Protection & Enhancement of the Cultural Environment (Executive Order 11593)	Applicable	Partial Compliance
Floodplain Management (Executive Order 11988)	Applicable	Full Compliance
Protection of Wetlands (Executive Order 11990)	Applicable	Full Compliance
Environmental Justice (Executive Order 12898)	Applicable	Full Compliance

**NOTES:**

- a. Full Compliance. Having met all requirements of the statute for the current stage of planning (either pre-authorization or post-authorization)
- b. Partial compliance. Not having met some of the requirements in the current stage of planning.
- c. Noncompliance. Violation of a requirement of the statute.
- d. Not applicable. No requirements for the statute required; compliance for the current stage of planning.

Regulatory requirements for a permit system governing the placement of dredged or fill material into waters of the United States are also mandated by CWA under Section 404. The Corps authorizes this permit. The Section 404(b)(1) Evaluation (40 CFR 23) is included in Appendix G. The proposed project would likely fall within the parameters of a nationwide permit number (NWP) 27 for stream and wetland restoration activities. NWP 27 also covers those activities that would obstruct or alter a navigable water (Missouri River) by affecting the course, location, or capacity of the water as defined under Section 10 of the *Rivers and Harbors Act of 1899* [33 USC 403].

Section 401 of the CWA requires state agencies to certify that a project requiring a Federal permit to discharge complies with specific provision of the CWA. The state of Missouri has issued water quality certification for wetland restoration activities under nationwide permit number 27.

#### 4.14.3 BIOLOGICAL RESOURCES

Federal agencies are required to determine the effects of their actions on Federally listed endangered or threatened species and their critical habitats under ESA [16 USC 1531 et seq.]. Steps must be taken by the Federal agency to conserve and protect these species and their habitat, and to avoid or mitigate any potentially adverse impacts resulting from the implementation of the proposed project.

The *Fish and Wildlife Coordination Act* (16 U.S.C. 661, et seq.) provides the basic authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It also requires that Federal agencies that construct, license or permit water resource development projects must first consult with USFWS (and the National Marine Fisheries Service in some instances) and state fish and wildlife agency regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Full consideration is to be given to USFWS recommendations.

The preparation of a biological assessment (Appendix E) is required under ESA to evaluate if a major construction activity is likely to adversely affect a listed species or its habitat. The assessment is used to determine if formal consultation between the

Federal agency and the USFWS would be required. Formal consultation would not be required for the proposed project as adverse impacts to listed species or their habitats are not anticipated.

#### 4.14.4 CULTURAL RESOURCES

Section 106 of NHPA of 1966 (amended June 17, 1999) requires Federal agencies to take into account the effects of their undertakings on historic properties. By definition, historic properties are properties eligible for or listed on the NRHP. Federal undertakings refer to any Federal involvement including funding, permitting, licensing, or approval. Federal agencies are required to define and document the APE for undertakings. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

The Advisory Council on Historic Preservation (ACHP) issues regulations that implement Section 106 of NHPA at 36 CFR Part 800, Protection of the Historic Properties. Section 106 sets up the review process whereby a Federal agency consults with the SHPO, Native American tribes, and other interested parties including the public to identify, evaluate, assess effects, and mitigate adverse impacts on any historic properties affected by their undertaking. The PIR will be provided to the Missouri State Historic Preservation Officer and appropriate Federally recognized Native American Tribes for comment in accordance with Section 106 of the NHPA during the public comment period.

#### 4.14.5 LAND USE (PRIME FARMLANDS)

The *Farmland Protection Act* [7 CFR 658] minimizes the extent to which Federal actions contribute to the unnecessary conversion of prime farmlands to nonagricultural use. The NRCS takes steps to ensure that prime farmlands lost to development are documented and provided to congress in a yearly report. In full compliance with the *Farmland Protection Act*, Form AD-1006 *Farmland Conversion Impact Rating* form was submitted to the NRCS (Appendix A).

#### 4.14.6 AIR QUALITY

The Federal policy to protect and enhance the quality of the air to protect human health and the environment is established under the *Clean Air Act* [42 USC 7401 et seq., as amended]. Impacts to air quality are considered to be insignificant. Therefore, no additional actions would be required for full compliance.

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# Chapter 5

## Other Considerations

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### 5.1 INTRODUCTION

The recommended alternative for Barney Bend includes various activities, primarily construction of a flow-through chute, to develop fish and wildlife habitat. Management of the site currently includes native warm season grass plantings, limited tree plantings and reestablishment of the riparian corridor, and noxious weed control. This section describes the monitoring and evaluation plan, operations and maintenance plan, real estate considerations, implementation responsibilities and views, cost estimate, schedule, and conclusions and recommendations for Barney Bend's recommended alternative.

### 5.2 MONITORING AND EVALUATION PLAN

The purpose of the site Monitoring and Evaluation (M&E) plan is to establish goals for monitoring and evaluating and to guide the pre- and post-construction collection of physical and biological information. This information would be used to evaluate any changes or improvements to Barney Bend and as a tool to measure the success of the proposed project in helping to achieve the goals of the overall Mitigation Program. Information obtained could also be used to compare Barney Bend to the success of past and future mitigation sites.

The M&E Committee appointed by the ACT was established to develop an M&E plan for the Mitigation Program. This committee included representatives from the Corps, USFWS, IDNR, KDWP, MDC, and NGPC. A draft of the M&E Plan has been completed. The goal of the M&E plan is to understand the physical and biological responses to Mitigation Program 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 program adaptations based on new information,
- Gain understanding of the physical and biological responses through time, and
- Formalize information transfer among all to communicate lessons-learned and increase the effectiveness of project actions.

Because of the Mitigation Program's significant financial investment, it is important to learn how constructed mitigation sites are performing and apply adaptive management, as needed, on existing and future sites to maximize habitat potential. This information will help determine the 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. Utilizing 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. The M&E committee has agreed to a three-tiered M&E program. 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.

Tier 1 data is limited to physical data on mitigation sites. The physical data will include habitat delineations, cross sections, hydrographs, etc. Habitats will be classified using the National Wetland Inventory (NWI) and the National Land Cover Data (NLCD) classification system. Aquatic and wetland habitats will be classified using the NWI and all upland habitats will be classified using the NLCD system. The existing baseline habitat conditions will be documented for each mitigation site to establish the baseline habitats that existed prior to acquisition by the Mitigation Program. This data will be established and maintained by the Corps as a GIS land cover data layer. Tier 1 efforts will be performed by the Corps or its contractors. In general, the baseline condition of new sites will be documented during site-specific design activities and NEPA compliance. The baseline terrestrial habitat assessment for Barney Bend is included in Appendix D.

Tier 2 activities will utilize standardized protocol, as approved by the M&E committee, to monitor the biologic response at select mitigation sites. The committee has established

native riverine fish species as being the highest priority for monitoring followed by birds, reptiles, and amphibians. This monitoring may also track changes in both quality and quantity of a species' preferred habitat. Tier 2 activities may characterize the habitat in greater detail using the NWI and NLCD systems, as appropriate. This additional data on habitat will be added to the GIS land cover data layer maintained by the Corps. These monitoring activities will be completed by the mitigation site's land managing agency and funded through the site's annual management plan. MDC is the land managing agency for Barney Bend. Each land managing agency will decide how to conduct these activities (i.e. in-house labor, contract, academic institution, etc.). Monitoring results will be reported in annual progress reports and final reports. Tier 2 monitoring data will also be summarized and presented in the Annual Implementation Report. The M&E committee will meet annually to review all on-going monitoring activities and decide on future activities based on available appropriations.

Specific research activities will be Tier 3 activities and will test a specific hypothesis relevant to the Mitigation Program. These activities may include more rigorous research techniques and sampling protocol. As with Tier 2 monitoring, these research projects will be completed by the mitigation site's land managing agency and funded through the site's annual management plan. For Tier 3 research, the land managing agency will also decide how to conduct these activities (i.e. as in-house labor, contract, academic institution, etc.). Research results will be reported in annual progress reports and final reports. The M&E committee will meet annually to review all on-going monitoring activities and decide on future activities based on available appropriations. Tier 3 research will receive lower priority for funding than Tier 1 or Tier 2 monitoring activities.

Monitoring efforts may reveal the need for adaptive management at Barney Bend. As an example, adaptive management efforts might become necessary on the site if drought conditions persist or flooding results in damage to project features or vegetative plantings. Additionally, the biotic response of the habitat development measures, results of the M&E plan, changing site conditions and opportunities to focus on achieving the maximum restoration benefits possible at each site may also require changes to the site through adaptive management. If any re-work is needed to restore the area, it would be paid for with Construction General funds. If the re-work was considered a major change to the recommended alternative identified in this PIR, an amended PIR would be prepared.

The M&E committee established two subcommittees to develop the program's mitigation efforts. These protocols are "living" documents that may be modified to better facilitate future monitoring activities, as needed (i.e. improved sampling methods, additional informational needs, etc.). A team of biologists, representative of the four state fish and game agencies and Federal agencies affiliated with various Missouri River projects, including pallid sturgeon projects, provided the framework for these plans and protocols. These biologists provided knowledge and experience regarding the fish and bird communities of the Missouri River ecosystem, including the pallid sturgeon. The fish monitoring protocol includes standard operating procedures for fishery sampling gears, sampling segments, sampling strategies, sampling experimental design, and collection of micro-habitat characteristic data.

Standardized protocols for monitoring of fish and avian response are included as an appendix to the M&E Plan that has been prepared by the M&E Committee. The M&E Plan also includes guidance on schedule, funding, quality control, acquisition strategy, and communications regarding M&E activities for the Mitigation Program. The M&E Plan and appendices will be made available on the Mitigation Program website (<http://www.nwk.usace.army.mil/projects/mitigation/>).

### **5.3 OPERATIONS AND MAINTENANCE (O&M) PLAN**

MDC would operate and maintain the terrestrial portions of Barney Bend as part of the larger Lower Hamburg for fish and wildlife purposes. MDC manages the site through annual sole source contracts with the Corps. The Corps would maintain any shallow water habitat constructed on the site including the flow-through chute or in the Missouri River, while all other O&M activities would be the responsibility of MDC.

O&M activities at Barney Bend would include the maintenance of developed habitats and additional management activities at the site.

MDC will submit an Annual Management Plan to the Corps for approval. The Kansas City District would negotiate the costs of implementing the Annual Management Plan with MDC prior to each Federal fiscal year. Individual management and maintenance features required at Barney Bend would be described in the plan. The Corps would be responsible for all costs required to implement the approved Annual Management Plan by MDC. MDC would be reimbursed for all costs in accordance with a sole-source contract.

The Corps will prepare an O&M Manual for Barney Bend. It is anticipated that MDC will conduct certain aspects of O&M as part of its normal management activities at Lower Hamburg. These final arrangements would be outlined in the O&M Manual.

#### **5.4 REAL ESTATE CONSIDERATIONS**

Barney Bend is currently owned by the Corps. The lands were purchased from willing sellers during a period from 1995 to 1998. MDC currently manages the site under a Cooperative Agreement with the Corps and would continue to do so upon completion of the project. The relationship, arrangements, and general procedures that the Corps and MDC would follow in operating, maintaining, repairing, and rehabilitating the project features are defined within the annual sole source contracts.

Additional lands may be acquired at Barney Bend if adjacent private landowners become willing sellers in the future, especially the tracts adjacent to the downstream side of the site. These additional lands are not required for project development as described in this PIR. If acquired, these lands would be managed as part of Lower Hamburg.

#### **5.5 IMPLEMENTATION RESPONSIBILITIES**

The Corps is responsible for study management and coordination with USFWS, MDC, and other affected/interested agencies. The Corps will prepare and submit the subject PIR and complete all environmental review and coordination requirements. The Corps will then prepare any design plans that may be required, finalize any plans and specifications, prepare and implement a monitoring and evaluation plan, advertise and award a construction contract, perform construction contract supervision and administration, develop an O&M manual, ensure O&M is carried out in accordance with the O&M manual, and develop and implement the real estate agreement and O&M agreement. The Corps will maintain the flow-through chute for all project purposes including fisheries and navigation. In the event of flood damages to the project, the Corps will evaluate and complete the work necessary to reestablish project features.

The MDC is responsible for management of the terrestrial portions of Barney Bend as part of the larger Lower Hamburg and for any other activities outlined as MDC responsibility in any O&M agreements.

The ACT meets quarterly to discuss the status of the Mitigation Program. As part of the meetings, an O&M update is given at which time the ACT ensures that site O&M is appropriate and reasonable.

## 5.6 COST ESTIMATE

The total estimated construction cost of Barney Bend ranges from \$2 to \$4 million depending on construction method (i.e. dredge or manual excavation). This estimate includes clearing and grubbing, chute excavation, excavation for grade control, rock fill for structures, excavation at chute inlet, seeding and mulching, and excavate and transport excavated rock.

Barney Bend would be Federally funded in its entirety. If Federal funds are not available to accomplish general operations, management and maintenance at the site, such work could be deferred or not accomplished. Additionally, the dynamics of the Missouri River adjacent to the site could deem a deferment or “no action” decision about operations, management and maintenance at the site. Annual O&M costs will be estimated as part of the Corps’ MCACES estimate. The cost estimate would be updated throughout the life of the project.

## 5.7 SCHEDULE

**Table 5-1. Barney Bend Project Schedule**

Milestone	Scheduled	Actual
Current Real Estate Acquisition Initiated		1995
Current Real Estate Acquisition Completed		1998
Future Acquisitions	Not Scheduled	
Cooperative Agreement Signed		1999
PIR Started		2/2006
PIR Approved	3/2007	
Plans & Specifications Started		7/2006
Plans & Specifications Reviewed	3/2007	
Plans & Specifications Approved	4/2007	
Construction Contract Advertised	Spring 2007	
Construction Contract Awarded	Summer 2007	
Construction Contract Completed	Not Scheduled	

## 5.8 CONCLUSIONS AND RECOMMENDATIONS

The habitat development at Barney Bend has been identified as a priority project for inclusion into the Missouri River Fish and Wildlife Mitigation Program. The MDC and ACT concur. The value of the area as fish and wildlife habitat prior to acquisition was minimal due to the majority of the area being in agricultural use. Development at Barney Bend would create aquatic habitat through construction of a flow-through chute and restore other terrestrial habitats. These activities would greatly enhance the site's value as fish and wildlife habitat.

It is recommended that the Single-Entrance alternative be constructed as described in this PIR and operated by MDC in accordance with their sole source management contracts with the Corps. The Single-Entrance alternative would result in the greatest beneficial impacts to fish and wildlife habitat while considering adjacent private property owner concerns, and would not significantly adversely affect the human environment.

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# List of Preparers

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## U.S. Army Corps of Engineers

### **Glenn Covington** (B.S. Fisheries and Wildlife, M.S. Fisheries and Wildlife)

Six years' state fisheries field assistant. Twenty years' experience in Corps environmental resources planning, including natural resource assessment, environmental planning, impact assessment, NEPA documentation, fish and wildlife mitigation, and project management.

### **David Hibbs** (B.S. Biology)

Nine years' experience in the Corps' Regulatory Program with wetland delineations, impact assessment, and NEPA documentation. Five years' experience in civil works and environmental resources planning with ecosystem restoration, natural resource assessment, fish and wildlife mitigation, agency and public coordination and NEPA documentation.

### **Tim Meade** (B.A. Anthropology, M.A. Anthropology)

Seventeen years' experience in Cultural Resource Management. Three years' in civil works environmental resource planning as district archeologist. Relevant experience in NEPA documentation and agency and tribal coordination.

## HDR Engineering, Inc.

### **Chad E. Babcock** (B.S. Natural Resources)

Ten years' experience in environmental permitting, site selection and evaluation, field surveys, NEPA documentation, and project management.

**Rajat Das, P.E.** (M.S. Environmental Engineering, M.B.A. International Business, B.S. Civil Engineering)

Six years' experience in hydraulics and hydrology modeling, stormwater collection systems modeling, and various projects including flood control, stormwater systems, levees, stream channel restoration/rehabilitation, wetland and lake restoration, and bridge hydraulic design. Also involved in calculating quantities, cost estimating, technical reports, and plan set development.

**John Denlinger, P.E., CFM** (B.S. Civil Engineering)

Sixteen years' experience in water resources planning and engineering including site reconnaissance, plan formulation, hydrologic and hydraulic analysis, economic analysis, engineering design, permitting, and project management for watershed studies, stormwater systems, stream restoration and stabilization, flood mitigation and related water resources projects.

**Tim Fobes** (B.S. Wildlife Ecology and Conservation, M.S. Biology)

Ten years' experience in ecological research, wetlands, threatened and endangered species, environmental planning, impact assessment, and NEPA documentation.

**Natalie R. Martin** (B.A. Environmental Studies)

Seven years' experience in project management, Federal program management, environmental permitting, NEPA documentation, management consulting, jurisdictional determinations, and environmental surveys.

**Raziul Mollah** (B.S. Agricultural Engineering, M.Eng. Civil Engineering)

Eight years' experience with modeling, management, planning and design of water resources related projects including drainage studies and storm water master plans; water quality; flood mitigation planning; development and design of channel improvements; stream bank stabilization; bio-engineering; best management practices; flood control structures; ground water; and Geographical Information Systems (GIS).

**Michael Snyder** (B.A. Biology, M.S. Biological Sciences)

Seven years' experience in NEPA documentation, environmental permitting, natural resource assessment, and threatened and endangered species.

**Jeffrey Turner** (B.S. Biology, M.S., Geography)

Twenty-eight years' experience in natural resource assessment, environmental planning, impact assessment, and NEPA documentation including project management and public involvement programs.