

**US ARMY CORPS OF ENGINEERS
NORTHWESTERN DIVISION
MISSOURI RIVER BASIN
WATER MANAGEMENT DIVISION**

**BIOLOGICAL ASSESSMENT
ON THE
MISSOURI RIVER MAINSTEM
RESERVOIR SYSTEM,
THE LOWER MISSOURI RIVER,
AND THE KANSAS RIVER**

July 2003



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List of Acronyms

AF	acre feet
BA	Biological Assessment
BiOp	Biological Opinion
BSNP	Bank Stabilization and Navigation Project
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CRP	Construction Reference Plane
CWCP	current Water Control Plan
DRM	Daily Routing Model
EA/FONSI	Environmental Assessment/Finding of No Significant Impact

EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESH	emergent sandbar habitat
FTC	Fish Technology Center
ft-msl	feet mean sea level
GPS	Geographic Positioning System
kcfs	thousand cubic feet per second
KDWP	Kansas Department of Wildlife and Parks
MAF	million acre feet
Master Manual	Missouri River Master Water Control Manual
MDC	Missouri Department of Conservation
mm	millimeters
MRRIC	Missouri River Recovery Implementation Committee
msl	mean sea level
MTFWP	Montana Fish, Wildlife and Parks
NEPA	National Environmental Policy Act
NFH	National Fish Hatchery
NGPC	Nebraska Game and Parks Commission
NRC	National Research Council (National Academy of Sciences)
O&M	Operation and Maintenance
PA	Proposed Action
PIT	Passive Integrated Transponder
PVA	Population Viability Analysis
RM&E	Research, Monitoring, and Evaluation
RPA	Reasonable and Prudent Alternative

RPMA	Recovery Priority Management Areas
SFH	State Fish Hatchery
SWH	shallow water habitat
System	Missouri River Mainstem Reservoir System
TESDMS	Threatened & Endangered Species Data Management System
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAPA	Western Area Power Administration
WRDA86	Water Resources Development Act of 1986
WRDA99	Water Resources Development Act of 1999
YOY	young of year

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EXECUTIVE SUMMARY

This Biological Assessment (BA) provides the information required pursuant to Endangered Species Act (ESA) and its implementing regulations, documents and incorporates new and additional information not previously provided by the U.S. Army Corps of Engineers (Corps), and describes all of the current and proposed actions of the Corps to comply with the ESA.

Since the issuance of the November 2000 Biological Opinion (BiOp) by the U.S. Fish and Wildlife Service (USFWS) and subsequent consultation activities which are incorporated by reference into this BA, additional information has become available that supports preparation of this BA and the request for reinitiation of consultation. These include (1) the National Academy of Sciences' National Research Council's endorsement of the USFWS objective of restoring "natural river processes," and the recommendation of an adaptive management strategy for the recovery of the Missouri River ecosystem; (2) the USFWS September 2002 designation of critical habitat for the northern Great Plains population of the piping plover; (3) the lessons learned from operations in 2002 and 2003 on the effects of summer flows on terns and plovers; (4) the effects of the 2000 BiOp Reasonable and Prudent Alternative (RPA) on shallow water habitat, tern and plover habitat, spawning cues, connectivity to low-lying lands, and other environmental and economic factors; and, (5) the assessment that the Gavins Point flow element of the 2000 RPA did not achieve the intended attributes that were anticipated. Further, there are components of the 2000 RPA that the Corps believes are not reasonable and prudent; however, a new approach is proposed that will achieve the biological attributes of the 2000 BiOp. The following proposed action is the result of careful consideration and evaluation of the best available scientific and commercial information.

PROPOSED ACTION

The proposed action (PA) is a comprehensive and integrated set of measures proposed by the Corps to be undertaken in consultation with the USFWS to avoid jeopardizing threatened and endangered species and adversely modifying the critical habitat. In addition, the Corps is proposing an adaptive management framework to collaborate with the states, Tribes and other stakeholders in the basin to further support efforts to benefit listed species.

The PA includes actions on the mainstem of the Missouri River from Three Forks, Montana, to St. Louis, Missouri, and on select tributaries of the Missouri River, including the Kansas River, while taking into consideration other Congressionally authorized uses of the river. The PA will be relied on by the Corps to avoid jeopardy to the listed species in the Missouri River, adverse modification of designated critical habitat, and violation of the take prohibitions of Section 9 of the ESA.

The proposed action falls into the following categories:

- System operations;
- Habitat creation, enhancement, and maintenance;
- Pallid sturgeon propagation support;
- Population assessments for pallid sturgeon, piping plover and least tern;
- Bald Eagle and cottonwood forest assessment;
- Research, monitoring, and evaluation;
- Kansas River operations;
- Operation and Maintenance (O&M) of BSNP; and
- Missouri River Recovery Implementation Committee.

This proposed action is intended to be consistent with all applicable federal and state laws, Native American trust responsibilities, interstate compacts and decrees.

The PA includes the concept of adaptive management, and within that framework, the formation of a Missouri River Recovery Implementation Committee (MRRIC) is proposed. Applicable actions will be identified and evaluated with a MRRIC. The proposed MRRIC would include broad and diverse stakeholder representation to ensure that public values are incorporated into the strategy and would provide recommendations to the Federal agencies regarding actions to benefit listed species. The MRRIC would be comprised of entities having an interest in survival and recovery of listed species and the critical habitat on which they depend. Committee membership would include representatives of tribal and state governments and of non-governmental organizations.

The operation of the System is guided by the Missouri River Master Water Control Manual (Master Manual). However, the multiple actions necessary for the survival and recovery of the species and the species' critical habitat go beyond the scope of the Master Manual. Therefore, the Corps is seeking authority and appropriations to implement additional actions. The PA provides a public process for reviewing scientific information, discussing and prioritizing activities, initiating legislative action when appropriate, and allowing an opportunity for stakeholder input.

LISTED SPECIES AND CRITICAL HABITAT

Species listed under the ESA that are addressed in this BA are:

- interior least tern (*Sterna antillarum athalassos*);

- piping plover (*Charadrius melodus*);
- pallid sturgeon (*Scaphirhynchus albus*);
- bald eagle (*Haliaeetus leucocephalus*); and
- Indiana bat (*Myotis sodalis*).

In addition, this BA addresses designated critical habitat for the northern Great Plains population of the piping plover.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION

The BA describes the manner in which the proposed action may affect the listed species and designated critical habitat of the piping plover. The biological effects will be considered in proposed adaptive management framework, and will continually be evaluated and updated in order to achieve greater success in our agencies' efforts to ensure the survival and recovery of the species and protection of the critical habitat.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON LEAST TERNS AND PIPING PLOVERS

While operation of the Missouri River System under the proposed action as described in this BA will not completely ameliorate all of the adverse effects to terns and plovers, the Corps has determined that the proposed action has many beneficial effects. The proposed action will: 1) meet the physical emergent sandbar habitat goals for nesting, brooding and foraging habitat; 2) provide critically significant gains in the understanding and knowledge of these species and their associated biological interactions within the ecosystem; 3) afford the opportunity to develop future courses of action through establishment of a recovery strategy to include broad stakeholder involvement in the management of the river and actions designed to benefit the listed species and critical habitat; and 4) meet the three year running average fledge ratio goals for the least tern (0.70 chicks/pair) and piping plover (1.13 chicks/pair), as described in the 2000 BiOp.

In summary, while the Corps has determined that this action “is likely to adversely affect” the least tern and piping plover (as that expression is defined in the Endangered Species Consultation Handbook), the Corps believes that the proposed action, including the Corps' commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, will avoid jeopardizing the continued existence of the interior least tern and piping plover.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON PIPING PLOVER CRITICAL HABITAT

Operation of the Missouri River System, under the proposed action as described in this BA, will increase piping plover critical habitat in the action area. While physical

emergent sandbar habitat goals, as identified in the 2000 BiOp for nesting, brooding and foraging habitat, will be met, additional information concerning important biological elements may need to be acquired. A variety of flow tests, and an intensive experimentally based habitat monitoring program will provide valuable information on hydrological/biological relationships leading to an increased understanding of habitat processes and functionality.

In summary, the Corps believes that the proposed action, including the Corps' commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, is beneficial to the critical habitat, but is also likely to cause some adverse effects. Therefore, the Corps has determined that the PA "is likely to adversely affect" piping plover critical habitat (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON THE PALLID STURGEON

The proposed action of the Corps will: 1) have positive effects due to the creation of habitat known to benefit pallid sturgeon and other native fishes; 2) significantly advance the scientific information and understanding of the life history and ecological requirements for survival of the endangered pallid sturgeon; 3) improve the pallid sturgeon propagation and augmentation program; and 4) provide a strategy for developing future courses of actions if needed utilizing the adaptive management framework. Together, these components are critical for the survival and recovery of the species. There are, however, adverse effects associated with the operation of the main stem reservoir system, the BSNP, and the Kansas River tributary lakes. Therefore, the Corps has determined that the proposed action as described in this BA, while providing beneficial effects, "is likely to adversely affect" the pallid sturgeon (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECT OF THE PROPOSED ACTION ON THE BALD EAGLE

The Corps believes that the proposed action is beneficial to the bald eagle, but is also likely to cause some adverse effects. Therefore, the Corps has concluded that the proposed action "is likely to adversely affect" the bald eagle (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECT OF THE PROPOSED ACTION ON THE INDIANA BAT

The Corps has concluded that the proposed action with activities to create shallow water habitat, as well as maintenance activities for the BSNP, "is not likely to adversely affect" the Indiana bat (as that expression is defined in the Endangered Species Consultation Handbook).

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INTRODUCTION

This Biological Assessment (BA) provides the information required pursuant to the Endangered Species Act (ESA) and its implementing regulations on consultation (50 CFR 402.14), documents and incorporates new and additional information not previously provided by the U.S. Army Corps of Engineers (Corps), and describes all of the current and proposed actions of the Corps to comply with the Endangered Species Act (ESA). Using this information, the Corps requests the reinitiation of formal consultation.

ESA consultation between the Corps and the U.S. Fish and Wildlife Service (USFWS) has been ongoing for several years (reference consultation history included in November 2000 Biological Opinion (BiOp)) and will continue into the future. In November of 2000, the USFWS issued a BiOp that concluded that the Corps' proposed action on current operations jeopardized the continued existence of three species protected under the ESA: the interior least tern, piping plover, and pallid sturgeon. Accordingly, the USFWS recommended a reasonable and prudent alternative (RPA) that was intended to establish that restoration of the form and function of the Missouri River to recover protected species and the ecosystem on which they depend.

Since the issuance of the November 2000 BiOp and subsequent consultation activities which are herein incorporated by reference, additional information has become available that now supports preparation of this BA and request for reinitiation of consultation. These include:

- The endorsement by the National Academy of Sciences' National Research Council's (NRC) 2002 Report entitled "The Missouri River, Exploring the Prospects for Recovery," underscoring the importance of restoring "natural river processes," and its emphasis on restoring river form and function as advocated by the USFWS. Further, the NRC recommended an adaptive management strategy for recovery of the Missouri River ecosystem that includes broad stakeholder participation. During the current informal consultation with the USFWS that followed submittal of the January 2003 Supplemental BA, the Corps recognized that to restore natural river processes, the NRC recommendation of a broader approach to include diverse stakeholder participation was necessary. In this BA, and consistent with the NRC recommendation, the Corps proposes a broader unified process that builds upon current stakeholder efforts to develop a program that would ultimately lead to greater success in the survival and recovery of the listed species and the ecosystem upon which they depend.

- The USFWS designation of critical habitat for the northern Great Plains population of the piping plover (67 FR 57638) including the Missouri River in September 2002. In accordance with 50 CFR §402.16(d), and as stated in the 2000 BiOp, reinitiation of consultation is required if the designated critical habitat may be affected by the action. The Corps addresses critical habitat in this BA.
- The lessons learned from operations in 2002 and 2003 on the effects of summer flows on terns and plovers. In 2002, The Corps consulted with the USFWS on the summer operations. In that year, summer releases from Gavins Point Dam were below those necessary to support minimum service to downstream uses and there were impacts experienced as a result of that operation. For 2003, the Corps and USFWS worked collaboratively to identify an operating plan as documented in the January 2003 Supplemental BA on the 2003 Annual Operating Plan; the March 2003 Additional Supplemental BA on 2003 Annual Operating Plan and the April 2003 Supplemental Biological Opinion. In recognition that each water year is different the Corps proposes in this BA continuing consultation with the USFWS for in-season System management and coordination with the region through the existing process to develop annual operating plans.
- The additional analyses and information provided to the USFWS by the Corps and presented in the Revised Draft Environmental Impact Statement for the Master Manual Review and Update released in August of 2001. These include effects of the 2000 BiOp RPA on shallow water habitat, tern and plover habitat, spawning cues, connectivity to low-lying lands, and other environmental and economic factors.
- The Corps' assessment that the Gavins Point flow element of the RPA in the 2000 BiOp did not achieve the intended attributes that were anticipated as documented in the January 2003 Supplemental Biological Assessment for the Current Water Control Plan. In this BA, the Corps describes and demonstrates how the proposed action will achieve those attributes intended by the Gavins Point flow element of the 2000 RPA. Restoration and maintenance of emergent sandbar and shallow water habitats, reconnection of riverine and floodplain habitats and reconnection of side channels and chutes are all elements of the proposed action. Potential spawning cues in various reaches of the river will be assessed and a rigorous research effort is proposed to reduce the uncertainty surrounding essential elements needed to insure spawning and survival of pallid sturgeon. The proposed adaptive management framework will assess new information and develop alternative courses of action if needed, to insure that the needs of the species are met while maintaining the current uses of the Missouri River. In addition, the proposed action in this BA includes innovative fall flow tests from Ft. Randall and Gavins Point to evaluate the redistribution of sediment and nutrients, and increasing the total amount and complexity of bare sandbar habitat.

- The assessment by the Corps of the various measures to attain the shallow water and emergent sandbar habitat goals in the 2000 BiOp. This information was developed during the consultation discussions after the submittal of the January 2003 Supplemental Biological Assessment for the Current Water Control Plan. It was determined that additional authority and funding would be necessary in order to take all necessary actions to attain the biological attributes in the time period identified in the 2000 BiOp. The Corps is currently seeking authority and requesting Congressional appropriations to initiate these activities.

In summary, there is significant new information that the Corps has obtained since the issuance of the 2000 BiOp. The proposed action in this BA is the result of careful consideration and evaluation of the best available scientific and commercial information. Further, there are components of the 2000 RPA that the Corps believes are not reasonable and prudent; however, a new approach is proposed that will achieve the biological attributes of the 2000 BiOp. The proposed action includes the concept of adaptive management, and within that framework, the formation of a Missouri River Recovery Implementation Committee (MRRIC) is proposed. This adaptive management process coordinated with a MRRIC would allow for changes in System operations to be considered in the context of the overall strategy for the survival and recovery of the listed species and their habitat.

Interagency Cooperation Regulations [50 CFR, section 402.14 (c)] identifies six separate information items when requesting formal consultation with the USFWS. Those items are:

- (1) A description of the action to be considered;
- (2) A description of the specific area that may be affected by the action;
- (3) A description of any listed species or critical habitat that may be affected by the action;
- (4) A description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects;
- (5) Relevant reports, including environmental impact statement, environmental assessment, or biological assessment prepared; and
- (6) Any other relevant available information on the action, the affected listed species or critical habitat.

The following sections address each information item.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action (PA) is a comprehensive and integrated set of measures proposed by the Corps to be undertaken in consultation with the USFWS to avoid jeopardizing threatened and endangered species and adversely modifying critical habitat. In addition, the Corps is proposing an adaptive management framework including a mechanism to collaborate with the states, tribes and other stakeholders in the basin to further support efforts to benefit listed species.

The PA includes actions on the mainstem of the Missouri River from Three Forks, Montana, to St. Louis, Missouri, and on select tributaries of the Missouri River, including the Kansas River, while taking into consideration other Congressionally authorized uses of the river. The PA will be relied on by the Corps to avoid jeopardy to the listed species in the Missouri River, adverse modification of designated critical habitat, and violating the take prohibitions of Section 9 of the ESA.

The proposed actions fall into the following categories:

- System operations;
- Habitat creation, enhancement, and maintenance;
- Pallid sturgeon propagation support;
- Population assessments for pallid sturgeon, piping plover and least tern;
- Bald Eagle and cottonwood forest assessment;
- Research, monitoring, and evaluation;
- Kansas River operations;
- Operation and Maintenance (O&M) of BSNP; and
- Missouri River Recovery Implementation Committee.

The PA includes the concept of adaptive management, and within that framework, the formation of a Missouri River Recovery Implementation Committee (MRRIC) is proposed. Applicable actions will be identified and evaluated with a MRRIC. The proposed MRRIC would include broad and diverse stakeholder representation to ensure that public values are incorporated into the recovery strategy and would provide recommendations to the Federal agencies regarding actions to benefit listed species. The MRRIC would be comprised of entities having an interest in survival and recovery of listed species and the critical habitat on which they depend. Committee membership would include representatives of tribal and state governments and of non-governmental organizations.

The Corps has responsibility for the operation and maintenance of six dams and reservoirs on the mainstem of the Missouri River located in Montana, North Dakota, South Dakota, and Nebraska. The Corps operates the System for the Congressionally authorized project purposes of flood control, navigation, irrigation, hydropower, water supply, water quality, recreation, and fish and wildlife. Authorization for the construction and operation of the projects can be found in the following legislation: the River and Harbors Act of 1935, the Fort Peck Power Act of 1938, and the Flood Control Act of 1944.

The Corps has also constructed numerous other projects on the Lower River, downstream from the System, including the Missouri River BSNP, from Sioux City, Iowa, to St. Louis, Missouri. There are three major authorities that have shaped the present condition of the Missouri River BSNP. These are the River and Harbor Acts of 1912, 1927 and 1945. The 1912 act authorized a 6-foot deep channel from the mouth to Kansas City, Missouri. The 1927 act required a 6-foot deep by 200-foot wide channel, and extended

the project to Sioux City, Iowa. The 1945 act increased the authorized channel to 9-foot deep by 300-foot wide. The existing project extends 735 miles from Sioux City, Iowa to the mouth of the Missouri River near St. Louis, Missouri and maintains a 9-foot deep by 300-foot wide channel. The project 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. Approximately 200 million tons of stone was placed during original construction (75 million in the Omaha District and 125 million in the Kansas City District). The bulk of the construction was completed after World War II, and the project was declared functionally complete in 1981. Significant new structures and structure modifications, such as sills, crossing control structures, and notches, have been completed since the project has been in an operational and maintenance status.

Fish and wildlife mitigation for the BSNP was authorized in the Water Resources Development Act of 1986 (WRDA86). Section 601(a) of WRDA86 provided the authority to purchase lands and construct fish and wildlife habitat on 48,100 acres on the lower Missouri River in accordance with the selected plan and conditions recommended in the 1981 Feasibility Report and Environmental Impact Statement (EIS). The Water Resources Development Act of 1999 (WRDA99) authorized the modification of the BSNP Mitigation Project by adding an additional 118,650 acres. This modification increased the total acreage of the project to 166,750 acres.

The Corps also constructed, operates, and maintains reservoirs on the Kansas River that support Missouri River operations. Clinton, Perry, Tuttle Creek, Milford, Waconda, Wilson, and Kanopolis are the primary downstream flood control dams in the Kansas River basin. Each is located on one of the major tributaries. Waconda is managed by the Bureau of Reclamation and the others are Corps projects. An additional 10 Reclamation reservoir projects and one Corps reservoir upstream of these dams provide flood reduction capability in the intervening reaches. Of the total 60,600 square miles of basin drainage area, about 9,700 square miles is uncontrolled. The uncontrolled drainage area above Wamego is about 5,900 square miles, and above Fort Riley it is about 5,130 square miles. The Corps' Kansas River projects were authorized by various acts of Congress. The Flood Control Act of 1938 contained a general comprehensive plan for flood control in the Missouri River basin and authorized the construction of Tuttle Creek and Kanopolis lakes. The Pick-Sloan Missouri River Basin Program (Pick-Sloan Program), under the Flood Control Act of 1944, authorized Wilson Lake and most of the upstream projects. The Flood Control Act of 1954 added Milford and Perry lakes as units of the comprehensive plan for flood control in the Missouri River basin. Clinton Lake was authorized by the Flood Control Act of 1962. The Corps' Kansas River projects are authorized for flood control, water supply and water quality, recreation, and fish and wildlife, either through initial authorization or through succeeding acts of Congress. Milford, Tuttle Creek, and Perry are also authorized to support navigation flows on the Missouri River. Harlan County, Waconda and the other Reclamation projects are authorized for irrigation.

The operation of the System is guided by the Missouri River Master Water Control Manual (Master Manual). However, the multiple actions necessary for the survival and recovery of the species and the species' critical habitat go beyond the scope of the Master Manual. Therefore, the Corps is seeking authority and appropriations to implement additional actions. The PA provides a public process for reviewing scientific information, discussing and prioritizing activities, initiating legislative action when appropriate, and allowing an opportunity for stakeholder input.

The Corps has study, construction, and co-management authority under the Missouri National Recreational River legislation (PL 95-625). This authority extends from below Gavins Point Dam to the downstream end of Ponca State Park. To date, this authority has been used for multiple purposes, including tern and plover monitoring, piping plover studies, tern and plover habitat creation construction, pallid sturgeon monitoring, endangered species boat ramp signs, initiation of a cottonwood model, bald eagle habitat surveys, bald eagle nest counts, bank protection to prevent erosion that threatened an eagle nest, and the feasibility / design for backwater habitat restoration.

The PA is intended to be consistent with all applicable Federal and state laws, Native American trust responsibilities, and interstate compacts and decrees. The Corps recognizes that the USFWS and Corps each have statutory responsibilities that cannot be delegated.

The proposed action fall into the following categories:

- System operations;
- Habitat creation, enhancement, and maintenance;
- Pallid sturgeon propagation support;
- Population assessments for pallid sturgeon, piping plover and least tern;
- Bald Eagle and cottonwood forest assessment;
- Research, monitoring, and evaluation;
- Kansas River operations;
- Operation and Maintenance (O&M) of BSNP; and
- Missouri River Recovery Implementation Committee.

Each category is comprised of a list of more specific actions, which are discussed in this section of this BA.

SYSTEM OPERATIONS

Current Water Control Plan

The existing Master Manual establishes guidelines for operating the System for the multiple project purposes of flood control, hydropower, water supply, water quality, irrigation, navigation, recreation, and fish and wildlife. Criteria for operations include how storage in the System is divided and how water is released during navigation and non-navigation periods.

System Storage Zones

The division of total available System storage volume into zones affects System operation. Zones are prescribed for flood control, multiple uses, and the permanent pool. Figures 1 and 2 show this division for the total System and individual reservoirs, respectively.

Exclusive Flood Control Zone

The exclusive flood control zone is the total upper volume of the mainstem reservoirs maintained exclusively for flood control. This zone represents the upper 6 percent of the total System storage volume, or between 68.7 and 73.4 million acre-feet (MAF) (Figure 1). Water is released from this zone as quickly as downstream channel conditions permit so that sufficient storage remains available for capturing future inflows. The larger four reservoirs—Fort Peck Lake, Lake Sakakawea, Lake Oahe, and Lake Francis Case—hold most (98 percent) of the volume retained exclusively for flood control (Figure 2).

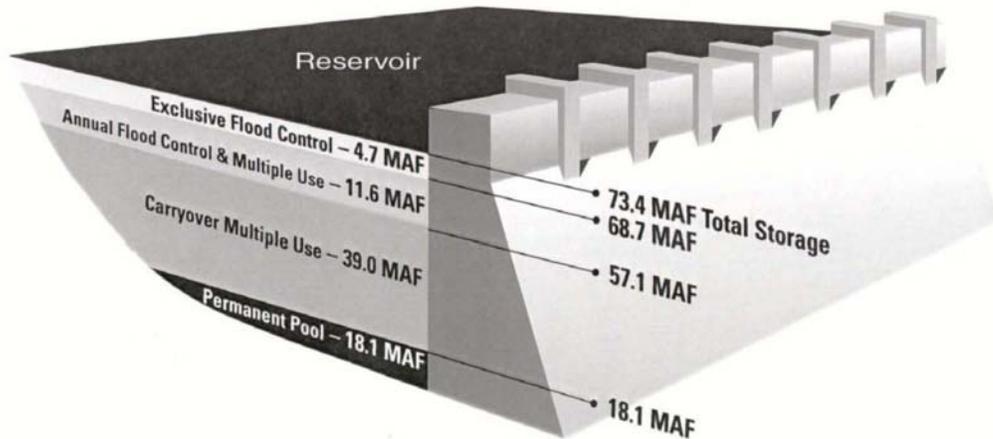


Figure 1 - Missouri River Mainstem Reservoir System total storage by zone.
(As established in the current Master Manual).

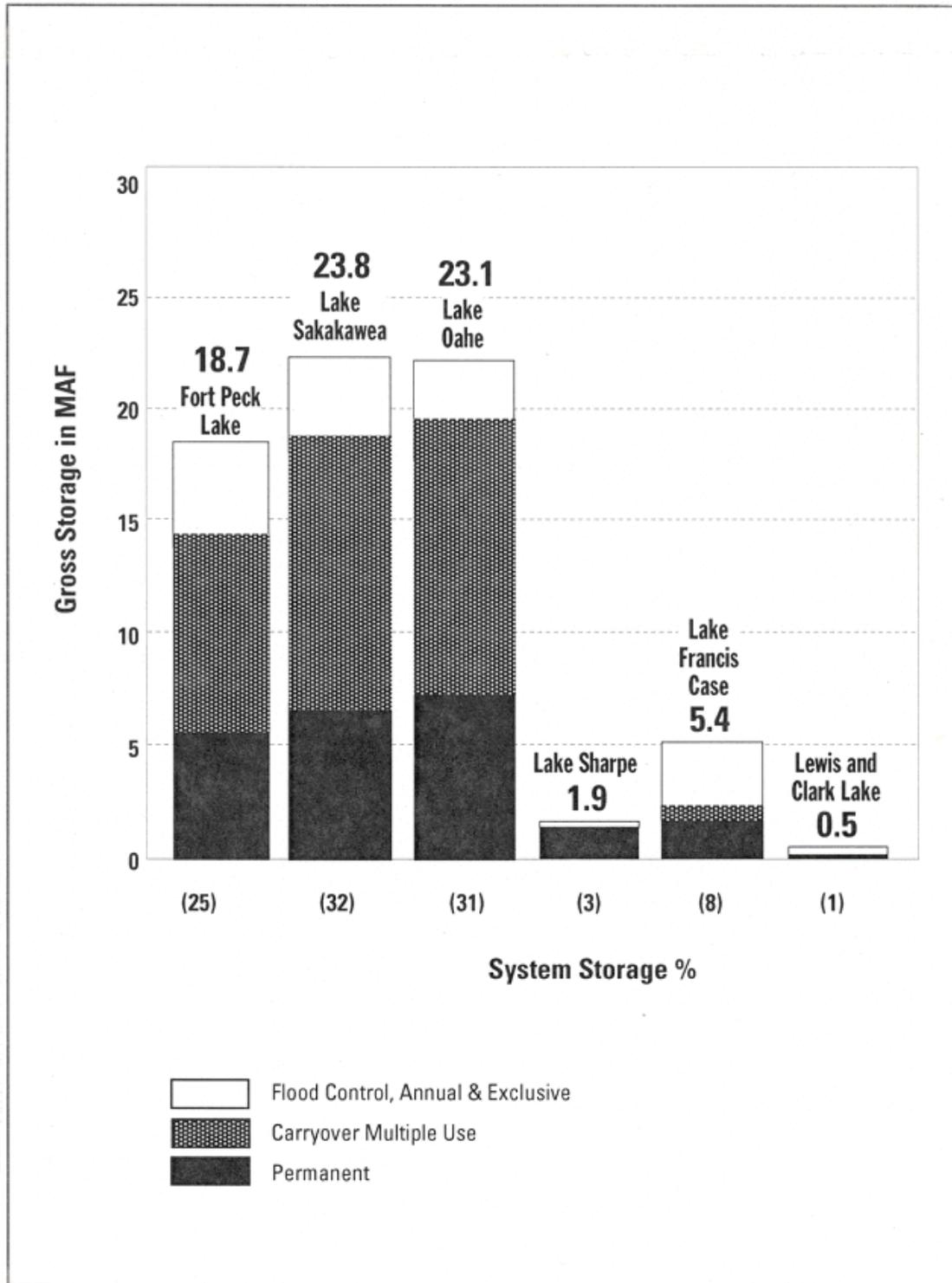


Figure 2 - Missouri River Mainstem Reservoir System storage by mainstem lake (As established in the current Master Manual).

Annual Flood Control and Multiple Use Zone

The next 16 percent of the System storage volume is reserved for annual flood control and multiple uses. It includes the System storage from 57.1 to 68.7 MAF (Figure 1). This zone is used to store the high annual spring and summer inflows to the reservoirs. Later in the year, water stored in this zone is released for riverine uses so that the zone is evacuated by the beginning of the next flood season on March 1. Evacuation is accomplished mainly during the summer and fall navigation season, because icing of the river may preclude high evacuation flows during the winter.

Carryover Multiple Use Zone

The largest portion of the System storage capacity, 53 percent, is designed to provide water for all uses during drought periods. The carryover multiple use zone includes storage between 18.1 and 57.1 MAF and is confined to Fort Peck Lake, Lake Sakakawea, Lake Oahe, and Lake Francis Case (Figures 1 and 2). It is operated so that it remains full during periods of normal inflow but is gradually drawn down during drought periods.

Permanent Pool

The remaining 25 percent of the total storage capacity is reserved as the permanent pool. Total capacity allocated for the permanent pool is 18.1 MAF. The permanent pool provides the minimal water level necessary to allow the hydropower plants to operate and to provide reserved space for sediment storage. It also serves as a minimum pool for recreation and for fish and wildlife habitat and as an ensured minimum level for pump diversion of water from the reservoirs.

Water Releases from the Reservoirs

The Master Manual provides criteria for releases from the flood control and carryover multiple use zones for flood control, navigation service, and non-navigation service. Each criterion relates to the amount of water in System storage. The criteria were designed so that System storage in the flood control zone can be evacuated in an orderly manner before the beginning of the next flood season. When storage volumes fall during extended droughts, cutbacks in System releases are made to conserve water. The criteria were originally designed so that the water in the carryover multiple use zones would be adequate to provide navigation service, though at a reduced level, through a drought comparable to that of 1930 to 1941.

Navigation Service Criteria

Augmenting downstream tributary flows by releasing water from the System provides support for navigation on the Missouri River below Sioux City. In drought periods, storage water is limited and cutbacks in releases may shorten the navigation season and

reduce navigation service. The current Water Control Plan (CWCP) has two criteria for reducing navigation service in droughts: navigation service level and season length.

The first step in conserving water in storage is to cut back releases to those necessary to provide a full service level (approximately a minimum of 8.5 feet of draft). As storage declines in a drought, the navigation service level is reduced a maximum of 6 thousand cubic feet per second (kcfs) to minimum service (7.5 feet of draft). The full navigation service level designation for the Missouri River navigation project is 35 kcfs. The downstream target flows are a minus or plus value from this service level designation. To meet full service, target flows are set at 31 kcfs at Sioux City and Omaha, 37 kcfs at Nebraska City, and 41 kcfs at Kansas City. Minimum navigation service is designated as 29 kcfs. To meet minimum service, target flows are set at 25 kcfs at Sioux City and Omaha, 31 kcfs at Nebraska City, and 35 kcfs at Kansas City.

On March 15 of each year, the level of navigation service is checked to determine if the service level should be changed based on the amount of water in System storage (Table 1). The season is normally scheduled to begin on April 1 at the river’s mouth at St. Louis. If water in storage is at least 54.5 MAF, full service is maintained by System releases. If there is 46.0 MAF or less, then minimum service is provided. Flows for navigation are proportionally set between 46.0 and 54.5 MAF, depending on the amount of water in storage.

Navigation support is suspended when the amount of water in storage on March 15 is 21.4 MAF or less. As the amount of water in System storage recovers, navigation support is restarted; this occurs when the amount of water in storage is 21.4 MAF or greater on March 15 of a succeeding year.

Table 1. Navigation service criteria for the CWCP.

Service Level—March 15 Check	
<i>Full Service (MAF)</i>	<i>Minimum Service (MAF)</i>
54.5	46
Service Level—July 1 Check	
<i>Full Service (MAF)</i>	<i>Minimum Service (MAF)</i>
59	50.5
Season Length—July 1 Check	
<i>8-month season (MAF)</i>	<i>5.5-month season (MAF)</i>
41	25

On July 1, after most of the inflow from the mountain snow pack has entered the System, service level and season length are checked to see what they should be in drought periods. Full service is provided if water in storage is 59 MAF or higher. Minimum service is provided if water in storage is 50.5 MAF or lower. When water in storage is between 50.5 and 59 MAF, the service level provided is set proportionally between minimum and full service, based on the amount of water in storage.

When July 1 storage drops below 41 MAF, the length of the navigation season is shortened. A full-length season, 8 months (March 23 to November 22 at Sioux City; April 1 through December 1 at St. Louis), is supported by System releases if water in storage is 41 MAF or more on July 1. From 41 to 25 MAF, the navigation season is shortened progressively from November 22 to September 7, depending on the amount of water in storage. If there is 25 MAF or less in storage and the March 15 check indicates there is enough storage to support at least some level of navigation, System releases are made to support a minimum season of 5.5 months (March 23 to September 7 at Sioux City).

Flood Control Criteria

Water Evacuation Regime

Water is released from the System reservoirs in most years to evacuate water from the exclusive and annual flood control zones. The goal is to evacuate all of the water from the annual zone by the beginning of each year's flood season (March 1). Most of the water is released during the summer and fall part of the navigation season because the potential for ice problems in the river limits the amount of evacuation releases in winter. (Ice reduces channel capacity and is subject to breakup and jamming, which could lead to flooding.)

Evacuating for flood control also benefits navigation up to a point, since flows for a 9-foot draft (about 3 kcfs above full service flows) are desirable. Water is evacuated during the navigation season by increasing flows in the river above those necessary to maintain full navigation service. The service level is increased above the full navigation service level of 35 kcfs; the amount of the increase depends on storage level, remaining evacuation time, and the estimated amount of water to be evacuated.

Limiting Navigation during Flooding

Gavins Point Dam releases exceed the navigation targets at Sioux City in at least three different circumstances. First, the navigation target location may be at either Nebraska City or Kansas City (the two downstream locations) when inflows between Sioux City and these two locations are not adequate to meet navigation target flows. Second, in years when excess water in the flood control storage zones needs to be evacuated at a rate greater than just meeting the navigation targets will allow, flows in excess of the Sioux City navigation target value result from the higher Gavins Point Dam releases. Third, if inflows increase fairly quickly upstream from Sioux City, the navigation target flow may also be exceeded. In any of these cases, Gavins Point Dam releases do not have to be reduced unless the flow at three downstream target locations exceeds specified levels that are indications that the downstream flooding potential has increased and actions should be taken to reduce the flooding potential. The specified levels, or flows, are referred to as flood control constraints. When these flood control constraint values are met or exceeded, Gavins Point Dam releases are reduced to provide full navigation service. The two sets of flood control constraint targets are specified in the Master Manual. The lower constraints at the flood control target locations are as follows: Omaha – 41 kcfs;

Nebraska City – 47 kcfs; or Kansas City – 71 kcfs. At higher specified river flows, or flood control constraint values (46, 57, and 101 kcfs, respectively, for the three target locations), the navigation support is reduced to the minimum service value or it is reduced by the amount the flow exceeds the flood control constraint target value, whichever results in the higher Gavins Point Dam release.

During high inflow years in nondrought periods, the specified values for the flood control constraints can be increased to correspond to higher service levels. For example, in flood storage evacuation periods, a higher service level is established to allow the increased releases from System storage. If the service level increase is 5 kcfs, the specified flow values at the three target locations are raised 5 kcfs. On rare occasions, releases from Gavins Point Dam are reduced to 6 kcfs (which is the level required to meet the Yankton water intake requirement); this was done during the 1993 Missouri River flood because flood flows on the Lower River forced the suspension of navigation.

Non-navigation Service Criteria

The CWCP specifies minimum releases to the Lower River in times of drought when navigation releases are suspended. During the winter non-navigation season (usually December 1 through March 30 at St. Louis), a reduced service level is maintained in the Lower River by flow releases from Gavins Point Dam. Under the CWCP, if the water in System storage is 58 MAF or higher on September 1, a minimum of 15 kcfs is released from Fort Randall Dam for the Lower River. If the amount of water in System storage is 43 MAF or less on September 1, the Master Manual specifies that 5 kcfs be released. These releases translate to 16 and 6 kcfs, respectively, from Gavins Point Dam. Releases vary proportionally for storage levels between 43 and 58 MAF.

The CWCP also specifies that in all seasons “releases from Gavins Point will be reduced to the minimum necessary for water intake or water quality requirements” (Corps, 1979). Changes in the river channel below Gavins Point Dam have necessitated non-navigation service levels higher than 6 kcfs. A minimum release of 9 kcfs is currently considered necessary from spring through fall to meet stage requirements for water supply intakes when navigation service is suspended to conserve water during extreme drought. During the winter, when ice forms on the Lower River, an average release of 12 kcfs is considered necessary for water supply intakes.

Intrasystem Regulation of Water

Although the current Master Manual does not provide specific rules for water releases from dams other than Gavins Point Dam, general water release criteria are presented for the other five dams. Intrasystem regulation of the System to meet the needs for power generation follows a seasonal pattern at each of these dams. Demands for water releases for navigation generally set the seasonal intrasystem regulation patterns. The gain or loss in water stored at each reservoir must also be considered in scheduling the amount of water transferred between reservoirs to achieve intrasystem balance while generating power.

The largest amounts of water are released from Gavins Point Dam during the navigation season. Because there is little multiple purpose storage in Lewis and Clark Lake, water for releases from Gavins Point Dam must be provided through releases from Fort Randall Dam. Fort Randall Dam, in turn, requires similar support from Big Bend Dam releases, and Big Bend Dam requires support from Oahe Dam releases. Here the chain is interrupted because Lake Oahe has sufficient annual flood control and multiple use and/or carryover multiple use storage to supply all downstream demands. During the fall, navigation demands are met for a short time by releases from Fort Randall Dam. The space evacuated in Lake Francis Case is then used to store water released from Oahe and Big Bend Dams in the winter. Water is released from these dams to produce hydropower during the daily peak power demand periods without causing ice-affected flooding in the downstream reaches, particularly downstream from Gavins Point Dam.

In winter, Gavins Point Dam releases are generally at their lowest level, and power demands are predominantly met with generation at the four upper dams. Increased winter power releases from Fort Peck and Garrison Dams allow refilling of Lake Oahe before the next navigation season.

In general, the movement of water in storage from one reservoir to another follows a basic pattern each year, but short-term adjustments in intrasystem regulation are occasionally necessary. Heavy runoff may raise river stages or reservoir levels at one project, necessitating cutbacks at another project. Very hot or cold weather may create sharp increases in demand for power and, therefore, require higher releases of water. Prior to about 1984, there was no purposeful effort to enhance the resources in one of the upper three reservoirs at the potential expense of resources in the other two reservoirs. More recently, opportunities to provide such a benefit have been considered and sporadically implemented. Had the Missouri River basin not entered another drought in 2000 and 2001, the Corps would have begun the implementation of a prescribed pattern for intrasystem regulation in 2001.

Daily Water Release Patterns

At all projects except Gavins Point Dam, hourly release rates may be varied widely to meet power demands. Minimum release rate restrictions apply to Fort Peck and Garrison Dams to protect downstream water supply intakes and some fish species. Minimum Oahe Dam releases are provided on weekends during the fishing season to enhance the tailwater fishery. A uniform peaking release pattern has been established during the summer from Fort Peck, Garrison, and Fort Randall Dams to protect endangered birds nesting along the river below the dams. At Oahe and Big Bend Dams, there are no constraints and hourly flows generally vary from 0 to 56 kcfs at Oahe Dam and 0 to 110 kcfs at Big Bend Dam. Minimum hourly release constraints are prescribed for Fort Peck and Fort Randall Dams during fish spawning periods.

Water Release Constraints for Threatened and Endangered Species

At Gavins Point Dam, releases have historically been constrained to limit adverse impacts to the threatened and endangered birds during the mid-May through mid-August nesting season. This is normally accomplished by making higher-than-needed late-spring and early-summer releases to anticipate the demand for late summer navigation releases. The higher steady releases begin in mid-May to ensure the flexibility needed for meeting downstream navigation targets through the summer. The releases were increased from mid-May through late August to compensate for the generally lower contributions from downstream tributaries during this period. The current higher steady release can be reduced for 2 days during the nesting season if the downstream flood control targets are exceeded. By the third day, the sand becomes dry and the birds may nest in the dry sand. By ensuring that the reduced release does not continue for more than 2 days, the Corps limits the possibility that a tern or plover will nest below the level that would be covered with water at the specified higher release. During the 1987 to 1993 drought, the specified higher release was made every third day instead of continuously to conserve water.

Average daily releases cannot exceed the specified level during any day of the nesting season except during required flood storage evacuation. Fort Randall Dam releases follow a similar pattern to ensure that river levels and Lewis and Clark Lake levels do not fluctuate excessively during the nesting season. Fort Randall Dam and Garrison Dam releases have hourly peaking limitations because of these constraints.

In 2002, the Corps followed a second mode of operation to reduce releases from the System during the third year of drought. This option is to set Gavins Point Dam releases to those that just meet the target flows at the four target locations on a daily basis all summer, increasing and decreasing releases during the season as needed. Operation under this mode was followed because the fledge ratio goals agreed to by the Corps and the USFWS in the November 2000 BiOp had been met in the years prior to 2002. Because releases may need to be increased under this mode of operation to meet the downstream target flows, potential taking of the birds may become an issue during the nesting season, as was the case in 2002. The Corps elected not to take birds that year by not increasing releases to meet downstream target flows, beginning in early July.

In 2003, the Corps and USFWS agreed upon a third option, which was a combination of these two modes of operation. An initial flat release that was lower than “normal” was selected, and the Corps had the option to increase the release if the initial release were inadequate to meet downstream navigation target flows as long as the take of birds was no greater than 121 eggs and chicks. As of the completion of this BA, the 26-kcfs flat release has been adequate to meet the downstream needs; however, releases may need to be increased through the end of the bird-nesting season to meet navigation target flows. Inflows from tributaries downstream from Gavins Point Dam dictate the level of releases from Gavins Point Dam that are required to meet the navigation target flows, and the 26-kcfs flat release could be inadequate to meet the target flows unless adequate rainfall runoff from the tributaries were to occur over the next 3 to 4 weeks.

In summary, three modes of operation could be followed under the PA. The more common one is the flat release; however, making lower releases just to meet downstream target flow requirements or combining a lower flat release followed by target releases, if necessary, are two options, especially during droughts, to retain more water in storage in the System.

Drought Conservation Measures

During extended drought periods, navigation service would be reduced earlier than it currently is under the CWCP. This would allow more water to be stored in the upper three lakes (Fort Peck, Sakakawea, and Oahe). During severe droughts, releases for navigation would be eliminated at a higher total system storage level than under the CWCP.

The drought conservation criteria for navigation consists of trigger points (storage levels) of 54.5 MAF of water in storage on March 15 and 59.0 MAF on July 1. If the amount of water in system storage were at or below those levels on those dates, navigation service would be cut from the full service level and an 8-month season. Instead, an intermediate service level 3 kcfs less than full service (and 3 kcfs more than minimum service) and a season length of 7.1 months (7 months and 3 days) would be followed in that year. A second navigation criterion would be checked on July 1. If there were no storage gain between March 15 and July 1, navigation support releases would be further cut to minimum service (6 kcfs less than full service). This minimum service level would be provided for the remainder of that 7.1-month season and for the period from April 1 through August 20 of the next season. The service level could not be increased to the intermediate level on July 1 of the second season because terns and plovers would still be located on islands in the Fort Randall and Gavins Point Dam reaches until about August 20. This second, more stringent navigation criteria would occur primarily in the more severe drought years (about 8 years in the 100-year period modeled).

One other navigation criterion is included. To limit drawdown of the lakes during the more severe droughts, a storage level is specified that precludes navigation. If the amount of water in storage on March 15 is less than 31 MAF there will be no navigation season that year. This would result in a higher storage level in a severe drought than under the CWCP.

Unbalancing the Upper Three Lakes

Under the CWCP, when system inflows are above or below normal, the amount of water in the upper three (largest) lakes is balanced so that the effects are shared equally among these lakes. To avoid jeopardizing the listed species, the Corps has included unbalancing the amount of water in these lakes as long as an extended drought (more than one year long) or an extremely high runoff into the system is not occurring. Unbalancing also provides benefits to young fish in these three lakes. Unbalancing the upper three lakes was recommended by the USFWS in its 2000 BiOp.

The water in system storage is unbalanced in “normal” years. In years when there is water high in the flood control storage zones of the system, this excess water is distributed on a somewhat equal basis among the upper three lakes. Similarly, when the basin is in the second year of an extended drought (greater than 1-year drought), the empty storage space is distributed on a somewhat equal basis among the upper three lakes. In those years in which there is not an excessive amount or a shortfall of water in storage, a 3-year cycle of unbalancing is followed. In the unbalanced mode of operation, the lakes are allowed to float down the first year, held down the second year, and allowed to refill the third year. The unbalancing cycle rotates among the upper three large lakes on a 3-year cycle. The endangered species inhabiting the reaches between the three lakes benefit from this procedure as high flows are good for the native river fish and for clearing vegetation from the islands and sandbars and the subsequent low flows maximize the amount of clear sand that is exposed. The fishery in the lakes benefits as the perimeters of the lakes provide a place for vegetation to grow, which becomes spawning habitat and hiding habitat for the young-of-year fish after hatching. The bare sand around the lakes also provides habitat for the nesting of the two listed birds, the least tern and piping plover.

HABITAT CREATION, ENHANCEMENT, AND MAINTENANCE

Under this category, the existing efforts to create shallow water habitat for the pallid sturgeon and emergent sandbar habitat for the least tern and piping plover would continue to be expanded to meet the habitat acreage amounts specified in the 2000 BiOp. Further, additional habitat enhancement efforts would be undertaken to provide even more and potentially better habitat for all three species. A combination of non-flow and flow measures would be used to accomplish this effort. The enhancement efforts involve some tests. All of the habitat construction efforts, whether tests or continuing construction, will require continual biological and physical monitoring. Biological monitoring to determine the impact of the habitat on meeting species life cycle requirements, and on species population and distribution is critical. Physical monitoring of the amount and quality of habitat will be conducted since river flows affect the geomorphology of the riverbed and other channel features. To achieve the long-term objective of the Corps to maintain the quantity of habitat at the level of the goals specified in the 2000 BiOp RPA, this monitoring is necessary.

Shallow Water Habitat

The 2000 RPA specifies a goal of 20 to 30 acres of shallow water habitat (SWH) per mile in the Missouri River below Ponca, Nebraska, by 2020. The habitat goals may be achieved through flow management, river widening, (notching/dike modifications), restoration of side channels, or combinations thereof. The 2000 RPA also sets performance standards, which include no-net-loss of existing SWH and interim goals of meeting specified percentages of total habitat acreage by specific dates. The Corps is committed to utilize existing authorities, and when required seeking new authorities, to meet the SWH goals set in the 2000 BiOp. The Corps’ most immediate goal is the

development of 2,000 new SWH acres between the period of 2000 to 2005. Between the period of 2005 to 2020, the Corps will continue to modify existing river conditions to assure that the river will have a total amount of 20 to 30 acre/mile of shallow water habitat.

The Corps is committed to achieving or exceeding these goals. These actions will require acquisition of all necessary real estate interests (willing seller requirement), collection of physical and biological baseline data, National Environmental Policy Act (NEPA) documentation, and design and construction work. To meet these goals, river conditions must be conducive to construction work. Extremely high river stages will prevent construction from proceeding on schedule, and extended periods of low flow will slow a number of construction efforts. This has the greatest likelihood of impacting the short-term goals. Long-term goals should not be impacted.

Actions initiated to date to meet the goal of 2,000 additional acres of SWH habitat by 2005, funded under the O&M program and the Missouri River Fish and Wildlife Mitigation Project include: excavation of over 400 notches, construction of reverse dikes/notches at Marion and Plowboy Bends, side channel construction at Overton Bottoms and Tobacco Island, buried dike excavation and notching at Overton, chevron construction and dike lowering near Nebraska City, and modification of dike maintenance at selected locations from Sioux City to the mouth to encourage aquatic habitat development.

Currently, The Corps is seeking additional authority and funding to accelerate construction of SWH. This additional funding and authority will enable the Corps to meet the 2005 goal and, with the current planning effort underway, exceed the RPA specified 2010 goal by 1960 acres. Development of SWH will be aimed at creating a more dynamic alluvial channel that provides greater depth and flow diversity over a wider range of flows.

Consistent with the 2000 BiOp, measurement of SWH acres will be based on the depth distribution for a 50 percent exceedence flow in the month of August. To determine the success of future or past SWH development projects, the Corps will conduct physical monitoring of selected sites to determine the amount of habitat created and available. Monitoring will consist of collecting bathymetry, velocity, and bed material data. A smaller set of sites will be modeled in detail in an attempt to determine long-term viability. The results of the monitoring effort will be integrated with basin-wide biological monitoring efforts to determine the biological effects of the created SWH.

In future years, as habitat development progresses and the biological needs of the pallid sturgeon are better understood, the SWH program can be easily adapted to meet the critical needs of the species.

The following actions will be taken to meet or exceed the short-term goals outlined in the 2000 BiOp.

Ponca State Park to Rulo, Nebraska

A goal has been set to construct an additional 1,000 acres of habitat in the reach below Sioux City and an additional 960 acres in the Kenslers Bend reach upstream from Sioux City. These two reaches are important because the current level of habitat is relatively scarce, averaging about 2 acres per mile in the reach downstream from Sioux City (Table 7.7-7 of the Revised Draft EIS for the Master Manual Study). The Corps is in the final design stages of chute/backwater projects at Glovers Point Bend (RM 712), Hole-in-the-Rock (RM 706), and Kansas Bend (RM 546). Construction of major dike modification is underway in the Nebraska City area, and additional site plans are being prepared for implementation in FY 2004 and 2005. The Omaha District and the Papio-Missouri River Natural Resources District are currently constructing a Section 1135 Project for SWH at Blair, Nebraska.

Rulo, Nebraska to the Mouth

The current notching program to enhance and diversify existing SWH areas will be continued and accelerated where possible, as long as private property interests are not impacted. This program consists of strategically placed 50' to 100' notches constructed in some of the existing 3500 rock structures below Rulo. The notches are placed to increase flow between structures during normal to high river stages. The effect is to diversify and enhance the habitat currently present within existing high banks. This program will ensure the 2000 BiOp performance standard of no-net-loss of existing SWH is met. Currently, structure modifications are being constructed at Overton Bottoms and a side channel is in the design phase for Worthwine Island. Initial planning efforts are underway to design and construct extensive structure modifications and/or side channels at Marion Bottoms, Eagles Bluff, Franklin Island, Jameson Island, and Baltimore Bend. The goal is to complete this work by the end of 2005.

It should be noted that Table 22 of the 2000 BiOp states that comparable data of existing SWH was not available for segments 14 and 15. New data provided by the Corps in the Supplemental BA for the 2002-2003 Annual Operating Plan shows that the lower Missouri River, from the mouth of the Grand River (RM 250) to the mouth of the Osage River (RM 130), averages 18.3 acres/mile of existing SWH. Due to the local channel geometry and the reach hydrology, it is reasonable to assume that from the mouth of the Osage River (RM 130) to the mouth of the Missouri River (RM 0) the quantity and quality of SWH would be at least equal to that in the Grand to Osage River reach. The fact that 250 miles of the lower Missouri River already averages nearly 20 acres/mile of SWH is very significant as we try and identify what adaptive management is needed to try and save the pallid sturgeon.

Floodplain Reconnection

The 2000 RPA recommended improvements to terrestrial floodplain habitat be made to avoid the likelihood of jeopardizing the pallid sturgeon, least tern and piping plover and to provide incidental benefits to native candidate species and other non-listed species in the Missouri River System. Implementation of these "ecosystem" elements is recommended to offset jeopardy to the listed species and the ecosystem upon which the

continued existence of these species depend, and may possibly help preclude the listing of other species. Through the existing BSNP mitigation program, the Corps has obtained real estate interests in over 36,000 acres of land from Sioux City to the mouth. Floodplain reconnection has taken place on many of these areas through breaching or moving existing levees. Additionally, the Corps has restored numerous acres of agricultural lands to riparian forest, wetlands, and prairies.

The Corps is committed to reconnecting the river to its floodplain wherever possible; however, several conditions must be met to ensure the goals can be attained. These include:

- acquisition of necessary real estate interests (willing seller requirement and easements);
- receipt of appropriate funds;
- land acquired must allow floodplain reconnection without induced damages to neighboring lands; and
- existing project purposes such as navigation and flood control are not adversely impacted.

Floodplain reconnection is already underway below Sioux City. Approximately 8,000 acres have been reconnected since the 2000 BiOp was published. An example of this effort is on the Overton North mitigation site where an existing agricultural levee was breached and 3,500 acres has been opened up to the river. This area has received floodwaters the past three springs for periods of two to eight weeks. Combined with the native vegetative plantings and natural regrowth of the area, this floodplain reconnection has greatly improved the floodplain habitat for a large variety of listed and non-listed species.

The existing mitigation program authorization is to acquire and develop habitat on 166,750 acres. The Corps proposes to continue this program to enhance habitat opportunities for native fish during spring time flood flows through moving back or breaching existing levees wherever possible. The Corps will also continue native vegetative plantings to increase the amount of riparian forest habitat for the Bald Eagle.

Emergent Sandbar Habitat

The 2000 RPA specifies varying amounts of emergent sandbar habitat (ESH) for the four reaches of the Missouri River currently used by least terns and piping plovers for nesting. By 2005, the recommended minimum habitat during the nesting season (to be measured in late July) is to be 40 acres per mile downstream from Gavins Point Dam, 40 acres per mile in Lewis and Clark Lake, 10 acres per mile downstream from Fort Randall Dam, and 25 acres per mile downstream from Garrison Dam. According to the 2000 BiOp, this habitat should be comprised of a minimum of 60 percent dry sand.

Efforts are currently underway by the Corps to provide some of the required additional habitat. Under this action, the rate of habitat construction in these reaches will be accelerated. All available habitat creation, enhancement, maintenance and reconstruction

methods will be utilized to provide suitable ESH in the critical reaches and new methods will be investigated. These methods include, but are not limited to, the following:

- Increasing the height of existing submerged sandbars utilizing dredges to pump and place material to create exposed sandbar conditions.
- Mechanical manipulation of existing sandbars by pushing submerged sand to exposed elevations utilizing bulldozers, and/or excavators.
- Contouring existing sandbars to either minimize high dunes or to add minor topographical height variations utilizing bulldozers, front-end loaders, scrapers and/or excavators.
- Contouring existing sandbars to provide depositional areas for organic material, wetted areas, and/or shallow ephemeral pools to increase forage production and forage availability.
- Investigate supplemental nitrification of sites with poor or insufficient forage production.
- Set up and removal of sand fences on existing habitat areas to add important microhabitat features and/or create dunes to add topographical variations.
- Short term armoring of productive nesting areas with temporary materials such as logs or bales.
- Vegetation removal by aquatically approved pre- or post-emergent herbicide application (e.g., glyphosate or arsenal), or, by utilizing scrapers, mowers, discs, chippers or similar type machines or by burning.
- Creating dynamic sandbar complexes by cutting shallow water channels through existing large sandbars.
- Reducing localized predator impacts by removal of land bridges and perches.
- Enhancing terrestrialized linear habitats with livestock enclosures and enclosures, peninsula cutoffs, and providing site security through slope reductions, and/or substrate modifications.

Because of the extent of recommended habitat, considerable new habitat will need to be constructed. Three tests would be conducted to determine the extent that additional habitat can be constructed with flows in Lewis and Clark Lake and in the reach downstream from Gavins Point Dam and to determine if constructed sandbars can be conditioned to provide better habitat for the least terns and piping plovers.

One test would be conducted downstream from Gavins Point Dam in the fall after the System has been refilled following the current drought. The test will consist of a release of approximately 60 kcfs for a period of approximately 60 days. The test would be monitored for physical changes in sandbar distribution and characteristics in the reach of the river from Gavins Point Dam to Ponca State Park. Representative island/bars will be monitored to determine the factors that limit the initiation of scour, and tests would be performed on techniques that may aid the scouring process. Examples include vegetation removal prior to the test discharges, physical conditioning (i.e., disking) prior to the test, etc. This would increase the total amount of bare sandbar habitat in this reach and would allow for a redistribution of the habitat.

To provide adequate water required for this test, there must be adequate system storage. Several other conditions would also have to be met prior to implementation. These include:

- The hydrologic conditions in the lower basin would have to be normal or drier.
- Appropriate National Environmental Policy Act (NEPA) documentation.
- Collection of pretest data. This would consist of surveys of the reach of the river between Gavins Point Dam and Ponca State Park, aerial photography, and detailed mapping of selected sandbars.
- Coordination with stakeholders.
- Appropriate economic mitigation measures and stop protocols will need to be in place to minimize adverse impacts on the Lower River.

A second test that includes a fall rise out of Fort Randall Dam would also be conducted. This action would consist of producing a controlled rise in releases from Fort Randall Dam preceded by a lowering of the pool in Lewis and Clark Lake to be conducted after Labor Day. The purpose of the rise is to further define sediment-flushing parameters and to re-work the sediment deposits in the delta area. This would increase the amount of tern and plover habitat in the reach below Fort Randall Dam and will further the basin's understanding of the sediment flushing requirements, as stated in the 2000 BiOp. The releases from Fort Randall Dam could be as high as 60 kcfs, and the pool at Lewis and Clark Lake could be as low as 1180 feet mean sea level (ft-msl). The length of the test would depend on the rate that the Lewis and Clark Lake pool is refilled, which depends on the release rate from Gavins Point Dam. It could be conducted at the same time as the fall rise test downstream from Gavins Point Dam or it could be conducted on its own. If it were run with the Gavins Point Dam fall rise, the duration could be up to 60 days. If it were run by itself, the estimated test length is 5 days.

This test has many of the same conditions as the fall rise from Gavins Point Dam. These include:

- Storage in the system would have to be adequate to support the test. Also, the Lewis and Clark Lake elevation would have to be no greater than 1185 ft-msl.
- Appropriate NEPA documentation.
- Collection of pretest data. This would consist of surveys of the reach of the river between Fort Randall Dam and fore set of the delta and aerial photography.
- Obtain funding for design, surveys, monitoring, evaluation, and report preparation.
- The test would be suspended or canceled if higher than normal discharges were to come from the Niobrara River. High flows from the Niobrara River will cause excessive flooding in the confluence area, and will alter the nature of the sediment-flushing test.

Finally, a third test, habitat construction and conditioning of it, will be conducted downstream from Gavins Point Dam. Under this test, new sandbar habitat would be constructed following the fledging of the least terns and piping plovers. As releases from Gavins Point Dam are increased the following spring to meet the navigation service requirements, arrangements would be made to make releases in excess of that planned to serve navigation such that the new sandbar habitat would be inundated for a day or two. This may consolidate the substrate and potentially mix organic material in the surface layer. The objective of this test is to determine if there is a difference in least tern and piping plover productivity between the conditioned habitat and the habitat that is constructed and not inundated.

This test would also have some conditions that would have to be met prior to the test. These include:

- Appropriate NEPA documentation.
- Collection of pretest data.
- Obtain funding for design, surveys, monitoring, evaluation, and report preparation.

Emergent sandbar habitat is also susceptible to change as the river flows vary from year to year. To be responsive to the changes, the Corps will monitor the habitat annually as plans for construction and maintenance of this habitat progresses from year to year.

Riverine and Reservoir Habitat Monitoring and Evaluation

A comprehensive habitat monitoring and evaluation program is crucial to insure habitat goals in the 2000 BiOp are met, and that the habitat requirements of the species are being fulfilled. The Corps proposes an expansion of its ongoing habitat assessment program to provide annual monitoring of riverine (emergent sandbars) and reservoir (island, shoreline) habitats. This program will integrate remote sensing information with a statistically based sampling design to provide estimates of habitat quantity and quality. Program measurements will include known habitat characteristics of importance, such as vegetation structure and dynamics, physical and topographic characteristics, substrates, forage resources, and juxtaposition of habitat types, as well as currently unknown factors that may be integrated, as their significance becomes known.

The Corps' riverine and reservoir habitat monitoring program is designed to:

- Provide annual estimates of habitat quantity and quality for emergent sandbar and reservoir habitats, and provide estimates of the effects of future operational scenarios on habitat attributes,
- Measure the effect of operational and management activities on emergent sandbar and reservoir habitat attributes,
- In conjunction with least tern and piping plover productivity monitoring, address the effects of emergent sandbar and reservoir habitat conditions on population, productivity, and survival rates,
- Address the monitoring and evaluation needs of ESH creation, enhancement, maintenance, and reconstruction projects, and to provide pre- and post-test data

for flow tests to determine the effectiveness and efficiency of various habitat creation methodologies,

- Identify areas for habitat improvement projects and provide structured methodologies for prioritizing tasks.

The long-term objective of the Corps is to attain the quantity of habitat at the level of the goals specified in the 2000 RPA and to maintain it at those levels.

The above flow tests to create ESH are included in this description of the Corps' proposed action, due to their experimental nature, and any future actions would be addressed in an adaptive management strategy.

PALLID STURGEON PROPAGATION SUPPORT

The 2000 BiOp RPA states, "To partially offset jeopardy to the pallid sturgeon as a result of system operations, the Corps shall assist in pallid sturgeon propagation and augmentation efforts and subsequent monitoring of the stocked pallid sturgeon juveniles in those recovery priority areas in the Missouri River Basin that are identified in the Pallid Sturgeon Recovery Plan. That program shall start in 2001 and continue through 2011, with an evaluation of the propagation and augmentation efforts in 2003." In 2003, the Corps is enhancing pallid sturgeon propagation activities at six rearing facilities to assist in achieving annual stocking goals. These include the Bozeman Fish Technology Center (FTC), Garrison Dam National Fish Hatchery (NFH), Gavins Point NFH, Neosho NFH, all operated by the USFWS; the Miles City State Fish Hatchery (Montana SFH); and the Blind Pony State Fish Hatchery (Missouri SFH). Funding will continue to be provided by the Corps for these types of activities.

Propagation efforts are coordinated through the Upper and Middle Basin Workgroups as well as a Propagation Workgroup to achieve annual stocking goals. The "Propagation Workgroup" was cooperatively established by the Corps and the USFWS in 2002 and comprises members representative of the Corps, USFWS and the States of Montana and Missouri possessing the unique knowledge and experience critical to successful propagation of pallid sturgeon. The Propagation Workgroup prioritizes propagation needs each year to facilitate achievement of the "Average Annual Shortfall" (Corps' responsibility) as identified in RPA Element VIA of the 2000 BiOp. A prioritization list is generated and is utilized to determine where the Corps directs assistance for the population/augmentation program each year. The program has been structured to exceed propagation efforts related to the average annual shortfall.

Annually, the workgroup members submit their supplemental needs to fulfill stocking requests for each of the Recovery Priority Management Areas (RPMAs). The Corps provides supplemental support to each facility producing pallid sturgeon. The level of support provided to each facility is determined by a priority ranking system that is administered by the Propagation Workgroup.

Additionally, the Corps has provided Passive Integrated Transponder (PIT) Tags and accessories for use in hatchery produced pallid sturgeon. The Corps provides training in PIT tagging of juvenile pallid sturgeon as well as providing assistance with tagging operations, fish distribution and stocking activities. The Corps has also provided cryopreservation equipment for pallid sturgeon milt storage to ensure that genetic material is available if wild fish and/or captive broodstock are unavailable. Currently, milt from all males collected for spawning purposes is preserved to ensure that the genetic material of each specimen is not lost.

The program has enabled the facilities to upgrade water systems, fish transport units, holding and rearing capabilities as well as a variety of miscellaneous items. Water intake systems have been modified to improve water quality through filtration and ultraviolet disinfection reducing the risk of disease and parasite outbreaks. Transport trailer and tank replacement have provided improved capabilities of the broodstock transport from the river back to the hatcheries for spawning. The upgraded system reduces handling and stress on the adult fish reducing the risk of mortality associated with the propagation program. The Corps is committed to continuing the cooperative efforts and support for the pallid sturgeon propagation and augmentation program.

In 2002 and 2003, support for the population augmentation program has facilitated enhancement of propagation and stocking to a level exceeding all previous efforts. In 2002, 13,550 pallid sturgeon juveniles were stocked into four primary areas of the Missouri River. These areas include Recovery Priority Management Areas (RPMA) 1-4 as identified in the Pallid Sturgeon Recovery Plan and are as follows including numbers of fish stocked in 2002: 1) the Missouri River above Fort Peck Reservoir (2,058) 2) the Missouri and Yellowstone Rivers downstream of Fort Peck Dam (3,061) 3) the Missouri River downstream of Fort Randall Dam and (1,025) 4) the Missouri River From Gavins Point Dam to the mouth (7,406). Table 23 of the BiOp identifies an annual total maximum target of 4,700 fish. Included in this total are the annual needs to develop the future captive broodstock (9 families of up to 50 individuals per family). The Corps share of the total production target is 2,973 fish, the “Annual Average Shortfall.”

Stocking efforts are underway in 2003. Progeny from the 2002 year class were stocked in the Fort Randall Reach and the reach extending from Gavins Point Dam to the mouth in July of 2003. In the Fort Randall Reach, 300 juvenile pallid sturgeon were stocked in the Missouri River at Sunshine Bottoms and another 300 were stocked at Standing Bear Bridge (Fort Randall Reach). In the lower Missouri (Gavins to mouth), the Mulberry Bend (NE) site received 1,936 fish, the Bellevue (NE) site received 1,936 fish and 1,423 fish were stocked at the Franklin Island State Park near Booneville, Missouri. Several thousand additional juvenile pallid sturgeon will be stocked in RPMAs 2, 3, and 4 and possibly 1 later this summer or early fall.

Propagation levels have met stocking requests in each of the RPMAs as well as fulfilled the requirements of the “Average Annual Shortfall.” The continuation of the program will enable propagation and augmentation efforts to be maintained at a level exceeding the requirements identified in the BiOp.

Hatchery Facility Improvements

Propagation success has been limited by a variety of factors. Many of these limitations are related to hatchery production limitations and may be modified to increase production capabilities. A list of limiting factors has been identified by the Propagation Workgroup for the six facilities currently involved in pallid sturgeon propagation. The USFWS and the Corps have prioritized this list jointly with an emphasis on increasing production capabilities and improving water quality and water reliability to propagate pallid sturgeon of the highest quality possible. The Corps is seeking funding for the following hatchery facility improvements.

These improvements include additional broodstock holding capabilities (Broodstock Building and Well Water/Tower) at the Gavins Point NFH. The Gavins Point NFH is the only facility currently holding future broodstock. Future broodstock are held captive as a safety net in the event that wild fish are unavailable for continuation of the program. Currently, the Gavins Point NFH is at its maximum capacity. Facility expansion to accommodate the holding of the future broodstock will provide a reduced stress environment by reducing holding densities. This expansion also enables the facility to participate as the lead facility in spawning efforts, as the expansion would provide space for holding wild broodstock. Additionally, this expansion would enable the facility to utilize the existing infrastructure for production and stocking of pallid sturgeon, essentially doubling the capabilities of the hatcheries current production.

Additional improvements include building expansion and construction of a pallid sturgeon culture building at the Neosho NFH. Currently, the facility has the ability to rear approximately 3,000 pallid sturgeon. These facility expansions would triple the production capabilities and enable the facility to spawn wild pallid sturgeon collected from the lower Missouri and Middle Mississippi Rivers.

A fatty liver condition has been identified in most all of the pallid sturgeon reared in the hatcheries that are on commercial feeds. Commercial feeds utilized for salmonids and other species have been labeled as unsuitable for sturgeon; however, limited suites of feeds are available for sturgeon culture. The Bozeman FTC has the expertise to develop and manufacture specialty feeds for a variety of species. This facility has conducted research regarding feed development and conducted feed trials evaluating performance, growth and overall health on multiple species over the past decade. Special formulations and development of compatible and suitable feeds requires a variety of unique equipment. Pallid sturgeon propagation and augmentation have been identified as an essential component to the recovery of pallid sturgeon (at least initially); therefore, it is critical to produce and stock fish of the highest quality possible. Proper nutrition is a necessity to achieve this goal.

The Blind Pony SFH has a single water source (Blind Pony Lake) that is currently affected by the drought conditions. Four interrelated modifications have been identified for the Blind Pony facility.

- Lake Dredging
- Water Supply Line
- Water Chiller
- Building Renovation/Expansion

Since the facility relies on a single water source, the storage capacity of the water supply would be improved by dredging. The increased water storage would maintain a more constant temperature less susceptible to rapid temperature spikes and dips that are common with small impoundments.

Simultaneously with the dredging operation, the water supply line leading from the lake to the endangered species portion of the facility should be replaced. The existing pipeline is original and water reliability is questionable with the transit pipe.

During extreme heat conditions, the facility does not have the capability of controlling water temperatures that may impose lethal levels of stress on the fish. A water chiller would provide the relief during the extreme heat conditions by enabling the crew to blend cooler water with the ambient lake water.

Currently, concrete raceways are being utilized for sturgeon production. These structures are covered by a metal roof, but lack both security and protection from predation. An enclosed pole shed would provide security and protection from vandalism, predation and weather conditions. A portion of the raceways would be removed in conjunction with this renovation and upgraded to circular tanks. The upgraded water supply line would be installed to accommodate these renovations.

The combination of facility improvements would increase production capabilities from 6,000 to 14,000 fish annually.

Lake Sakakawea is the water source for the Garrison Dam NFH. Although the lake provides an abundance of water, the temperature range is below the requirements needed to obtain growth in an intensive culture environment for the pallid sturgeon. As a result, water must be heated to provide suitable temperatures necessary for spawning and rearing activities. Several potential options have been explored. The simplest option is to increase the power capabilities to the hatchery and install boilers to heat the water. Other options include installing heat pumps in conjunction with a water reuse system. This option is less ideal because of water quality issues associated with reuse systems and the increased potential for disease and parasite outbreaks.

Increasing the power capabilities and installing boilers at the Garrison Dam NFH would provide the ability to mimic ambient river temperatures that correspond with photoperiod. Currently, the existing heat exchangers are run at the most efficient times which do not coincide with normal river temperature because of the typical time lag between when the river warms up in the spring and when the lake warms up in the spring. This same effect takes place in the fall when the river temperatures decline more rapidly than the large reservoirs.

The Miles City SFH has undergone minor modifications in the past couple of years to accommodate pallid sturgeon propagation activities. An addition to the existing building would enable the facility to hold broodstock in the spring separate from production fish. Currently, the broodstock holding tanks displace production tanks (rearing space) during spawning activities.

The building expansion doubles production capabilities for the facility and reduces the risk of disease transmission because the wild broodstock would be held separately (isolated) from production fish.

The existing water supply system at the Miles City SFH contains a high sediment load. Renovation of the existing supply system would provide increase natural settling of particles that otherwise would require multiple filtering prior to passing through the ultraviolet disinfection system.

Renovation of the existing water supply system improves water quality and reduces the potential for disease and parasite outbreaks.

The geographic range that these pallid sturgeon need to be distributed across (from Montana to Missouri) to meet the needs of the propagation and augmentation program requires that well designed fish transport units are available. Fish distribution is the final step of the propagation effort and reliable transport systems are essential to ensure that the progeny are transported safely to the stocking location.

Dependable fish transport units will help ensure that fish are transported to stocking locations safely with minimal stress and loss associated with the stocking event.

Accelerated Brood Stock Collection

Currently broodstock collection efforts in the lower Basin have relied upon acquiring adult fish from commercial fishermen on the Middle Mississippi River. No successful spawning of fish in the lower Missouri River (downstream of Gavins Point Dam) has taken place since 2001 when the Blind Pony SFH last spawned pallid sturgeon captured by a commercial fishermen in the Middle Mississippi River. The Missouri Department of Conservation is considering closing commercial fishing for sturgeon (shovelnose). In response to this action, the commercial fishermen have announced that they will no longer provide support for the broodstock collection efforts that the program has grown to rely on.

In 2002 and 2003, pallid sturgeon progeny, resulting from adults captured in the Missouri and Yellowstone Rivers in North Dakota and Montana, have been stocked in the lower basin (downstream from Gavins Point Dam); however, genetics are limiting in the upper basin with aging fish and a dwindling population. The need to capture and propagate the remaining genetics in the lower basin has risen. Currently, there is an inadequate effort targeting collection of these lower basin pallid sturgeon for propagation purposes.

The accelerated broodstock collection would enable the state and federal agencies to direct intensive collection efforts to capture the genetic stocks that inhabit the lower basin. Broodstock collection is essential in order to represent the genetic variability of pallid sturgeon in the lower Missouri River. Successful collection, spawning, rearing and stocking will partially offset the lack of natural reproduction and may help ensure that these genetic stocks are not lost.

POPULATION ASSESSMENT

The 2000 RPA states, “The Corps has the primary responsibility for, and shall monitor the biologic resources and responses of threatened and endangered species to changes in Missouri and Kansas River operations, maintenance, or habitat restoration projects. Monitoring is needed to assess the biologic value of Corps management decisions.” The Corps recognizes that a complete monitoring and evaluation program should be a central and operational component of all management activities. As a focal point of this action, the Corps will incorporate a monitoring and evaluation program that provides data to further our understanding and resolve the wide range of uncertainties, including assessing population status, establishing causal relationships between habitat (or other) attributes and population response, and assessing the effectiveness of operational or management actions.

The Corps proposes an assessment program through monitoring and evaluation that will address four major groupings of questions:

- What is the status of least tern, piping plover and pallid sturgeon populations; does that status change through time?
- What are the environmental conditions in reaches showing different least tern, piping plover and pallid sturgeon abundance or productivity; are there systemic patterns suggesting that specific natural or operational factors affect least tern, piping plover and/or pallid sturgeon population dynamics?
- Is there a cause and effect relationship between operational or management actions and least tern, piping plover and/or pallid sturgeon population responses in the basin or across a regional extent.
- Have operational or management actions been implemented; have they been implemented appropriately and in their entirety?

Conducting monitoring and evaluation effectively will require that both data collection and the implementation of any Corps operational or management actions continue to be highly coordinated. Actions will be conducted in the context of an experimental framework that will offer the greatest opportunities for detecting responses in the shortest amount of time. Data collection will be conducted in a standardized manner and data will be reported and managed in reach, basin and regional (metapopulation) databases. Maintaining a scientifically rigorous, coordinated monitoring program will be imperative to supporting adaptive management decisions based on “good science” and in perpetuating a successful MRRIC.

The following sections provide additional details concerning the ongoing and enhanced population assessment monitoring and evaluation efforts for pallid sturgeon, piping plovers and least terns and their associated ecosystems.

Pallid Sturgeon Population Assessment

The 2000 RPA states, “The endangered species and habitat monitoring program shall be designed to detect annual improvement in the ecosystem. This will be accomplished by documenting pallid sturgeon reproduction and recruitment, physical habitat improvements, improvements of the warm water benthic fishery (surrogate species), hydrograph improvements in form and function, improved water temperature regimes, and increased aquatic nutrient cycling, sediment transport, and in turbidity.” Additional detail is provided in the 2000 BiOp with the implementation of this program to begin in 2001. Sampling efforts were initiated in 2001 and have gradually been expanded. The program is to be fully implemented in the spring of 2004 with crews conducting standardized assessments in all of the high priority river segments as identified in Table 21 of the BiOp.

Existing Population Assessment

The USFWS (Great Plains Fish and Wildlife Management Assistance Office and the Columbia Fishery Resources Office) and the Nebraska Game and Parks Commission (NGPC) are currently conducting population assessment activities on the Missouri River. Sampling efforts consist of year round surveys and are guided by protocols in the draft document “Long-Term Pallid Sturgeon and Associated Fish Community Assessment for the Missouri River.” The Pallid Sturgeon Population Assessment Team has developed these guidelines. Additional monitoring efforts have been conducted by the Montana Fish, Wildlife and Parks in the Fort Peck Reach. These efforts have been funded and support primarily by other sources including Western Area Power Administration (WAPA). The Corps provide funds to Missouri Department of Conservation (MDC) in 2001 to initiate their “Sturgeon Monitoring Program;” however, the continued program is supported primarily through MDC. It is the intent of the Corps to integrate and expand population assessment activities with these crews.

Wild and hatchery reared pallid sturgeon have been sampled by all crews during these assessment activities. In 2002, 22 pallid sturgeon were captured in the lower Missouri River by the USFWS and Nebraska Game and Parks Commission (NGPC) crews, 12 hybrid sturgeon and nearly 5,000 shovelnose sturgeon. Slight declines in pallid sturgeon relative abundance continue in comparison to shovelnose sturgeon. Catch per Unit Effort has decreased for shovelnose sturgeon over the past 5 years (Pers. Comm. Vince Travnichek, MDC).

The standardized gears for these sampling efforts provide additional information on other benthic fish species ranging from small cyprinids (i.e., chubs) to larger catostomids such as the blue sucker *Cycleptus elongatus*. Information that has been absent from previous sampling efforts related to associated community species will provide the start of baseline data to compare long-term trends.

Sampling efforts in 2003 have already yielded the collection of approximately 20 pallid sturgeon. The majority of these recaptures are the result of previous stocking efforts initiated in the late 90's as 12 of the 20 pallid sturgeon collected during surveys have been in the Fort Randall Reach.

Data is also being collected on a variety of species representative of the benthic fish community that would supplement benthic fish data collected during 1995 - 1997, providing valuable biological information. Rather than just collect data when pallid sturgeon are collected, habitat characteristic data is collected at a portion of all fishery sampling to provide information related to habitat characteristic preferences (i.e., velocity, turbidity, substrate). Over time, these data will provide information regarding population trends of pallid sturgeon and a variety of warmwater benthic fish species. With this action the Corps will continue funding these cooperative assessment projects.

Comprehensive Biological Baseline Collection

The 2000 RPA calls for the Corps to develop a Pallid Sturgeon Population Assessment Program. The RPA states:

The endangered species and habitat monitoring program shall be designed to detect annual improvement in the ecosystem. This will be accomplished by documenting pallid sturgeon reproduction and recruitment, physical habitat improvements, improvements of the warm water benthic fishery (surrogate species), hydrograph improvements in form and function, improved water temperature regimes, and increased aquatic nutrient cycling, sediment transport, and in turbidity.

Pallid sturgeon population assessment shall include: (1) Total number of fish captured and tag number, (2) GPS coordinates of capture sights, distribution, recapture incidences and numbers, (3) channel and substrate mapping of the habitats used by the fish, (4) tributary use and concentrations by pallid sturgeon, (5) temperature, surface and bottom velocity, turbidity, and depth at capture locations, (6) length of fish frequency, (7) morphological measurements of fish and meristic counts, (8) species characterization utilizing morphological measurements, (9) genetic analysis of fish, and (10) productivity and recruitment. Additional information needs and priorities for the monitoring program should be developed through a cooperative effort between the Service, Corps, and Recovery Team.

The structure of the program proposed by the Corps includes sampling seasons and strategies that focus on pallid sturgeon as well as the associated fish community. The program, when fully implemented, will provide a "Pulse Rate" for pallid sturgeon and Missouri River fishes over time.

The following objectives have been established to guide the program:

- Document current and long-term trends in pallid sturgeon population abundance, distribution and habitat usage throughout the Missouri River System.
- Document survival, growth, and habitat use of stocked pallid sturgeon in the Missouri River System.
- Document pallid sturgeon reproduction and recruitment in the Missouri River System.
- Document current and long-term trends in native Missouri River fish species abundance, distribution and habitat usage, with emphasis on the warm water benthic fish community.

A Pallid Sturgeon Population Assessment Team (Team) comprised of Missouri River basin biologists, sturgeon experts, and other scientists has been assembled to develop sampling strategies and standardized protocols to achieve the objectives. The Team has partitioned the Missouri River into sampling segments based on differences in the physical attributes of the river (e.g., degrading stream bed, tributary influence, natural hydrograph, etc.). Sampling strategies have been outlined into two primary sampling seasons, a sturgeon season and a fish community season. Standardized protocols for habitat classification, gears and techniques, habitat characteristic data collection, data recording and data sheets have been developed and guide current sampling efforts.

The Pallid Sturgeon Population Assessment Team has selected a representative group of native Missouri River fishes to serve as surrogate species to detect improvements in the warm water benthic fish community. Among the species selected are: Sand Shiner *Notropis stramineus*, Sicklefin Chub *Macrhybopsis meeki*, Sauger *Stizostedion canadense*, Shovelnose Sturgeon *Scaphirhynchus platyrhynchus*, Plains minnow *Hybognathus placitus*, Western silvery minnow *Hybognathus argyritis*, Speckled Chub *Macrhybopsis aestivalis*, and Sturgeon Chub *Macrhybopsis gelida*. Additional information may be collected on these species related to age, growth and body condition (relative weight information).

When fully implemented, all high priority Missouri River segments as identified in the BiOp will be sampled providing trend information on pallid sturgeon and the fish community. Each segment will represent a piece of the entire puzzle. Jointly, these pieces will be representative of the overall trends and status of pallid sturgeon and the fish community of the Missouri River. The significance of Missouri River tributaries to the species is recognized by the Corps (i.e., Yellowstone, Platte). The comprehensive biological baseline program will be expanded to include these tributaries within the standardized sampling efforts. The fully implemented program will also provide information on the success of the propagation augmentation program and provide data addressing the BiOp requirements to evaluate survival, movements and habitat use of juvenile pallid sturgeon. The Corps is seeking funding for the proposed program.

Diet Evaluation

Additionally, in this proposed action, the Corps will continue to fund the research project currently underway in the Fort Randall Reach to evaluate food habits of juvenile pallid and shovelnose sturgeon. The objectives of this project are to compare food habits

between juvenile pallid sturgeon and shovelnose sturgeon. This effort will include comparisons by season to determine if food habits are different at different times of the year. The Pallid Sturgeon Workgroup has identified these efforts, as an information gap and a priority to better understand the species. Currently, the diet evaluation study is being conducted in conjunction with population assessment activities in the Fort Randall Reach. Gastric lavage (non-lethal) is being used to flush and collect stomach contents. Support for these efforts will continue to completion.

The results of this study will provide insight to the feeding habits of various year classes of pallid sturgeon juveniles in the Fort Randall Reach. Additionally, condition and growth of juvenile pallid sturgeon in the Fort Randall Reach will be used to determine the suitability of this stretch of river for continued stocking and recovery efforts.

Least Tern and Piping Plover Population Assessment

The 2000 BiOp commended the Corps for its comprehensive least tern and piping plover monitoring program it implemented, which has provided state-of-the art information on habitat and birds critical to river management decisions. With this action as proposed, the Corps will continue this successful assessment program and seek ways to improve and modernize the monitoring and evaluation techniques and data delivery and communication tools.

Corps management of Missouri River and Kansas River operations for least terns and piping plovers is a highly coordinated effort. Intensive field monitoring activities provide not only important population assessment information but also inform water managers and policy makers of near real time information from which decisions are made. The Corps will continue monitoring birds and their associated communities beginning in late April as the first piping plovers arrive on the System, through the end of August when the last birds depart for the wintering grounds. Monitoring currently includes and will continue to include identification of least tern and piping plover nesting sites, recording of nest locations and observation of chicks from hatching to fledging. An adult census of both species will be conducted on the system to assess population trends. Monitoring personnel are and will continue to be trained by Corps biologists in tern and plover biology and survey techniques to ensure the capture of consistent and quality data.

The Corps is currently compiling and evaluating all available current and historic information from these assessment activities to document natural loss and the impacts of System operations on avoidable and unavoidable take of least tern and piping plover nests, as described in the 2000 Opinion. This analysis will evaluate the impacts of take from 1) daily dam operations including storage and releases, 2) flood control operations, 3) uncontrolled local inflow and 4) predation, weather, abandonment, human disturbance, livestock, erosion. The report on this analysis will be included in the 2003 BiOp Annual Report.

The Corps proposes with this action that a comprehensive management plan, including an assessment protocol, be prepared and implemented on the Kansas River. Subsequent to

the findings of the source/sink evaluation expected in 2005, the Corps proposes to develop management strategies and implement actions to provide overall benefit to the conservation of least terns and piping plover on the Kansas River. These may include efforts to enhance reproduction and recruitment of the population or deterrence activities to prevent nesting of least terns and piping plovers in a sink.

In conjunction with the monitoring program the Corps currently undertakes, and will continue with this action, several management activities are proposed during the breeding season to increase nesting and fledging success. Through the Threatened & Endangered Species Data Management System (TESDMS), nest and fledgling status and locations will be coordinated with all management and enforcement partners. Use of the TSDMS allows the Corps biologists and water managers to minimize flooding threats, coordinate law enforcement efforts, and inform other federal and state agencies of nest status. Management actions to be continued include reducing threats from predation, human disturbance, inundation and shoreline erosion. In addition, the Corps proposes to significantly enhance its outreach and interpretive programs to enhance public awareness of endangered species.

In addition to the population assessment and monitoring efforts on the Missouri River proper, the Corps proposes, with this action, to develop and support a regional coordination process for the subpopulations or metapopulation of which Missouri River piping plovers and least terns are part. It has become apparent that if successful management actions are to occur for these species on the Missouri River, we must understand the dynamics of their larger population structure. Greater understanding of regional population interactions such as immigration/emigration, source/sink populations and seasonal presence/absence will provide greater sensitivity in assessing the long-term prospects for species persistence and allow more informed management decisions.

The Missouri River piping plover population is an important component of the Northern Great Plains piping plover population. The Northern Great Plains population extends across the northern Great Plains of the United States into Prairie Canada. Piping plovers are found in the alkali wetlands of North Dakota and Saskatchewan, wetland areas of Alberta and Montana, along the Missouri River from eastern Montana to northeastern Nebraska, and along Nebraska rivers. Remnant populations are found in Manitoba, Colorado, Kansas, Minnesota and Iowa. These populations do not exist in isolation from one another and annual coordination of population assessment information from the Northern Great Plains piping plovers should be done to facilitate recovery of the birds on the Missouri River. This action will consist of establishing a central data collection center for productivity surveys and adult censuses that are annually conducted during the nesting season. Partners in data collection would include the Canadian Wildlife Service, USFWS, Corps, The Nature Conservancy, various states, provincial and Tribal natural resource agencies and private entities. The Corps would set up the database and use it for its data. In coordination with the other interests, it may serve as the repository for all data being collected by the other agencies. In conjunction with this effort, the partners would continue to support the International Piping Plover Adult Census, next scheduled to be conducted in 2006.

The interior least tern nests on the major interior rivers of the United States. This includes the Missouri, Mississippi, Rio Grande, Canadian and Arkansas Rivers and their tributaries. Missouri River tributaries with nesting least terns include the Kansas, Platte, Elkhorn, Loup, Niobrara, Cheyenne and Yellowstone Rivers. To determine actual population and recovery trends on the Missouri River, the least terns need to be assessed on other rivers. This action will consist of establishing a central data collection center for productivity surveys and adult censuses that are annually conducted during the nesting season. Partners in data collection would include the USFWS, Corps, various states and Tribal natural resource agencies and private entities. The Corps would set up the database and use it for its data. In coordination with the other interests, it may serve as the repository for all data being collected by the other agencies. In conjunction with this effort the Corps will set up a task force to coordinate recovery efforts between Corps Districts. This team may be of assistance to the USFWS as they coordinate a new recovery plan utilizing all data and information accumulated since the 1990 plan.

Additionally, of critical importance to the recovery of least terns and piping plovers are adequate and sustainable areas of wintering habitat. The Corps proposes with this action to seek partnerships with various foreign and state natural resources agencies and private organizations to learn of opportunities for perpetuating sustainable wintering habitat.

The Corps also proposes to complete the comprehensive review of its captive rearing program. On Feb 26-27, 2003, an Animal Husbandry and Health Team conducted a focused "best practices" review of the physical facilities, the collection, incubation, brood rearing, and release protocols, animal handling and care practices, veterinary care guidelines, diet sources and food preparation, contamination containment and prevention, handling and disposal of mortality specimens, and operational guidelines for facility personnel. This inspection included a detailed review of products and technologies being used to ensure the most current, state-of-the-art products and methods are put in practice with the captive rearing program.

The Corps is identifying a process to complete the second track of our peer review. This effort would deal with the broader perspectives and questions of captive rearing as a long term management tool for these species, including:

- Does the captive rearing program represent a sustainable approach to management and recovery of these species?
- Is its operation consistent with the goals of Endangered Species Act (ESA) and current understanding of conservation biology?
- What are the ramifications of long term management which focuses on captively reared birds?
- Under what conditions should captive rearing be considered a viable and acceptable management tool?

Efforts will include a broad review of the impacts of captive rearing on species recovery, System operations, social values and the Corps Threatened and Endangered Species Program. This effort will be completed in 2004 and results will be formally included in the 2004 BiOp Annual Report.

Bald Eagle/Cottonwood Population Assessment

The 2000 BiOp states, the Northern States population of the bald eagle has exceeded recovery goals. Missouri River bald eagles have contributed to those recovery goals and continue to grow in numbers despite the adverse effects of operation of the Missouri and Kansas River systems and the BSNP. The long-term impacts of operations of the Missouri River on nesting and wintering habitat will continue unless management of this habitat is improved. The indirect effects of System operations on wintering habitat have yet to be fully realized. To reduce the impacts of declining wintering habitat on the Missouri River, conservation recommendations provided by the USFWS will be implemented and include:

- Conduct or participate in annual wintering and nesting bald eagle surveys
- Determine population dynamics of wintering and nesting birds
- Protect and manage bald eagle habitat
- Conduct public outreach on the value of river habitat to the bald eagle
- Exercise Section 10/404 permit authority to protect, maintain, and enhance riparian forest usable by bald eagles
- Restoration of stands of cottonwood, and sycamore in the Kansas River floodplain should be pursued in all permit reviews.

The bald eagle/cottonwood model that has been initiated will help the Corps and other agencies address the conservation recommendations of the USFWS.

RESEARCH, MONITORING AND EVALUATION

Interwoven throughout the actions described previously in this BA are the various research, monitoring, and evaluation (RM&E) efforts required to support the endangered species actions to create habitat, to provide propagation support, and to assess the populations of these species. As quoted previously, the 2000 RPA states, “The Corps has the primary responsibility for, and shall monitor the biologic resources and responses of threatened and endangered species to changes in Missouri and Kansas River operations, maintenance, or habitat restoration projects. Monitoring is needed to assess the biologic value of Corps management decisions.” RM&E features predominantly in our PA.

The RM&E necessary to support all of the actions identified in this BA will be conducted as these actions are implemented. The Corps will also conduct special, additional RM&E. These additional efforts are:

- Comprehensive pallid sturgeon United States Geological Survey (USGS) research proposal,
- Survival and habitat use of stocked pallid sturgeon,
- Pallid sturgeon population viability analysis,

- Piping plover population viability analysis,
- Least tern and piping plover focused research,
- Fort Peck spring rise tests,
- Pallid sturgeon genetic analysis, and
- *Scaphirhynchus sp.* spawning behavior and habitat selection analysis.

Comprehensive Pallid Sturgeon Research Project

Research to determine the critical ecological factors that contribute to successful pallid and shovelnose sturgeon reproduction and survival in the Missouri River. The research will include laboratory and field research. These studies will provide new information on the physiology of reproduction and growth, survival across the life stages, status of populations, and taxonomy for sturgeon in the Missouri River, including quantitative assessment of how biology, hydrology, and water quality combine to provide suitable habitat and resources over a considerable spatial and temporal scale.

While a variety of factors has been proposed as contributing to the viability of pallid and shovelnose sturgeon, the significance and interaction of flow-related factors (such as hydrologic clues, temperature, turbidity, depth, and velocity) with in-channel habitat features and other factors (such as nutrition, competition, predation, productivity, water quality and contamination) have not been clarified. The research tasks will provide definitive information on the effects of flow-related factors on sturgeon, but will not be restricted to these factors. An objective assessment of how multiple life stages and essential activities of the two sturgeon species respond to a range of potential stressors will provide rigorous and credible information for use in resolving the many issues surrounding pallid sturgeon recovery actions. This research is intended to provide the best understanding of sturgeon responses as functions of management variables, thereby providing stakeholders with an improved understanding of tradeoffs among management alternatives.

Research tasks include:

- Understanding the reproductive physiology of Missouri River sturgeon – Objective is to further the understanding of the reproductive physiology of Missouri River sturgeon in order to assess if environmental conditions are adequate for gamete maturation and release.
- Spawning of Missouri River sturgeon – Evaluate sturgeon stocks in several representative reaches of the Missouri River to examine the chronology of spawning activity.
- Characterization of optimal conditions for normal development and hatch of Missouri River sturgeon embryos – Characterize the exposure response relationships for several important water quality parameters during embryo development through hatch, evaluate egg quality, and determine contaminant doses for commonly detected contaminants of concern in water and sturgeon tissues. Apply this information to an assessment of embryo survival at likely or know spawning sites.

- Determinants of post-hatch survival of larval Missouri River sturgeon – Examine the influence of water temperature and sediment levels on initiation of feeding, growth, and morphological development of post-hatch sturgeon. Identify food habits, food availability, and habitat used by post-hatch sturgeon. Examine river hydraulic processes as mechanisms of larval sturgeon transport.
- Environmental factors affecting Missouri River sturgeon – larval feeding to juvenile life stage – Continuation of previous research as larval sturgeon shift from internal to external feeding. Tasks include the determination and examination of ecomorphology, environmental factors, diet, predation, habitat use, and drift.
- Determination of the critical ecological factors that contribute to successful survival of Missouri River sturgeon from juvenile to 1 year of age – Examination and determination of preferred habitat, food habits, growth rates, and overwintering of juvenile to 1-year-old sturgeon.
- Survival and growth of Missouri River sturgeon from year-one to reproduction – Determine habitat use as compared to availability, nutrition and feeding, and growth and maturation rates.
- Develop population-forecasting models that can be used to predict future population size and distribution of sturgeon in the Missouri River.
- Examination of morphological and molecular characteristics to determine the identification of pallid and shovelnose sturgeon and hybrids.
- Develop a database of sturgeon information, including Web-based format for access by the public.

Survival and Habitat Use of Stocked Pallid Sturgeon

The pallid sturgeon population assessment program has been designed to incorporate the evaluation of stocked pallid sturgeon regarding survival, growth, and habitat use in the Missouri River System. However, additional strategies proposed by the Corps in this BA may provide enhanced results in a reduced time frame. Likewise, the propagation augmentation program has been based on a series of assumptions. For example, survival rates have been projected based on similar programs working with white sturgeon. Concern has arisen regarding over winter survival due to the lack of capture during population assessment surveys in 2003. Over 7,400 juvenile pallid sturgeons were stocked at three primary stocking locations (Mulberry Bend, NE; Bellevue, NE; Booneville, MO) in the lower Missouri River in April 2002. A small portion of these juveniles was recaptured during the summer and fall sampling efforts in 2002. However, continued sampling efforts throughout the winter and into the summer of 2003 have proven to be less successful. As a result of this, a telemetry project using juvenile pallid sturgeon may help to address this issue. Additional stocking efforts are underway in 2003. Stocking numbers will be similar to those efforts accomplished in 2002. Refer to Pallid Sturgeon Propagation Support regarding numbers stocked in 2002 and 2003.

In addition to monitoring efforts included within pallid sturgeon population assessment activities, the Corps proposes a telemetry project using juvenile pallid sturgeon in the unchannelized (Gavins Point Dam to Ponca, NE) and the channelized (near Booneville, MO) portions of the Missouri River to provide a better understanding of these fish

following stocking. The telemetry project would incorporate Geographic Positioning System (GPS) coordinates for all relocations. Physical habitat data would be collected at each relocation (i.e., turbidity, temperature, depth, velocity and substrate). Fish relocation sites would be classified into macrohabitats and mesohabitats consistent with the standardized habitat classification system that has been developed for the pallid sturgeon population assessment program. These telemetry efforts will provide specific information related to the movements of pallid sturgeon, habitat use and preference, overwinter survival, and better survival rate data. This data would provide important feedback for the propagation augmentation program when determining suitable stocking rates for fish inhabiting these vastly different portions of the Missouri River.

Pallid Sturgeon and Piping Plover Population Viability Analysis

In managing any endangered species or population there is a need to conduct a risk analysis to assess current risk, and what is necessary to reduce the risk to an acceptable level. This is particularly pertinent to the pallid sturgeon and piping plover in the Missouri River Basin with populations distributed over wide geographic areas, often in disconnected subpopulations, and very subject to stochastic effects. Operational and management decisions are often made with a nescience to population viability. With this action, the Corps proposes to conduct a Population Viability Analysis (PVA) for the Missouri River pallid sturgeon and piping plover populations.

PVA, the process of identifying the threats faced by a species and evaluating the likelihood that it will persist for a given time into the future, may be used to address the following aspects of the Corps recovery program as they relate to pallid sturgeon and piping plovers.

- Focusing research and data collection. PVA may reveal that population viability is insensitive to particular parameters. Research may be focused by targeting factors that may have an important impact on extinction probabilities or on the ranking of management actions.
- Assessing risk. Together with cultural priorities, economic imperatives, social values, and/or taxonomic uniqueness, PVA may be used to support policy and management decisions and allocate resources.
- Prioritization of management options. PVA may be used to predict the likely response of species to any of many management options, (i.e. predator aversion, habitat creation, captive rearing, etc.).

Least Tern and Piping Plover Focused Research

The 2000 BiOp recognized the paucity of information concerning various aspects of least tern and piping plover life history, and identified the importance of RM&E to the future recovery process. The 2000 RPA identified a “piping plover forage ecology study on the Missouri River” to document forage abundance and availability. This study will be concluded in 2003, and under this action the Corps proposes to continue its focused research effort by investigating the relationship between nest initiation chronology of

piping plovers and least terns, the timing of hydrologic events, and forage abundance and availability. This focused research project will further advance the information gained through the forage ecology study and provide insight into the importance of the timing of hydrologic events in driving the energetics and productivity of these species within the Missouri River basin.

Fort Peck Spring Rise Tests

Preliminary biological data collection is an essential component in determining the responses and effects of the spring rise test on pallid sturgeon and the species that have been selected for this project. The multiple components of this study will provide science critical to recovering fish populations throughout the Missouri River System.

The Corps is currently planning two flow tests for releases from Fort Peck Dam to determine the potential effects of warmer water releases at a rate higher than normal on the integrity of the Fort Peck Dam spillway, downstream river reach (bank and bed erosion, cultural resource exposure, etc.), and (based on the main purpose of a warmer water spring rise) on native river fish. These tests are commonly referred to as the mini test and the full test. Low Fort Peck Lake levels have resulted from the current drought, which has delayed the mini test, which is to be completed before the full test is to be conducted. If adverse impacts resulting from the mini test are acceptable and the level of Fort Peck Lake is adequate, the full test would be conducted the following spring. These two tests were included in the 2000 RPA.

Mini Test

The mini test will address concerns about long-term spillway operations with engineering test, collect data for development of a water temperature relationship model, and test the procedures for monitoring the affects of the full test on native river fish.

The mini test will occur the first year reservoir elevation and runoff criteria can be met, regardless of the reservoir unbalancing cycle.

The initiation of the mini test will be a specified date set between 15 May and 1 June depending on weather and other logistical concerns. This date will be set a minimum of one month prior to the test and public notice will be made. The discharge rates and timing of flows will be as follows:

Table 2. Flow Test Scenarios.

Flow Test Scenarios			
Duration (days)	Spillway Flow (1000 c.f.s.)	Power Tunnel (1000 c.f.s.)	Combine Flow Total (1000 c.f.s.)
Adjustment: Initial power flow at 8K, reduce to 4K while increasing spillway flow from 0 to 4K.			
4	4	4	8
Adjustment: Increase power flow from 4 to 8K while reducing spillway flow from 4 to 0K.			
1 ¹	0 ¹	8	8
Adjustment: Increase power flow from 8 to 11K. Reduce power flow from 11 to 7K while increasing spillway flow from 0 to 4K.			
4	4	7	11
Adjustment: Increase power flow from 7 to 14K while reducing spillway flow from 4 to 0K.			
4	0	14 ²	14 ²
Adjustment: Reduce power flow from 14 to 11K while increasing spillway flow from 0 to 4K.			
4	4	11	15
Adjustment: Reduce power flow from 11 to 7K while increasing spillway flow from 4 to 8K (maintain a maximum total of 15K). Further reduce power flow from 7 to 4K.			
4	8	4	12
Adjustment: Increase power flow from 4 to 7K.			
4	8	7	15
Adjustment: Reduce power flow from 7 to 4K while increasing spillway flow from 8 to 11K (maintain a maximum total of 15K).			
4 ³	11	4	15
1 ⁴	11 (no fish barrier)	4	15
Adjustment: Day 1 – Reduce spillway flow from 11 to 5K while increasing power flow from 4 to 7K. Day 2 – Reduce spillway flow from 5 to 0K while increasing power flow from 7 to 9K. Day 3 – Further reduce power flow from 9K to desired flow (7 or 8K).			
NA	0 ¹	Normal	Normal

1. Monitoring Period. Spillway flow will be stopped during a 4-12 hour period to perform scour hole and exit channel surveys. The monitoring is scheduled to start at approximately 0830 after the listed spillway flows are stopped. After completion of monitoring, the spillway and power flows will be adjusted to the next flow combination.
2. Approximate power flow will vary depending upon pool elevation.
3. Flow combination duration may vary from 4-9 days depending upon monitoring results.
4. Flow combination duration as required may vary to provide data without the fish barrier.

General Release Adjustment Guidelines

For the purpose of blending flows and altering Missouri River water temperature, the flow test scenarios require a series of combinations between the power plant release rate and the spillway release rate. Local interests have indicated that a varying river level affects the functioning of the irrigation intakes. Therefore, each change in flow releases will be phased such that the total flow remains roughly the same. As the spillway release is altered (raised or lowered), a corresponding change in the power plant release is required to maintain a constant combined flow total.

Strategy for Changing to New Flow

The spillway exit channel enters the Missouri River at an angle, which may direct flows toward the opposite or left bank. In order to minimize spillway release impact on the left

bank, power plant releases will be used to provide a backwater effect on the spillway exit channel. When the flow scenario causes an increase in the combined total flow, the increase will first be accomplished with the power tunnel to the extent practical. After the river is stabilized, power tunnel flows will be reduced while spillway flows are increased.

Constant Flow Period

Constant flows from both the spillway and power tunnel are required for the duration of each flow combination. Severe winds or extreme inflows may affect the pool elevation enough that the spillway releases vary during the test. Spillway flow measuring equipment will be monitored during the test. If the monitoring equipment indicates a spillway flow change greater than 500 cfs, adjustments to the spillway gate setting will be performed. No adjustment to power tunnel release is expected during the constant flow period. Power plant peaking or variation from a constant flow will not be allowed during the test flow period. If unforeseen power plant flow variation occurs, the test period will be lengthened accordingly.

Pool Evaluation Requirements

Due to uncertainty in runoff and operation releases, the Fort Peck pool evaluation during the test period is unknown. The Corps will proceed with the assumption that spillway flow releases will occur if possible. To provide adequate head for warm releases from spillway gates (2225 msl), the minimum elevation of Fort Peck Reservoir should be 2230 msl.

The Milk River flows will be addressed in the specific “stop” mini test flow protocol. If a test segment is interrupted due to the “stop” mini test flow protocol, that segment will be restarted from the beginning after the “stop” test issue is addressed. However, if the test is delayed for 20 days or until 1 August, the remainder of the test would be cancelled and the mini test may be rescheduled if necessary.

If the mini test “stop” protocol results in a stop or adjustment during a 4-day constant flow data collection period, the mini test will be restarted at the 4-day constant flow stage where it was stopped after the “stop” protocol item has been cleared. This will add a corresponding period of flow time to the mini test corresponding to the “stop” protocol delay time. An underlying assumption is that the water will be available for a restart. If the water is not available, the test will continue until the available water is exhausted, at which time, the success of the mini test will be evaluated and a decision will be made to either redo the mini test or move to the full test.

Appropriate NEPA documentation is required before this test can be conducted. Appropriate “stop” protocols also have to be identified.

Full Test

The full test will be as described below or as modified based on the results of the mini test of the flow enhancement.

The full test will continue to address concerns about long-term spillway operations with engineering test and collect data for verification of a water temperature relationship model. In addition, biological data and physical data regarding the full test will be collected to evaluate and analyze the biological response.

The full test will occur the first year following the mini test that reservoir elevation and runoff criteria can be met, regardless of the reservoir unbalancing cycle.

After standard flows are adjusted between the powerhouse releases and the spillway releases, the spillway flows will be increased by approximately one-sixth of the flow needed to reach the target flow each day for 2 consecutive days and then the flow is held constant for 4 consecutive days. The increase in flow each day of the test is expected to be in the 3.2 kcfs range or less. The raise cycle is a 2-day increase with a 4-day constant peak flow. The constant flows are necessary during the test to allow appropriate data collection. The flows will be lowered at the same rate as the raise until the standard flows are reached. This is a total duration of 32 days. At this time, the powerhouse and spillway flows will transition back to normal.

The Milk River flow will be determined prior to each adjustment in flow and appropriate adjustments in spillway discharges will be made.

A full test “stop” protocol will be developed which addresses stopping or adjusting the flows if there are high tributary flows, endangered cultural resources, structural damages, etc. The peak full test flow may be adjusted from 23 kcfs to 20 kcfs if high tributary flow causes a delay to the test.

If the full test “stop” protocol results in a stop or adjustment during a 4-day constant flow data collection period, the full test will be restarted at the 4-day constant flow stage where it was stopped after the “stop” protocol item has been cleared. This will add a period of flow time to the full test corresponding to the “stop” protocol delay time. An underlying assumption is that the water will be available for a restart. If the water is not available, the test will not continue until the available water is exhausted, at which time the success of the full test will be evaluated and a decision will be made to either redo the full test or proceed to the implementation of the full flow enhancement.

If the test is delayed for 20 days or until 1 August, the remainder of the test would be cancelled and the full test may be rescheduled if necessary.

The initiation of the full test will be a specified date set between 15 May and 1 June depending on weather and other logistical concerns. This date will be set a minimum of one month prior to the test, and public notice will be made.

Appropriate “stop” protocols also have to be identified and NEPA actions need to be completed.

Monitoring and Evaluation of the Below Fort Peck Missouri River Reach

A biological data collection plan has been developed by the USGS and Montana Fish, Wildlife and Parks (MTFWP) and reviewed by the Upper Basin Pallid Sturgeon Workgroup. The Fort Peck Flow Modification Biological Data Collection Plan is a monitoring plan designed to evaluate the influence of proposed flow modifications from Fort Peck Dam on physical and biological response of pallid sturgeon and other native fishes. Components of the monitoring program include:

- measuring water temperature and turbidity at several locations downstream from Fort Peck Dam
- examining movements by pallid sturgeon that inhabit areas immediately downstream from Fort Peck Dam¹, and supporting the examination of pallid sturgeon movements within the confluence between the Yellowstone River and Missouri River.
- examining flow- and temperature-related movements of paddlefish *Polyodon spathula*, blue suckers *Cycleptus elongatus*, and shovelnose sturgeon *Scaphirhynchus platyrhynchus*,
- quantifying larval fish distribution and abundance

This plan is being implemented and it currently is in its third year of data collection. Data collection efforts will continue through the mini and full tests. Data collected prior to these tests will serve as preliminary data that will facilitate viable comparisons following the tests. Our evaluation of pallid sturgeon movement would also include data from the USFWS study evaluating movements of adult pallid sturgeon in the Missouri and Yellowstone rivers and other relevant studies.

The initial test plan will address approximately 7 years. It is anticipated that this will include four “no test” years, a mini test year, a full test year, and a subsequent “no action” year, provided there is sufficient water in the Fort Peck Reservoir. At the end of the 7-year period, the data will be given a comprehensive evaluation and the plan will be reevaluated. If the test cannot occur due to lack of available water, corresponding years may be added to the 7-year initial plan evaluation period. We are currently in the third “no test” year due to low reservoir elevations.

Research Associated with the Fort Peck Tests: Through ongoing scoping for the tests, we’ve become aware of some data gaps that may affect the ultimate goal of getting sturgeon to spawn below Fort Peck Dam. These gaps have been converted into hypotheses and research proposals, which are in various stages of completion.

- Food habitats of piscivorous fishes in the Missouri River
- Drift behavior of larval sturgeon
- Sturgeon larvae survival in the headwaters of Lake Sakakawea
- Imprinting tendencies of pallid sturgeon

¹ This component has not been implemented due to the inability to capture adult pallid sturgeon below Fort Peck Dam.

The food habits analysis began at the same time as the first year of monitoring and evaluation. An additional component was initiated this year to evaluate the behavior and drift characteristics of sturgeon. The first field component drift test was initiated in June 2003 utilizing shovelnose sturgeon rather than pallid sturgeon to ensure that the evaluation of the pallid sturgeon propagation and augmentation program was not compromised. Additional efforts utilizing pallid sturgeon are being conducted in laboratory experiments by the USGS. Interrelated with this project, river travel time models are being developed based on discharge and water velocities. Based on these findings, model transport of larval pallid sturgeon will be developed. Additionally, the Corps will conduct an evaluation of survival of larval sturgeon in headwater areas in 2004. Recently, questions were raised by sturgeon fisheries scientists with regard to the potential imprinting tendencies of pallid sturgeon. The Corps is in the process of developing a scope of work for this effort. Adaptive management provides for modification of actions if data from these studies so indicates.

While the Fort Peck flow tests are included in this description of the Corps action because of their experimental nature, future actions based on the results of the tests would be addressed in the adaptive management strategy.

Pallid Sturgeon Genetic Analysis

Pallid and shovelnose sturgeon are closely related and therefore resemble one another when evaluated based on phenotypic characteristics. Morphological measurements have facilitated the development of a variety of indices to distinguish between the two species. Current indices are valuable in differentiating between the two species; however, these techniques have limitations and are subjective due to the precise requirements in collecting morphological measurements. Shovelnose sturgeon is a common species native to the Mississippi, Missouri, and Ohio rivers. Pallid sturgeon is a rare and endangered species with a distribution from the Missouri headwaters to the mouth of the Mississippi but not the upper Mississippi or Ohio Rivers. Adults of either species are distinguishable by subtle differences in the placement of barbels and by the larger size and more flattened head profile of pallid sturgeons. Distinguishing young fish is far more difficult. Young of year (YOY) shovelnose and pallid sturgeon are virtually indistinguishable at sizes less than approximately 22-23 mm using various morphological indices. As a result, morphological based indices have been criticized on the basis that it does not work for smaller specimens.

With this action the Corps proposes to develop a genetic analysis that would distinguish between the species. This technique would have several benefits. This type of analysis eliminates the limitations of differentiating sturgeons of smaller size. It is critical to obtain the ability to accurately identify smaller sturgeon to the species level to determine whether natural reproduction is occurring in pallid sturgeon. Additionally, the chemical analysis would be applicable to all life stages ranging from newly hatched sturgeon fry to adult. This analysis may be useful in locating spawning areas through larval sampling efforts downstream of spawning locations. This analysis could be used to refine the morphological indices to improve field identification. Presently, there are no tools

available to differentiate between pallid and shovelnose sturgeon eggs. The genetic analysis would be valuable in monitoring the exploitation of caviar through commercial avenues.

***Scaphirhynchus sp.* Spawning Behavior and Habitat Selection Analysis**

Pallid and shovelnose sturgeon are believed to exhibit similar characteristics regarding spawning and habitat selection. However, pallid sturgeon is in very low relative abundance when compared to shovelnose sturgeon. Both species have been artificially spawned in captive environments in equal temperatures and photoperiods with the use of synthetic hormones. Hybrid sturgeons have also been produced in these controlled environments. However, an increase in hybridization has been documented in the lower Missouri River.

With this action the Corps will develop a study focusing on spawning, spawning behavior and habitat preferences that would provide information regarding the causes for increased hybridization. If the cause of the increase in hybridization can be attributed to a limiting factor, actions can then be taken to address this limiting factor.

KANSAS RIVER OPERATIONS

Specific operations for various lake purposes are described in following sections. Typically, the flood control pools are designed to store runoff from major floods up to about the 1993 flood level. Typically, they continue to store water until downstream flows drop below about 60 percent of the channel capacities. The target flows vary with the amount of stored water in the lakes (see the later section on flood control). Stored flood flows are then evacuated as rapidly as the downstream channel capacities allow. When flooding is not occurring, the Corps attempts to maintain the lake elevations near the multipurpose pool level to benefit lake recreation and fish and wildlife. Minor releases at some projects are managed to benefit downstream fish and wildlife and special requests from river users. Minimum releases are maintained for water quality control in the first reach downstream. Large portions of the multipurpose pools at Milford, Tuttle Creek, Perry, and Clinton have been purchased or reserved by the State of Kansas for downstream municipal and industrial water supply in cooperation with the Kansas River Water Assurance District No. 1. Releases from the contracted storage must be approved by the Kansas Water Office. The live storage in the multipurpose pools at the irrigation projects likewise has been contracted to irrigation districts. A portion of each multipurpose pool is reserved for sediment storage and fishery conservation. A portion of the multipurpose pools at Milford, Tuttle Creek, and Perry are also reserved for maintenance of navigation flows on the Missouri River.

Levee and bank protection projects to protect principally urban areas along the Kansas River and major tributaries are designed to operate in conjunction with the reservoir projects to prevent flooding of those areas from the most severe flood events of record. Local protection projects downstream of the lakes are designed to be effective during the standard project flood, similar to the 1951 flood. The primary local protection projects

on the Kansas River include the Kansas Cities (three units along the Kansas River, four units along the Missouri River), Lawrence, Topeka (eight units), Manhattan, and Fort Riley. Local protection projects have also been constructed at Abilene and Salina on the Smoky Hill River and at a number of locations along tributaries.

Flood Control

The lower basin lakes, augmented with the upstream reservoir system and the local protection works, are intended to provide flood protection for the urban population centers along the Kansas River, including the Kansas Cities, when operated as a system. The severity of floods over rural areas will also be greatly reduced, but without agricultural levees this type of impact will continue to be substantial during major floods. The lower basin lakes have a combined capacity of 5.16 MAF specifically allocated to flood control which is supplemented by an additional 1.73 MAF of upstream flood storage capacity. The flood control capability of the Kansas River system of lakes also extends downstream along the Missouri River to Waverly. During major floods, the Kansas River system flood storage capacity is coordinated with the capacity from the main stem reservoirs upstream of Omaha to provide flood control benefits along the lower Missouri River and the Mississippi River downstream of St. Louis.

General flood control criteria are as follows: (1) Flood control storage space is reserved for the control of floods. (2) Releases are made to evacuate accumulated flood control waters only when the river channels downstream can pass the releases without resulting in further flooding, accounting for local inflows and travel time. (3) In determining priority of releases from individual projects, consideration is given to the unoccupied flood control storage space in each lake and the potential that future basin runoff upstream of a dam will fill the flood control pool behind that dam. The equation also accounts for travel times to downstream flood damage centers in such a manner that flood control benefits are maximized. (4) The seasonal hydrologic characteristics of each inflow basin are recognized in developing the plan for evacuating accumulated flood storage. (5) Surcharge storage above the normal flood control pool is used only in conjunction with the respective spillways to control floods in excess of project capacity and to preserve the safety of the respective structures.

The flood control pool at each lake is divided into three zones for each season in diagrammatic form termed the Seasonal Guidelines. The zones are designated in order from lowest to highest as Phase I, II, and III. Phase I storage occurs with every significant flood flow requiring flood control storage. Releases made to evacuate stored water in this zone should not exceed about 60 percent of channel capacity downstream. This provides a margin of safety if an unexpected storm arrives, increasing local inflows below the dam. As the lake fills, the chance that a future storm will fill the remaining flood control pool storage space increases, as does the danger to the dam and downstream damage centers. Therefore, it becomes more urgent to evacuate the accumulated flood storage. In the Phase II zone, releases are made to essentially fill the downstream channel capacity up to the flood stage. This means that an unexpected storm will likely result in out-of-bank flows at the damage center. The Phase III zone is usually the last 10

percent of the flood pool. At this point, flood control operations begin to transition to a surcharge operation. Releases are intended to fill the downstream channels to a level that will not exceed what the Weather Service refers to as moderate flooding. This can result in impacts to agriculture and outbuildings, but homes and businesses should still be protected. The portions of the flood pool assigned to each zone varies seasonally to reflect the higher probability of major rainstorms in the spring.

At Wamego, the Corps found in the last 5 years that Kansas River stages above 8 feet (about 12 kcfs) would potentially wash away nesting terns and plovers. This compares to a Phase I regulating discharge at Wamego of 14.5 ft (about 39 kcfs), a flood stage of 19.0 feet (about 65 kcfs), and a Phase III stage of 21.0 feet (76 kcfs). Regulating the river at Wamego to an 8-foot target stage has the effect of increasing the average amount of flood water stored in the upstream reservoirs. As the probability that the flood control pools will fill into the Phase II and Phase III zones increases, downstream flood protection is reduced and the probability of damage increases.

Analysis of the flow duration curves for Wamego shows that except for reduction of floodflows, present lake regulation plans have only a limited effect on the downstream flow regime. Extremely low flows are increased in duration, low to moderate flows (representing 60 to 80 percent of the flow days) were reduced in duration, moderately high flows (representing the upper 10 to 20 percent of flows) were increased, and high flood flows at the upper 1 to 5 percent of the curve were reduced. Regulation of the lakes is largely a pass-through operation with little long-term carryover storage. A significant portion of the high streamflows on the mainstem Kansas River is generated by uncontrolled drainage and cannot be altered by the existing system.

Municipal, Industrial, and Rural Water Supply and Water Quality

Minimum releases from each of the Federal reservoirs in the Kansas River basin were established during the original design and authorization process using U.S. Public Health Service guidelines for downstream water quality needs along the tributary before it reaches the Kansas River. Minimum releases range from 7 cfs to 100 cfs. Clinton is also authorized to provide supplemental low flow releases for downstream fisheries during April through September. Authorizations were also included at Milford, Tuttle Creek, and Perry lakes for low flow supplementation for water quality on the lower Kansas River and the Missouri River at Kansas City. Releases for water quality supplementation can be adjusted according to changing conditions, but current water control plan documents anticipate total releases from the three reservoirs on the order of 500 cfs for the Kansas River and to 3 kcfs at Kansas City, Milford, Tuttle Creek, and Perry lakes also are authorized to provide short-term releases for navigation supplementation at Kansas City of as much as 4 kcfs. Tuttle Creek is the primary reservoir source for navigation supplementation.

Under the Water Supply Act of 1958, and amended by the Federal Water Pollution Control Act amendments of 1961, state and local interests were authorized to purchase storage rights in the multipurpose pools of most Federal lakes. The Act also set the

policy of recognizing the primary responsibility of States and local interests to develop water supplies for domestic, municipal, industrial, and other purposes. Since then, the State of Kansas has reserved or purchased most of the multipurpose storage in Milford, Tuttle Creek, Perry, and Clinton allocated for various water supply purposes. The water supply storage also covers low flow supplementation needs for water quality on the Kansas River, but not on the Missouri River.

The State of Kansas initially reserved storage in Milford and Perry Lakes under the terms of the Federal Water Supply Act of 1958 and the State Water Plan Act passed by the 1963 Kansas Legislature. In 1965 the State of Kansas enacted the "State Water Plan," which is supplementary to the State Water Plan Act and implementing the same. And in 1986 the Kansas legislature enacted the Water Assurance Program Act. That legislation assigned to the Kansas Water Office the authority to negotiate with the Federal government to contract for multipurpose storage in each lake for water supply and quality, which in turn would be contracted to local users. Water right holders are thereby provided with water during times of low flow, while the state operates the lakes in a river basin as a system for increased efficiency in water delivery to other potential users. It also established long-range planning procedures and goals for flood control, conservation, development, utilization, and disposal of the waters of the state. None of the provisions in the State Water Plan Act were intended to conflict with flood control or conservation plans already authorized for the projects.

The Kansas Water Office then assisted in the formation of the Kansas River Water Assurance District No. 1 and entered into a Memorandum of Understanding with the Department of the Army to give the state the first purchase option for multipurpose storage in Tuttle Creek and a number of other lakes in Kansas. The Assurance District includes municipal and industrial water right holders along the Kansas River from Junction City in the west to the Kansas-Missouri border in the east. Reserve capacity in Milford and Perry previously purchased under the State Water Plan Act was then transferred to the Assurance program. Separate contracts for municipal water supplies from Clinton Lake are not affected by the Assurance program. The State of Kansas has now contracted for use of 300,000 acre feet (AF) of the total 390,000 AF of multipurpose storage at Milford, 50,000 AF of the total 300,000 AF at Tuttle Creek, 150,000 AF of the total 210,000 AF at Perry, and 89,200 AF of the total 125,000 AF available at Clinton. Portions of the remaining storage in each lake are reserved for sediment. Releases for low flow supplementation on the Kansas River beyond the specified minimum lake releases are coordinated with the Kansas Water Office and through them with the Assurance District and other state offices.

Irrigation

Irrigation developments during the 1800's began under riparian law and were later controlled to varying degrees by the state governments. The more extensive developments occurred in the western parts of the basin, particularly in the Republican River drainage area in Nebraska and Colorado. In the State of Kansas, water appropriations were first recognized by the legislature in 1866. Acts in 1907 and

subsequent years strengthened the law and recognized other water uses. Irrigation is part of the authorized project uses of all Reclamation reservoirs in the Kansas City District. It is also an authorized use of the Harlan County multipurpose pool. All authorized irrigation storage space in federal lakes in the Kansas City District has been contracted out to irrigation districts. Reclamation regulates the release of water from this contracted storage at all of its projects as well as from the Harlan County multipurpose pool. Irrigation releases are not a factor in controlling flows at Wamego.

Navigation

The Missouri River navigation season normally lasts from about April 1 to December 1. The length of the season and the level of navigation support are dependent on main stem water supplies. Maintenance of minimum navigation flows on the Missouri River is a major function of the main stem reservoirs. However, the authorizations for Milford, Tuttle Creek, and Perry Reservoirs on Kansas River tributaries include supplemental flows for maintenance of navigation on the main stem of the Missouri River (PL 83-780). Water from lower Kansas River basin reservoirs may be used effectively to replace releases from the main stem reservoirs when natural gains in flow between Nebraska City and Kansas City are less than the increase in requirements for navigation, or a maximum of about 4 kcfs.

The Corps has established guidelines in the Water Control Manuals for the release of water from the joint use storage space available in each lake. The guidelines are intended to balance the needs of the multiple purposes authorized at each lake. The joint use space is used for navigation and water quality supplemental flows, recreation, fish and wildlife, and sediment storage. It is separate from the multipurpose space specifically allocated to water supply.

For example, the Corps' guidelines specify that supplemental releases for navigation from Tuttle Creek are limited each year to that storage above elevation 1072 msl. during the main recreation season from Memorial Day through Labor Day. Following Labor Day and throughout the remainder of the Missouri River navigation season, supplemental storage for Missouri River navigation purposes will be limited each year to that storage above elevation 1061 msl except that sufficient reserve storage above this elevation will be retained at the end of the navigation season to assure maintenance of Kansas River

low flows. Releases for navigation supplementation are coordinated with the Kansas Water Office and the Corps' Reservoir Control Center.

Hydropower

No provision has been made for lake releases in the interest of hydropower, but the Bowersock Mill plant at Lawrence is kept informed of changes in lake releases and forecasts of flows above and below the plant. A non-Federal sponsor could request a Federal Energy Regulatory Commission license to install a hydropower plant at any of the dams, but the application would have to be evaluated against other projects and uses.

Recreation

The growing population in the Kansas River basin, as elsewhere, has led to increasing demands for outdoor recreational opportunities. The lower Kansas River basin lies in a region practically devoid of natural outdoor recreational opportunities, particularly of an aquatic nature. Water sports or activities carried out on land adjacent to water are the most sought after forms of recreation. Facilities in and near the Kansas River valley for water-related recreational activities consist of the four Federal projects, six lakes under the jurisdiction of the State of Kansas, and many other lakes under the jurisdiction of county or city governments.

A comprehensive master plan for recreational purposes and land management for each project in the basin has been prepared in coordination with the National Park Service, the USFWS, the U. S. Public Health Service, the Kansas Department of Forestry, Kansas Department of Wildlife and Parks (KDWP), the Kansas Park and Resources Authority, and the Kansas Board of Health. Provisions have been made at each lake for interior roads, parking areas, boat launching ramps, group shelters, comfort stations, drinking water supplies, and other facilities for picnicking or camping.

Optimum recreational use of the lakes depends on maintaining the lake elevations near the multipurpose pool level, particularly for the boat ramps, marina facilities, and swim beaches. Moderate rises in the pools do not have a large impact on recreation. Some boat ramps and beaches become unusable when more than 25 percent of multipurpose pools are lost. Most of the recreational use occurs in the summer, but fishing and hunting access is important throughout the year.

Fish and Wildlife

A wide variety of fish and game species occur within the Kansas River basin but aquatic resources can be limited in the western parts of the basin due to long periods of little or no stream flow. In the more humid eastern parts of the basin, natural stream flows are sufficient to support significant populations of fish and other aquatic organisms. Some mammals, birds, and fish species provide significant recreational opportunities for anglers, hunters, and non-consumptive recreationists. Rapidly developing interest in hunting and fishing has resulted in increased pressure on the land and water for all uses, often to the detriment of natural resources. Water development programs are assisting in maintaining those resources at a level commensurate with their importance by providing for fish and wildlife considerations in the planning, construction, and operation of the projects. Comprehensive state and federal wildlife management programs have been initiated in response to the growing concern over the depletion of those resources.

Close cooperation between the Kansas City District office, project operating personnel, and KDWP has resulted in operation plans recognizing lake fish and wildlife management objectives. One significant feature of this cooperation is the annual approval of water level management plans at each lake. Those plans modify the effective

multipurpose pool elevation for water release guidance to benefit fish and wildlife and recreation on the lake. The maximum modifications add to or reduce the flood pools about 5 percent of the total flood control storage space during certain seasons. Those plans are reviewed and modified annually in cooperation with the states. In recent years, additional provisions have been reviewed and approved for downstream flow management in hopes of benefiting downstream fisheries as well.

The typical water level management plan for Tuttle Creek Reservoir calls for a low winter level for ice control and to provide additional buffer storage for large winter and spring flows. Once the lake ice cover is established, the pool is maintained at a steady level to reduce shoreline and riprap erosion and displacement. In the spring, a slow pool rise is preferred to enhance fish spawning. For the same reason, large releases are minimized to prevent washing fish spawners along the face of the dam downstream. Later in the spring and in the summer, the pool is usually maintained close to the multipurpose level to enhance recreation and maximize flood control benefits during the wet season. Sometimes in the late summer or early fall, the pool may be lowered to enhance shoreline vegetation growth. Then later in the fall the pool is allowed to rise when water is available to inundate the growth and maximize waterfowl habitat and hunting access. In late December the pool is lowered to its winter level.

System Limitations

The ability to control flooding at tern and plover nesting sites is limited due to long travel times from the controlling lakes and the opportunities for large uncontrolled local inflows. In general, the water travel time with bank full flows is about 40-50 miles per day. The travel time from Kanopolis, Wilson, and Waconda lakes to Junction City is about 4 days, and therefore those lakes are typically not operated for points below Enterprise. The travel time from Ft. Riley to DeSoto is another 4 days, with another day travel time to the Missouri River control point at Waverly. During low and moderate flows, the travel time increases about 50 percent. Most of the tern and plover nesting occurs in the reach from Manhattan to below Topeka. Wamego tends to be the index gauge in that reach. Only Milford and Tuttle Creek are in a position to reduce flood flows at Wamego. During moderate and high flood flows, the controlling damage point for lake regulation often becomes Waverly, because of the restricted channel capacity on the Missouri River at that point.

The longer the travel time for flows from a lake to a downstream target flow point, the less chance the lake will be able to provide effective stage control because of the incidence of local inflows. From Milford Lake to Wamego travel time is about 2 days, and from Tuttle Creek to Wamego it is about 1 day. For points within one day travel time downstream, the lake releases can be reduced soon enough to have a large impact on potential flood flows, although sometimes the flood flows cannot be entirely eliminated. Peak local flows generally occur in the intervening local reach within one day after a storm, and the effectiveness of the lake decreases rapidly after one day and with the magnitude of the storm.

The normal regulating flood discharge at Wamego is 39 kcfs (stage of 14 ft). That was exceeded during just one flood event in 1999, but multiple events are common in many years. The 1999 target stage of 8 ft (about 12 kcfs) at Wamego to benefit bird nesting on the sandbars is normally exceeded many times. Flood control regulation primarily reduces very high flows and increases the duration of very low flows. Normally, it has little impact on moderate flow levels.

Use of stored lake water to maintain low river flows for water supply and water quality is more effective than flood control since the primary concern is maintaining base flows. Normal minimum lake releases are supplied by natural inflows. Special releases from multipurpose storage for downstream flow support is generally only necessary during extended drought, and the maximum lake release is approximately 1 kcfs, and rarely 4 kcfs for Missouri River navigation.

The maximum flow targets at Waverly on the Missouri River often limit flood control storage releases from the Kansas River lakes. During high flow years on the main stem, such as in 1997, this limitation can occur more often than restrictions due to flows on the Kansas River itself. In some years, approvals are obtained to regulate to the Phase II flow target at Waverly instead of the Phase I target. That can sometimes result in larger releases than normal from the Kansas River lakes after a flood at Waverly.

The Kansas River lakes have substantial multipurpose pool storage, but under current operation plans they have limited ability to support moderate flows on the Kansas River. Wet years provide more opportunity for downstream flow support than dry years when lake inflows are low and there is little opportunity to store water for later releases. The multipurpose pools at all Reclamation reservoirs have been contracted to irrigation districts. Limited portions of the multipurpose pools at the four lower Kansas River lakes are reserved for support of downstream navigation flows and sediment. Larger portions have been contracted to the State of Kansas for water supply and quality control. The contracted space is only utilized for downstream releases during drought situations. Drawdowns from the multipurpose pool level can have a negative impact on lake recreation and fish and wildlife.

System Flexibility

Much of the flood control flexibility of the reservoir project system is derived from the ability to regulate each lake within broad bands defined by the seasonal phase diagrams. Flexibility increases when normal basin runoff occurs. The flexibility of the system becomes much more restricted as the flood control pools and the urgency to evacuate accumulated flood control storage increases. Because the Kansas River basin is subject to prolonged droughts it is desired to maintain the lakes at multipurpose pool. This also enhances recreation opportunities and fish and wildlife habitat. While a routine operational pattern is followed, detailed plans for specific floods are not a part of the normal operating plans. Additional flexibility is in planning navigation release requirements, since the increase in navigation flow above minimum levels is a matter of operating judgment each year and is determined by system storage that year.

Conservation Measures for Threatened and Endangered Species

The large and prolonged flood flows of 1993 scoured a number of sandbars in the Kansas River of vegetative cover. The federally listed interior least tern and piping plover were discovered nesting for the first time on the Kansas River in 1996 on several recently scoured sand bars in Wabaunsee County between Manhattan and Wamego. That was the first documented account of piping plovers nesting in Kansas, and the first account of least terns nesting on the Kansas River.

In 1997, the KDWP conducted an aerial survey of the Kansas River for these species. Although piping plovers were not visible from an airplane, the observers did locate two separate sites with least tern activity upstream of Wabaunsee and downstream of Wamego. Additionally, they observed potential nesting habitat for both species in the river as far downstream as St. Marys. Similar monitoring of nesting activities occurred in 1998 and 1999. Since 1999, monitoring has been conducted by Dr. Boyd of Baker University and funded by the Corps of Engineers.

Lake operations during the nesting season have been altered since 1998 to avoid adverse impacts to listed species. During the nesting season, the Corps has coordinated extensively with the Manhattan office of the USFWS to avoid adverse impacts. In general, the altered lake operation has involved reducing target stages on the Kansas River to avoid flooding existing nests with releases from Corps lakes. In coordination with the USFWS, weekly field observations are made of nest sites and a river elevation is maintained that will provide protection for the nests. No water is released from Corps lakes which would increase river stages and inundate nests. Releases from Corps lakes are only increased when there is a decrease in the baseflow of the Kansas River and then only enough to maintain the existing river stage. Releases from Corps lakes are reduced when a rise in the unregulated baseflow of the Kansas River occurs upstream of the nesting colonies. The USFWS is consulted after any unregulated high flows occur on the river that flood nests and also prior to resuming normal lake operations.

The Corps will continue monitoring the least terns and piping plovers nesting on the Kansas River, through the 2005 nesting season, and continue to coordinate lake operations during the nesting season with the USFWS. The Corps, as required by the RPA will make an evaluation of whether the Kansas River provides a source or sink for least terns and piping plovers in 2005.

O&M OF THE MISSOURI RIVER BSNP

O&M

Maintenance on the Missouri River BSNP can be broken into two categories, routine and non-routine. They can be distinguished by the type of work and/or the event(s) that cause the need for the maintenance. Either type of maintenance can be needed to support both project functions of bank stabilization and navigation. Non-routine actions are not

programmatic in nature and therefore require separate ESA compliance, and are not addressed in this Biological Assessment.

Routine maintenance, as a rule, is preventative in nature. In other words, maintenance is pro-actively scheduled to prevent project deficiencies (excessive shoaling, thalweg meander, etc), and is most often caused by normal run-off conditions. Routine maintenance can be generally described as replacement of stone lost to normal hydrologic cycles and general deterioration of riprap material. That does not involve new structures, structure extensions, and with the exception of marker clumps generally does not include raising the elevation of structures. However, routine maintenance is necessary for the continued integrity and function of the existing structures of the BSNP. That maintenance is usually funded through routine, or baseline, budget allocations. Nearly all maintenance work for Omaha District (RM 735 - 498) is performed from a floating plant by in-house labor forces. The Kansas City District (RM 498 - 0) uses its in-house labor forces to perform 10 percent of the maintenance. The rest is performed by contract. A list of structures and their typical routine maintenance needs are summarized in Table 3.

Occasionally, existing structures are salvaged, and the stone from one structure is used to maintain others within the general area. Salvage operations are conducted mostly in the reach above Decatur, Nebraska (RM 691), and are generally conducted in the winter months. Extensive salvage work also involves considerable disturbance of the high bank. Hired labor performs nearly all of this work.

Non-routine maintenance that is not preventative is aimed at local problems caused by deterioration of existing structures. Those problems can be chronic, transient, or occur only once. Reach or system problems are not addressed through routine maintenance, as they generally require major structural modifications.

Deferring routine maintenance for a single season has only a slight impact to project performance. Changes in the channel and over bank conditions are relatively small, on both a spatial and temporal scale. There is generally no measurable increase to top width or change in the depth distribution through the bend, but rather a change in the location of deep and shallow water. Continued deferment will lead to thalweg meander over longer reaches and possibly some erosion of the high bank adjacent to the channel. However, changes in depth distributions, increases in top width, and channel avulsions are not likely as the base/toe of the individual structures is well entrenched. That has been demonstrated in a five-mile long test reach in the upper part of the project.

The physical configuration of dikes, sills and kickers may deteriorate, as discussed in Table 3. The river's response to this changed condition may be the development of conditions which provide less than the authorized navigation channel dimension. That response may also be more pronounced within specific discharge ranges.

Table 3. Routine Maintenance	
Structure Type	Description of Maintenance Needs
Revetments	Scour along the toe can cause the upper bank paving to slide down the bank leaving the upper bank exposed to erosion. Small holes (< 50 feet) do not cause problems for either bank stabilization or navigation unless there is some landward feature (chute, oxbow, etc.) that can cause a major change in flow around the bend. Holes from 50 to 100 feet in length can begin to cause navigation problems. Tows navigating at night can begin to lose site of the bankline. Also, as the bankline becomes irregular, the channel roughness changes, which can lead to changes in the shoaling pattern within the sailing line. Holes larger than 100 feet are generally considered navigation hazards, and may lead to thalweg instabilities if not corrected.
Dikes	Routine over topping, riprap material breakdown, and ice action all tend to deteriorate the crown and riverward ends of the dikes. Minor losses in length do not generally lead to project deficiencies, particularly for dikes in the middle portion of the bend, as long as consecutive dikes are not noticeably damaged. Minor damage to the crown of a dike is not cause for alarm, as long as most of the crown is at the maintenance elevation. Significant and/or prolonged over topping can lead to flanking of the dike, which if severe enough can lead to shoaling in the sailing line. On rare occasions routine dike deterioration can lead to thalweg stability concerns.
Sills	Routine sill damage is caused by continuous over topping and ice action, and is totally related to navigation problems. Sills were constructed in locations where thalweg meander historically caused navigation problems. Even small deterioration of the sills can cause navigation problems.
Crossing Control Structures (Kickers)	Kickers are routinely damaged by over topping, riprap material breakdown, and ice action. Their purpose is to provide a more reliable depth through the crossing by effectively narrowing the active river channel. A deteriorated kicker will lead to instability of the cross and can itself become a very serious navigation hazard.

One such response is shoaling. Shoaling in the channel may result in reduced depths and/or reduced top width. If the problem persists over an extended period of time or is significant enough to impede navigation, river structures in the immediate vicinity are repaired to design lines and grades. If repairing structures to lines and grades does not correct the problem, additional structures may need to be designed and constructed. However, shoaling problems rarely require additional structures as the original layout provides for a reliable navigation channel over a wide range of flow conditions.

Another such river response is bank erosion. Dikes, on occasion, become flanked permitting water to flow between the dike and the bankline. The primary cause of flanking is stages which consistently run 5 to 10 feet above the construction reference

plane (CRP) elevation for an extended period of time, overtopping the dike and eroding the bankline. The CRP was established to aid the design of river structures on the Missouri River BSNP. CRP is an imaginary sloping plane that is approximately the elevation of average low flows on the Missouri River. The CRP was initially established by the Missouri River Commission in 1889, with subsequent revisions by the Corps in 1931, 1938, 1960, 1973, 1982, and 1990.

The dikes most susceptible to flanking are dikes that do not extend back into the bank and that do not have adequate scour protection near the bank. In general, once a dike becomes flanked, the bank erodes rapidly forming a deep scarp landward of the dike. The cross sectional area between the dike and the bank is dependent on the proximity and layout of adjacent structures. Flanked dikes are repaired by extending the dike landward into the high bank. Most dike extensions are less than 25 feet long. Revetments also may fail due to scour along the toe leaving the upper bank unprotected, as discussed in Table 3. If repairs are warranted, the revetment is repaired to design lines and grades.

Maintenance of the Kenslers Bend portion of the river (RM 735 to 753.5) is very similar to the maintenance of the navigation portion of the project with the following exceptions. First, the Kenslers Bend Project is a bank stabilization project only. Therefore there are no sills or kicker structures to maintain, and second, all maintenance is aimed at preventing channel meander. Thalweg meander is quite common. Maintenance activities include replacement of stone on dikes and repair of large holes in the revetments, in an effort to prevent general channel meander. The structures in this reach of the river are subject to the same maintenance guidelines as mentioned above. Maintenance is not performed on this reach of the river each year. Stone from some structures is salvaged for use elsewhere, and a few structures have been almost completely salvaged.

Changes to Established Operation and Maintenance Practices

Original maintenance called for all structures to be maintained at their as-built lines and grades. That was expensive and logistically difficult, requiring as much as 1,000,000 tons of maintenance riprap in some years. As the self-maintaining channel became established and maintenance costs increased, structures located landward of the high bank were given a lower priority. In 1988 the Kansas City District and Omaha District along with the Missouri River Division, developed new formal maintenance guidelines that are still in use today. Those guidelines were intended to: (1) reduce operation and maintenance costs, (2) manage encroachment of the high bank into the channel, and (3) help identify structures for salvage. Presently, approximately 120,000 tons of riprap is placed per year (20,000 in the Omaha District and 100,000 in the Kansas City District) or approximately 0.06 percent of the original construction. The results of implementing the new maintenance guidelines are: (1) the maintenance elevation of nearly every structure has been lowered, (2) critical structures have been identified and are given a high priority, and (3) structures are allowed to deteriorate further before maintenance is initiated. Those guidelines have achieved two of the intended goals; reduced maintenance costs and reduced encroachment of high bank into the channel.

History of Modification for Fish and Wildlife Habitat Improvement

Since 1974, the Corps has restored some side-channel connections and increased habitat diversity in the channelized Missouri River by notching dikes or otherwise modifying channel structures (Burke and Robinson 1979). As of 1981, the Kansas City District had excavated openings in 200 structures, left unrepaired openings in 400 structures and constructed 150 new structures with notches and 80 rootless structures (no connection to the bank). The Omaha District has notched 320 structures and left unrepaired sections in 30 structures (USFWS 1980). Both Districts continue to modify structures as the opportunities arise, provided impacts are not expected to occur to navigation.

Notching is designed to prevent shoaling around a wing dike from accreting to the adjacent bank. It is one way to maintain aquatic habitat and improve fisheries habitat value associated with those structures. Notching dikes or revetments adjacent to publicly owned lands (e.g., Jameson Island, MO) can increase channel width and diversity, and create substantial shallow-water/sandbar complexes at certain river stages. After the 1993 Flood, revetment repairs that allowed continued riverine connection to off-channel scours and chutes have also helped maintain habitat diversity and value, particularly for riverine fishes. Because of limited monitoring, however, the Corps currently can not quantify the extent of habitat benefits from those efforts.

Conservation Measures for Threatened and Endangered Species

The Omaha and Kansas City districts coordinate their respective future routine annual maintenance schedules as agreed to during informal consultation between the Corps and the Service. As part of this coordination process, the Corps explores alternative maintenance practices such as notch enlargement, vein dikes, chevrons, etc., in lieu of standard maintenance practices. The alternative maintenance practices will be aimed at increasing depth and velocity diversity, while maintaining the authorized project functions. These actions will be similar to many of the non-routine maintenance activities that were completed after the 1993 Flood, and resulted in the preserving and/or creation of significant fish and wildlife habitat at locations such as Lisbon Bottoms and Jameson Island in Missouri. The USFWS believes that these habitats also likely benefit listed threatened and endangered species. In 1999, larval pallid sturgeon were found for the first time in 50 years on the lower Missouri River at Lisbon Bottoms.

The Corps is implementing the modified Missouri River BSNP Fish and Wildlife Mitigation as authorized by Section 334(a) of the 1999 Water Resources Development Act (WRDA 99). This project will be used to construct shallow water habitat for Corps' compliance with the 2000 BiOp.

ADAPTIVE MANAGEMENT

The 2000 BiOp recommended that the Corps adopt an adaptive management approach to implementing the various BiOp measures. The USFWS stated that the "adaptive management framework is a particularly effective way to address multiple species,

ecosystem variability, and biological unknowns about the lifecycles, behaviors, and habitat requirements of the listed species.” The National Research Council in their January 2002 report on “The Missouri River Ecosystem: Exploring the Prospects for Recovery,” also recommended that adaptive management be adopted as an “ecosystem management paradigm” for the Missouri River. Key components included broad stakeholder involvement, an independent scientific peer review process, and a collaborative process to “learn about successes, failures, and potential management actions that could be usefully implemented in the Missouri River ecosystem.”

The Corps in its proposed action, embraces the concept of adaptive management. Adaptive management is not a new concept; but rather, a construct that is now commonly used throughout the world to help shape resource management decisions, policies, and approaches. There is an up-front recognition that all is not known about the complete life cycles and behaviors of the threatened and endangered species, or the requisite habitat needs throughout the species life cycles. Adaptive management is an overall strategy for dealing with change and scientific uncertainty. It promotes an environment for testing hypotheses and pursuing promising changes based on sound scientific data and analyses.

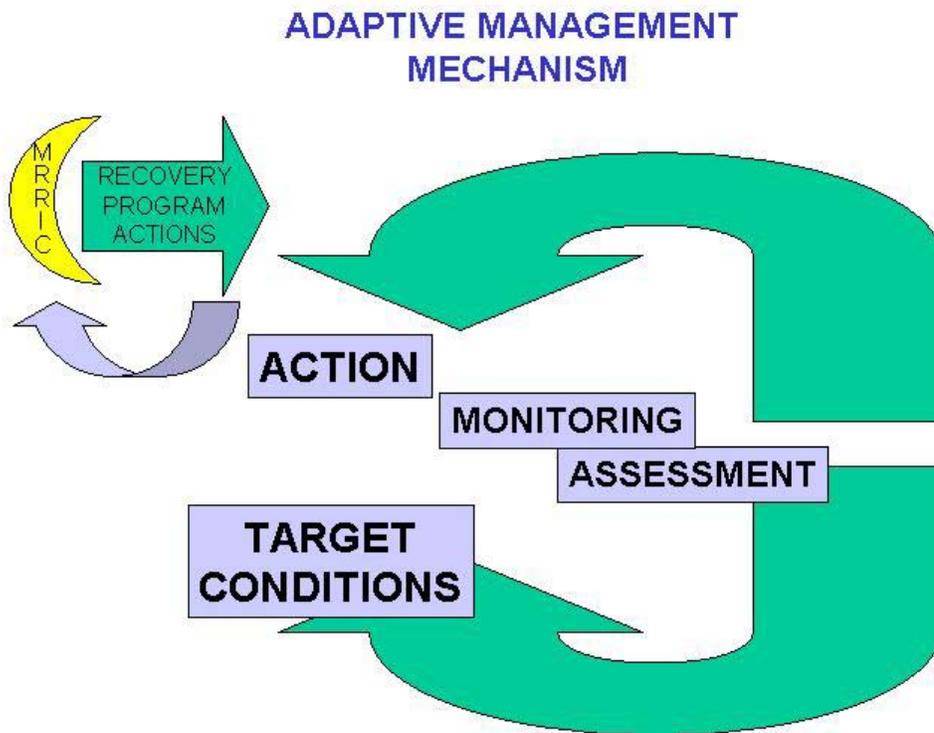
Generally speaking, adaptive management: 1) aggressively implements on-the-ground actions to attain those biological attributes which will result in beneficial effects for the listed species; 2) conducts a rigorous research effort to reduce the uncertainty surrounding essential attributes needed to insure the survival and recovery of listed species; and 3) adapts to the findings of an intensive and comprehensive monitoring and evaluation program. In carrying out an adaptive management approach to decision-making, certain proposed actions may pose significant effects to the natural and/or human environment. In some cases, this may require that the Corps undertake an assessment of the effects in accordance with the National Environmental Policy Act, prior to making any decisions to implement an action. The ultimate success of the adaptive management framework for the Missouri River Basin must also take into account that humans are integrated into the ecosystem and that natural ecosystems do not recognize property lines and administrative boundaries. Understanding this, the Corps proposes within the adaptive management framework, the development of the Missouri River Recovery Implementation Committee (MRRIC), where a range of stakeholders from a variety of disciplines with diverse interests, expertise, talents, and perspectives come together to assist the Corps, the USFWS, and other interested and involved agencies in implementing actions to benefit threatened and endangered species and to ensure that public values are incorporated into recovery implementation.

The MRRIC will be developed cooperatively with entities having an interest in recovery of listed species and the ecosystem on which they depend. The committee will include representatives of tribal and state governments and of non-governmental organizations that have an interest in the management of the river and recovery of the species and ecosystem. The MRRIC will provide recommendations to the federal agencies concerning actions that take into consideration the best scientific information as it is developed, and will provide a public process for reviewing scientific information,

discussing and prioritizing activities, initiating additional legislative action when appropriate, and affords an opportunity for stakeholder input.

The proposed action is consistent with all applicable federal and state laws, Native American trust responsibilities, and interstate compacts and decrees. The Corps recognizes that the USFWS and the Corps each have statutory responsibilities that cannot be delegated, and the establishment of the MRRIC is not intended to abrogate any of their statutory responsibilities. However, the Corps advocates that the MRRIC be a partner in recommending applicable future actions taken to benefit the listed species in the Missouri River. Consistent with the adaptive management framework, the Corps will pursue alternative courses of actions based on the scientific findings of our efforts and when applicable, recommendations of the MRRIC.

It is anticipated that basin development of a MRRIC will require a considerable amount of time and the structure of MRRIC itself will be the subject of adaptive management. A conceptual diagram of an adaptive management strategy to include MRRIC is provided below.



DESCRIPTION OF THE PROJECT AREA

The proposed action would affect the mainstem of the Missouri River from Three Forks, Montana, to St. Louis, Missouri, and on select tributaries of the Missouri River, including the Kansas River.

LISTED SPECIES AND CRITICAL HABITAT

Critical factors necessary for species recovery, such as the river processes, are hereby incorporated into this document by reference from the November 2000 BiOp.

Species listed under the ESA in the project area include:

- interior least tern (*Sterna antillarum athalassos*);
- piping plover (*Charadrius melodus*);
- pallid sturgeon (*Scaphirhynchus albus*);
- bald eagle (*Haliaeetus leucocephalus*); and
- Indiana bat (*Myotis sodalis*).

INTERIOR LEAST TERN

The least tern (*Sterna antillarum*) is the smallest member of the subfamily Sterninae and family Laridae (gulls, jaegers, skuas, terns and skimmers) of the order Charadriiformes (shorebirds, gulls and alcids) with the interior least tern recognized as a subspecies (*Sterna antillarum athalassos*). The least tern is 21-24 cm long with a 51 cm wingspan. The sexes are alike with a black-capped crown, white forehead, grayish back and dorsal wing surfaces, snowy white undersurfaces, legs of various orange and yellow colors depending on the sex, and a black-tipped bill whose color also varies depending on sex. Immature birds have darker plumage than adults, a dark bill, and dark eye stripes on their white foreheads.

The interior least tern is migratory and historically bred along the Mississippi, Missouri, Arkansas, Red, Rio Grande, and Ohio River Systems. On the Missouri River System least terns breed on the Missouri, Kansas, Platte, Loup, Niobrara, Cheyenne and Yellowstone Rivers. On the Missouri River prime breeding areas are located below Garrison and Gavins Point Dams. Lesser breeding areas on the Missouri include below Fort Peck Dam, Lake Oahe, Lake Sakakawea, below Fort Randall Dam and Lewis and Clark Lake.

Least tern colony sites are usually located in open expanses of sand or pebble beach within the river channel or reservoir shoreline. They prefer sites that are well drained and well back from the water line. Least terns usually nest on sites totally devoid of vegetation, but have been found on sites with up to 30 percent vegetative cover. Foraging habitat for least terns includes side channels, sloughs, tributaries, shallow water

habitats adjacent to sand islands and the main channel. To successfully reproduce, productive foraging habitat must be located within a short distance of a colony.

The interior least tern is piscivorous, feeding on small fish in shallow waters of rivers, streams, and lakes. Important prey genera include *Fundulus*, *Notropis*, *Camptostoma*, *Pimephales*, *Gambusia*, *Blonesox*, *Morone*, *Dorosoma*, *Lepomis*, and *Carpiodes*. Fishing behavior involves hovering and shallow dives over standing or flowing water.

The least tern begins arriving on the Missouri around mid May. Nest initiation begins in late May with peak nest initiation occurring during the first two weeks in June and continuing into July. The nest is a shallow and inconspicuous depression in an open, sandy area, gravelly patch, or exposed flat. Small stones, twigs, pieces of wood and debris usually lie near the nest. Least terns nest in colonies as small as a single pair to 40+ pairs and nests can be as close as just a few feet apart or widely scattered up to hundreds of feet. The birds usually lay two to three eggs. Least terns will re-nest if a nest or young brood is lost. Both sexes share incubation, which generally lasts 18 to 22 days but has ranged from 17 to 28 days.

Least tern chicks hatch within one day of one another and stay near the nest bowl for several days. Young least terns are somewhat precocial and are brooded for about 6 days after hatching. At that time, they are strong enough to wander from the nest on their own. Chicks are able to fly by about 20 days after hatching, but do not become competent at fishing until after migrating from the breeding grounds. They depend on some parental care even after they have become strong fliers.

Departure from colonies by both adults and fledglings varies, but is usually complete by late August or early September. Least terns are found during the winter along the Central American coast and the northern coast of South America from Venezuela to northeastern Brazil.

On the Missouri River, adult censuses of least terns have been conducted from Fort Peck Lake in Montana to Ponca State Park, Nebraska from 1988 to present. The average adult census has been 625 birds with a high of 777 in 1994 and a low of 446 in 1996. For the past three years least tern adult census numbers on the Missouri River have been: 2001 – 653, 2002 – 731 and 2003 – 735.

PIPING PLOVER

The piping plover (*Charadrius melodus*) is a migratory shorebird of the family Charadriidae (plovers), order Charadriiformes (shorebirds, gulls and alcids). Adult piping plovers have an average body length of 17 cm and generally weigh from 46 to 64 gms. Throughout the year, adults have a sand-colored upper body, white undersides, and orange legs. During the breeding season, adults develop orange bills and single black bands on the forehead and breast. In general, males have more complete bands than females. Breeding birds lose the orange bill and bands after the breeding season, but are easily distinguished from related plover species by their slightly larger size and orange

legs. Juvenile plumage is similar to adult non-breeding plumage. Juveniles acquire adult plumage the spring after they fledge.

Piping plovers historically bred in three areas of North America: (1) Atlantic coastal beaches from Newfoundland to South Carolina; (2) beaches of the Great Lakes; and (3) the northern Great Plains/Prairie. In the northern Great Plains breeding areas include southern Alberta, Saskatchewan and Manitoba in Canada, wetland areas in eastern Montana and North Dakota, the Missouri River in North Dakota, South Dakota and Nebraska, and on the Niobrara, Loup and Platte Rivers in Nebraska. Other populations have been found in Colorado, Kansas and Iowa. On the Missouri River prime breeding areas are located below Garrison and Gavins Point Dams, Lake Sakakawea and Lake Oahe. Lesser breeding areas on the Missouri include Fort Peck Lake, below Fort Peck Dam, below Fort Randall Dam and Lewis & Clark Lake.

Piping plovers in the Great Plains make their nests on open, sparsely vegetated sand/gravel beaches adjacent to alkali wetlands, on beaches of reservoirs and lakes, and on sandbars and islands of major river systems. On the Missouri River reservoirs, piping plovers use beaches, sand flats and islands. Preferred riverine habitat on the Missouri for plovers are sandbars located in midstream, with a sand and gravel mix, enough elevation to prevent the loss of nests from flooding and vegetation cover of less than 25%.

Open, wet, sandy areas provide feeding habitat for plovers on river systems and throughout most of the birds' nesting range. Piping plovers feed primarily on exposed substrates by pecking for invertebrates at or just below the surface. Prey items available on piping plover territories in North Dakota include *Ephidridae*, *Chironomidae*, *Dolechopodidae* and *Muscidae*.

Piping plovers begin arriving on the breeding grounds on the Missouri River in late April and early May. Piping plovers are territorial and males may arrive before the females to establish defended areas. After pairing, the male and female will line the nest bowl with pebbles and both will actively defend the territory they have established. Though territorial, plover pairs will nest in close proximity to each other if there is not a line of sight between the nests. Piping plovers will nest within least tern colonies and coexist with the terns, but they will chase away other plovers and killdeers that invade their territory.

Piping plovers in the Great Plains generally lay a clutch of three to four eggs. A pair will raise one brood per year, but if the nest is destroyed before the eggs hatch or if the chicks are lost at a young age, the pair may re-nest. Second or third re-nest clutches often will contain fewer eggs, usually two or three and sometimes only one. Both adults incubate the eggs and both defend the nesting territory. Incubation is between 27 to 31 days. During the incubation period the nest is susceptible to destruction from a variety of factors. These include flooding, predation, storms, sandbar erosion, human disturbance and abandonment of the nest by the adults. On the Missouri, a little less than half (56%) of all plover nests survive to hatching.

Plover chicks leave the nest within several hours of hatching, as soon as their down is dry. Chicks forage near a parent and immediately use “peck and run” foraging behavior of adults. The chicks begin trying to fly around the age of 20 to 24 days. By the time the chicks are 25 days old they are capable of sustained flight and are considered fledged. Both parents generally will stay with the brood until the chicks fledge.

Departure to the wintering grounds may begin as early as July and is generally complete by late August. Piping plovers winter on the Atlantic Coast south from North Carolina, on the Gulf Coast from Florida to Mexico and on Caribbean islands.

On the Missouri River, adult censuses of piping plovers have been conducted from Fort Peck Lake in Montana to Ponca State Park, Nebraska from 1988 to present. The average adult census has been 588 birds with a high of 1,300 in 2003 and a low of 117 in 1997. For the past three years piping plover adult census numbers on the Missouri River have been: 2001 – 1,054, 2002 – 1,134 and 2003 – 1,300.

PALLID STURGEON

The pallid sturgeon, *Scaphirhynchus albus*, also known as white sturgeon, white shovelnose, white hackleback, and rock sturgeon is endemic to the Yellowstone, Missouri, middle and lower Mississippi Rivers, and the lower reaches of their major tributaries. The specimens for species identification were collected at or near Grafton, Illinois on the lower Illinois and Mississippi Rivers. The pallid sturgeon grows to lengths of over 6 ft (1.8 m), can weigh in excess of 80 lbs (36 kg), and can be described as having a flattened, shovel-shaped snout, a long and completely armored caudal peduncle, and lacks a spiracle. The mouth is toothless, protrusible, and ventrally positioned under the snout, as with other sturgeon.

Pallid sturgeon are similar in appearance to the more common and darker shovelnose sturgeon (*Scaphirhynchus platyrhynchus*) and have five rows of scutes that run the entire length of the body. The principal features distinguishing pallid sturgeon from shovelnose are the paucity of dermal ossifications on the belly, 24 or more anal fin rays, and 37 or more dorsal fin rays.

Today, pallid sturgeon are found in a few selected areas. Since 1980, reports of most frequent occurrence are from the Missouri River: 1) between the Marias River and Ft. Peck Reservoir in Montana; 2) between Ft. Peck Dam and Lake Sakakawea (near Williston, North Dakota); 3) within the lower 70 mi (113 km) of the Yellowstone River downstream of Fallon, Montana; 4) in the headwaters of Lake Sharpe in South Dakota; 5) near the mouth of the Platte River near Plattsmouth, NE; and 6) below river mile 218 to the mouth in the State of Missouri. Pallid sturgeon have also been captured from Fort Randall dam downstream to the headwaters of Lewis and Clark Lake.

Of 872 pallid sturgeon records prior to 1998, 70 percent were reported from the Missouri River. Approximately 10 percent of the Missouri River records were from below Gavins

Point Dam; the majority of records were from intensive sampling efforts in Montana, North and South Dakota, and include recaptures.

Since 1988, pallid sturgeon researchers have collaborated on studies to gather information about the species including estimates of fish numbers on the upper Missouri River. That has allowed workers to identify where populations still remain and to obtain rough estimates of present abundance of the species. Tag and recapture data has allowed researchers to estimate that 50 to 100 pallid sturgeon remain in the Missouri River above Ft. Peck Dam in Montana, and between 200 and 300 pallid sturgeon remain between the Garrison Dam in North Dakota and Fort Peck Dam, including the lower Yellowstone River. One to five sightings per year have been made of pallid sturgeon between the headwaters of Oahe Reservoir in South Dakota to the Garrison Dam and from the riverine reach in the Missouri River above Gavins Dam to Fort Randall Dam suggesting that, perhaps as many as 25 to 50 fish may remain in each of these areas. A small population also exists between Oahe Dam and Big Bend Dam on the Missouri River in South Dakota with perhaps 50 to 100 fish remaining in this riverine section. Unfortunately, no evidence has been obtained that any of the upper Missouri River system populations are successfully reproducing because only large individuals are being reported.

Evidence of successful pallid sturgeon reproduction and recruitment is rare throughout the range of the species. In 1998, the Missouri Department of Conservation collected a young-of-the-year pallid sturgeon near Cape Girardeau in the middle Mississippi River. More recently, in August 1999, one confirmed and two probable pallid sturgeon larvae were collected from the lower Missouri River in Missouri and, in September 2002, two pallid sturgeon larvae were collected near the confluence of the Yellowstone and Missouri rivers in Montana. These three instances represent the only evidence of successful pallid sturgeon reproduction in recent years and indicate that some suitable spawning habitat and hydrologic conditions remains in the Missouri River and, potentially, the middle Mississippi River.

BALD EAGLE

The bald eagle is a large, powerful, brown bird with a white head and tail. Females generally weigh up to 14 pounds and have a wingspan up to 8 feet. Males are smaller, weighing 7 to 10 pounds with a wingspan of 6-1/2 feet. Young bald eagles are mostly dark brown until they reach four to six years of age and may be confused with the golden eagle. The bird's life span in the wild can reach 30 years.

Bald eagles mate for life and build huge nests in the tops of large trees near rivers, lakes and marshes. Nests, which are usually re-used and enlarged every year, can reach 20 feet across and weigh up to 4,000 pounds. The birds travel over great distances, but normally return to nest within 100 miles of where they were originally raised.

The bald eagle once ranged throughout every state in the Union except Hawaii. When America adopted the bird as its national symbol in 1782, as many as 100,000 nesting bald

eagles lived in the continental United States, excluding Alaska. By 1963, only 417 nesting pairs were found in the lower 48.

Today, due to recovery efforts by the USFWS in partnership with other federal agencies, tribes, state and local governments, conservation organizations, universities, corporations and thousands of individual Americans, this number has risen to an estimated 5,748 nesting pairs.

On July 12, 1995, the USFWS reclassified under the ESA of 1973, as amended, the bald eagle (*Haliaeetus leucocephalus*) from endangered to threatened in the lower 48 States. This action will not alter those conservation measures already in force to protect the species and its habitats. The bald eagle also occurs in Alaska and Canada, where it is not at risk and is not protected under ESA.

Along the Missouri River, bald eagles can be found wintering from North Dakota to Missouri. The raptors' habitat includes estuaries, large lakes, reservoirs, major rivers, and some seacoast areas. These areas, however, must have an adequate food base, perching areas, and nesting sites in order to support the species. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and offer good perch trees and night roosts.

INDIANA BAT

The Indiana bat is a medium-sized bat with a head and body length that ranges from 1.6 to 1.9 inches. Its range includes much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. Its range includes much of the lower Missouri River floodplain. The Indiana bat is migratory, and the above described range includes both winter and summer habitat. The winter range is associated with regions of well-developed limestone caverns. Major populations of this species hibernate in Kentucky, Indiana, and Missouri. Smaller winter populations have been reported from Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. About 85% of the population hibernates in only seven caves, and nearly 50% may hibernate in only two caves.

Indiana bats spend the winter hibernating in caves in the southern part of the Missouri River basin, and migrate north to establish small maternity colonies. Indiana bats winter in caves or mines that meet highly restrictive temperature requirements during hibernation.

During summer, adult females and young have been found hundreds of miles north of hibernacula caves. Densest concentrations of reproductive females in summer have been documented in northern Missouri, southern Iowa, Illinois, northern Indiana and southern Michigan. Summering Indiana bats roost in trees and forage for flying insects between dusk and dawn in riparian and upland forests, including the Missouri River floodplain. Roost trees generally have loose bark which allows the bat to roost under the bark and

must be of sufficient diameter. Bats will roost in trees as small as nine inches diameter at breast height (dbh), but prefer to roost in the largest trees available. Cavities and crevices in trees also may be used for roosting. A variety of tree species are used for roosts including shagbark hickory, slippery elm, American elm, cottonwood, northern red oak, post oak, white oak, shingle oak, sassafras, sugar maple, silver maple, green ash, and bitternut hickory. Many of the trees along the lower Missouri River channel are suitable roost trees.

Female Indiana bats give birth to a single young in June or early July. During that time, they join together in maternity colonies beneath the loose bark of dead or living trees. Maternity colonies, which may contain up to 100 adult female bats and their young, may be occupied from mid-May to mid-September. Young Indiana bats are capable of flight within a month of birth. They spend the latter part of the summer foraging to accumulate fat reserves for the fall migration and hibernation. Maternity colonies have been located in riparian habitat, adjacent floodplains, and nearby forested upland areas. Indiana bats exhibit strong site fidelity to summer roosting and foraging areas. Traditional summer sites are essential to the reproductive success of local populations.

Early researchers considered floodplain and riparian forests to be the primary roosting and foraging areas used by Indiana bats in the summer. While these forest types are still considered important to the species, recent research demonstrates that upland forests are also important summer roosting and foraging habitat.

The total known Indiana bat population, based on the most recent hibernacula census, is roughly 333,000. Many hibernating populations, especially in Missouri and Kentucky have decreased in number. Populations have increased in recent years in Indiana; now 50% of all hibernating bats winter in this state.

A variety of factors have contributed to Indiana bat population declines. Because many known threats are associated with hibernation, protection of hibernacula has been a management priority. Despite the protection of most major hibernacula, population declines have continued. Most of the hibernacula (70%) in Missouri are protected from disturbance by either gates or fences and otherwise appear to have stable conditions. No link between population trend and type or lack of protection is readily apparent. Population reductions in Missouri, therefore, do not seem to be directly attributable to human disturbance at hibernacula. Continued population declines of Indiana bats, in spite of efforts to protect hibernacula, have led scientists to the conclusion that additional information on summer habitat is needed.

PIPING PLOVER CRITICAL HABITAT

The Service designated critical habitat for the northern Great Plains population of the piping plover (67 FR 57638) including the Missouri River in September 2002. In Montana, critical habitat was designated on Fort Peck Lake (77,370 acres (31,310.6 ha.), and 125.4 miles (201.8 km) of the Missouri River below Fort Peck Dam (RM 1712.0 to RM 1586.6). In North Dakota, critical habitat includes 18.6 miles below Fort

Peck Dam (RM 1586.6 to RM 1540.0), 179 miles of river on Lake Sakakawea above Garrison Dam (RM 154.0-RM 1389.0), 87 miles of river below Garrison Dam (RM 1389.0-RM 1302.0), and 70 miles of river on Lake Oahe (RM 1302-RM 1232.0). In South Dakota, critical habitat includes 159.7 miles on Lake Oahe (RM1232.0-RM 1072.3); 36 miles (57.9 km) below Fort Randall Dam (RM 880.0- RM 844.0), 32.9 miles (52.9 km) on Lewis and Clark Lake (RM 844.0-RM811.1); and 58.9 miles (94.8 km) below Gavins Point Dam (RM 811.1-752.2). The Kansas River was not designated as critical habitat.

Primary constituent elements of the northern Great Plains population of the piping plover are those habitat processes (biological) and components (physical) essential for the biological needs of courtship, nesting, sheltering, brood rearing, foraging, roosting, intraspecific communication, and migration. The overriding primary constituent element (biological) necessary on all sites is the dynamic ecological processes that create and maintain the physical components of piping plover habitat through dynamic hydrological processes. On rivers, the physical primary constituent elements include sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river. On reservoirs, the physical primary constituent elements include sparsely vegetated shoreline beaches; peninsulas; islands composed of sand, gravel, or shale; and their interface with the water bodies.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION

This section of the BA describes the manner in which the proposed action may affect the listed species and designated critical habitat of the piping plover. The biological effects will be considered in proposed adaptive management framework in this BA. Adaptive management is an overall strategy for addressing change and scientific uncertainty. It promotes an environment for testing hypotheses and pursuing promising changes based on sound scientific data and analyses. Based upon review of the best available scientific data, including the results of assessment, research, and monitoring efforts described in the proposed action, different courses of actions to promote survival and recovery of the species and the critical habitat may be pursued through the adaptive management framework. A component of that framework is the MRRIC as described above. Monitoring and evaluation of the actions undertaken will assist in determining if actions should be modified, continued, or supplemented to achieve identified goals. Independent scientific review will be incorporated into the process so that recommended actions will utilize valid, comprehensive, and the most current information. The adaptive management approaches provides the flexibility to assess the biological effects of the actions taken and continually evaluate and update the actions in order to achieve greater success in the survival and recovery of the species and protection of the critical habitat.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON LEAST TERNS AND PIPING PLOVERS

The effects on least terns and piping plovers from Missouri River Operations, including the System, BSNP and Kansas River Project, have been addressed in two prior BA's

(1998, 1999) and in the 2000 BiOp. These included a general loss of habitat through inundation, channelization, channel degradation, lack of sediment transport, and vegetation encroachment. The loss of habitat and habitat regeneration processes has also indirectly affected these species through declines in productivity due to predation, human disturbance, catastrophic weather events and flooding of nest sites. Missouri River operations have impacted ecological processes that affect least tern and piping plover food resources and timing of their availability by decoupling the timing of forage fish spawn and least tern nest initiation; and by reducing forage abundance for piping plover through hypolimnetic releases and inundation of foraging habitat.

The 2000 RPA identified actions to palliate these effects and avoid jeopardizing the continued existence of the least tern and piping plover on the Missouri River. This included: 1) implementing flow enhancement with the goal of providing the hydrologic conditions necessary for reproduction and recruitment, 2) implementing a concurrent habitat restoration program with the goal of restoring habitat quality, quantity, and diversity so that the benefits of dynamic river processes are restored, 3) conducting a comprehensive endangered species habitat and monitoring program to better characterize habitat use, longevity, and availability in the Missouri River to facilitate and guide habitat restoration and flow modification, and 4) establishing an adaptive management framework to implement, evaluate and modify the RPA in response to variable river conditions, least tern and piping plover responses and increasing knowledge base. The Service believed these measures would ensure that the likelihood of survival and recovery of the interior least tern and piping plover would not be appreciably reduced.

The Corps believes that the proposed action as described in this BA captures the objectives of the 2000 RPA with regard to the least tern and piping plover. The emergent sandbar habitat program, coupled with system unbalancing and drought conservation measures on the reservoirs, all provides an aggressive habitat restoration effort to meet suitable habitat requirements and restore river processes. Current population assessment efforts, as recognized in the 2000 BiOp, will continue on the Missouri River, and be enhanced with a comprehensive river and reservoir habitat monitoring program to guide development of effective management strategies. Additionally, standardized data collection and coordination from a regional or metapopulation perspective will further engender greater understanding of the population dynamics/interactions and importance of Missouri River least terns and piping plovers with those using associated habitats. Intensive experimentally based focused research studies including flow tests from Fort Peck, Fort Randall and Gavins Point, population viability analysis, and investigations into the forage/energetics/hydrology relationship for least terns and piping plovers, will be absolutely critical in understanding and identifying those specific physical and biological conditions necessary for successful reproduction and recruitment. The Corps believes that these efforts, including the commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, will avoid jeopardizing the continued existence of the interior least tern and piping plover. The following sections describe effects to the interior least tern and piping plover anticipated from the proposed action as described in this BA. As described earlier in this BA, many least tern and piping plover life cycle requirements are similar while on the

breeding grounds, including habitats used for nesting and brood rearing. Because of this close association, these species will be considered together, when appropriate, when evaluating effects of this action.

Habitat Creation, Enhancement, and Maintenance

The emergent sandbar habitat effort as described in this action, will expedite accomplishing the physical emergent sandbar habitat goals as prescribed in the 2000 BiOp. Meeting these emergent sandbar habitat goals, and maintaining them, with an accelerated program of habitat creation through mechanical projects and chemical applications, will reduce the adverse effect of limited habitat regeneration that is occurring under current operations on least tern and piping plover productivity and recovery. By 2015, this program will restore and maintain 12,510 acres of sandbars and shallow water areas that serve as nesting, brooding and foraging areas for least terns and piping plovers. The Corps recognizes that the effect of this emergent sandbar habitat effort on least tern and piping plover recovery cannot be predicted with precision. The Corps' monitoring program, as described in this BA, includes an intensive experimentally based monitoring approach and real-time assessment of the value of these habitat creation methods in providing not only the physical elements but also the biological elements necessary for suitable habitat. As information is obtained and analyzed and information gaps filled in, the Corps is committed through its adaptive management process to pursue modifying its actions and techniques in order meet least tern and piping plover life needs.

In addition to gaining invaluable information on flow/habitat dynamics and informing the adaptive management framework, the Gavins Point fall evacuation and Fort Randall flush flow tests may provide significant benefits to least terns and piping plovers in these reaches by redistributing sediment and nutrients and increasing the total amount and complexity of bare sandbar habitat available.

Developing a mechanism for providing a sustainable level of habitat on the Fort Peck Lake, Lake Sakakawea and Lake Oahe Reservoirs is also a critical part of reducing the effects of Missouri River operations on least terns and piping plovers habitat. The 2000 BiOp recommended that the Corps continue its investigations into the value of reservoir habitats and opportunities to enhance these habitats for least terns and piping plovers. The Corps habitat creation efforts on the reservoirs, including peninsula cutoffs, island construction, livestock exclusion fencing and water control structures will provide sustainable habitat to support least terns and piping plovers. Additionally, the unbalancing of the reservoirs will enhance both the creation and availability of nesting and foraging habitats along reservoir beaches and islands by periodically inundating and scouring shoreline vegetation. Likewise habitat will be regenerated on the Missouri River below Fort Peck and Garrison Dams when high releases inundate vegetation on sandbars. Habitat will also be created on riverine reaches during periods of low flows as water is being held to fill the reservoirs.

Drought conservation measures as described may benefit nesting habitat on the reservoirs during extended droughts by more evenly spreading the draw down of reservoir

elevations over time and maintaining reservoir elevations at higher levels. By exposing smaller areas of habitat over more years early in the drought, drought conservation measures minimize the rapid loss of habitat that occurs from vegetation encroachment when large areas are exposed in a short time interval. Additionally, drought conservation measures maintain reservoir elevations at higher levels, where the amount of habitat exposed by a drop in reservoir elevations is greatest. Additional riverine habitat may become available to both species in the short-term, through the reduction of flows from Fort Peck, Garrison, Fort Randall and Gavins Point Dams. Reduced flows from these dams will expose sandbar habitat on the Missouri River below these dams. During a more prolonged drought, the long-term effects of this action may be increased vegetation encroachment on riverine sandbars or continued inundation of reservoir beach habitat that might otherwise have been exposed.

These habitat creation efforts cumulatively will provide the quantity of high quality sandbar complexes key to the successful recovery of the species through the distribution of birds over significantly greater habitat on a much larger geographic scale, subsequently reducing the impacts from predation, human disturbance, localized flooding, forage availability and catastrophic weather.

Population Assessment

The Corps' state-of-the-art monitoring and assessment program for least terns and piping plovers, with the digital data collection system, will continue to provide near real-time and annual data on population trends and vital rates for these species. This information is used by water managers during the nesting season to minimize effects from flooding, and is used as a critical annual feedback mechanism to evaluate and adapt management applications. This effort coupled with the proposed comprehensive habitat monitoring and evaluation program will annually provide a full complement of data on all aspects of least tern and piping plover population and habitat dynamics on the Missouri River. Management actions undertaken during the breeding season will continue to reduce adverse effects to both least tern and piping plovers through predator aversion, enhancing public awareness through outreach programs, and preventing nest loss from flooding and sandbar erosion by nest moving. Additionally, completing a comprehensive management plan for the Kansas River, subsequent to the source-sink report as requested in the 2000 BiOp, will ensure that the Kansas River is operated to provide an overall benefit to the conservation of least terns and piping plovers.

Understanding and managing the regional dynamics of populations distributed across landscapes in large geographic areas is proving invaluable in assisting in the recovery of rare species. The 2000 BiOp suggested as a conservation recommendation that the Corps should research the interaction between Missouri River populations of least terns and piping plover and other associated populations. This action, as described in this BA, would address that recommendation. Determining the extent of the Missouri River least tern and piping plover metapopulation distribution and coordination of vital rate information from this regional perspective will allow understanding of actual population trends, annual survival rates, and subpopulation interactions. This will have a significant

positive effect on recovery efforts of least terns and piping plovers by focusing resources, timing of management actions, and providing a comprehensive understanding of the success of management actions. Furthermore, approaching population management from a regional or metapopulation perspective will foster understanding and co-operation between countries, tribes, agencies, and private organizations and individuals beyond that envisioned by the 2000 BiOp.

Research Monitoring and Evaluation

The action described in this BA includes conducting a population viability analysis (PVA) of the Missouri River piping plover population. This PVA may help to reduce the effect of Missouri River System operations by assessing the level of risk to the species and identifying management strategies needed to reduce the risk to an acceptable level. While informing the adaptive management process with valuable information, this effort may help focus research and data collection, and accelerate the development of management options to benefit the piping plover and least tern. In conjunction with the PVA, a focused research project investigating the forage/energetics/hydrology relationship for least terns and piping plovers will be conducted. This research monitoring and evaluation effort will provide greater knowledge and understanding and fill data gaps concerning biological cues of these species and their associated ecological processes. This information is critical to establishing appropriate management strategies and to the future success of management activities.

Conclusion

While operation of the Missouri River System under the proposed action as described in this BA will not completely ameliorate all of the adverse effects to terns and plovers, the Corps has determined that the proposed action has many beneficial effects. The proposed action will: 1) meet the physical emergent sandbar habitat goals for nesting, brooding and foraging habitat; 2) provide critically significant gains in the understanding and knowledge of these species and their associated biological interactions within the ecosystem; 3) afford the opportunity to develop future courses of action through establishment of a recovery strategy to include broad stakeholder involvement in the management of the river and actions designed to benefit the listed species and critical habitat; and 4) meet the three year running average fledge ratio goals for the least tern (0.70 chicks/pair) and piping plover (1.13 chicks/pair), as described in the 2000 BiOp.

In summary, while the Corps has determined that this action “is likely to adversely affect” the least tern and piping plover (as that expression is defined in the Endangered Species Consultation Handbook), the Corps believes that the proposed action, including the Corps’ commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, will avoid jeopardizing the continued existence of the interior least tern and piping plover.

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON PIPING PLOVER CRITICAL HABITAT

The effect on piping plover critical habitat from Missouri River Operations, including the System, BSNP and Kansas River Project, was not addressed in the 2000 BiOp. Critical habitat was designated for the Great Plains population of the piping plover in September of 2002. While not describing the primary constituent elements, the 2000 BiOp did describe the effect of Missouri River Operations on piping plover habitat. This included a loss of habitat through inundation, channelization, channel degradation, lack of sediment transport, and vegetation encroachment. The description of the primary constituent elements in the critical habitat designation indicates the important role that dynamic processes have in creating and maintaining the physical elements of piping plover habitat. In general, Missouri River Operations have limited the occurrence and magnitude of these dynamic processes by altering the timing and magnitude of hydrological events. Furthermore, the 2000 BiOp stated that habitat loss and alteration from these effects, as well as disruption and alteration of the dynamic processes that create, restore and maintain habitat, resulting from continued operations on the Missouri and Kansas Rivers were likely to jeopardize the continued existence of the piping plover.

To avoid jeopardizing the continued existence of the piping plover and adversely modifying its habitat, the 2000 RPA advocated flow enhancement concurrent with a habitat restoration program with the goal of providing the habitat conditions (primary constituent elements) necessary for piping plover reproduction and recruitment.

The Corps recognizes the value of all piping plover critical habitat constituent elements and the importance of sustainable habitat in the recovery of the piping plover on the Missouri River. The Corps believes that the proposed action - with its emergent sandbar habitat program, flow tests, sandbar conditioning, comprehensive river and reservoir habitat monitoring program, and system operations, including system unbalancing and drought conservation measures, including with the Corps commitment to evaluate, pursue and adapt to new findings and information - is beneficial to the critical habitat, but is also likely to cause some adverse effects.

Habitat Creation, Enhancement, and Maintenance

The Corps emergent sandbar habitat program will create and maintain 12,510 acres of potential piping plover critical habitat by the year 2015. This equals the goal set forth in the 2000 BiOp. This acreage will include 4,450 acres below Garrison Dam, 700 acres between Fort Randall Dam and Lewis and Clark Lake, 2,720 acres on Lewis and Clark Lake and 4,640 acres below Gavins Point Dam. This habitat will be created as a complex of side channels and sandbars with the proper mix of nesting, brooding rearing and foraging habitats. Efforts to create, manage, and sustain critical habitat on Lake Sakakawea and Lake Oahe will provide additional acres of critical habitat available to piping plovers. These efforts along with the Fort Randall and Gavins Point flow tests and the Ft. Peck tests are expected to provide a beneficial impact on piping plover critical habitat. Furthermore, implementation of drought conservation measures and unbalanced

system operation will provide beneficial benefits by lowering flows and exposing habitat during drought periods and periodically inundating and exposing reservoir habitats.

The Corps recognizes there is limited information that demonstrate the ability of many of the proposed habitat creation methods to provide properly functioning, ecologically dynamic habitat, or that address the effects of these methods on the physical primary constituents elements over large geographic and temporal scales. The effects of several action components on piping plover critical habitat are difficult to quantify or are currently unknown, but are designed to lead to the beneficial effect of increased knowledge and understanding of habitat creation and functionality processes. An intensive experimentally based monitoring approach will be used to assess the value of these habitat creation methods in providing the biological and physical elements of piping plover habitat. As this critical information is gained and evaluated, the Corps is committed to pursuing alternative action components through the previously described adaptive management framework. Furthermore, the river and reservoir habitat monitoring and evaluation program will provide long-term data to assess and evaluate effectiveness of operational decisions and management actions and to develop more effective habitat creation methods and management strategies.

Conclusion

Operation of the Missouri River System, under the proposed action as described in this BA, will increase piping plover critical habitat in the action area. While physical emergent sandbar habitat goals, as identified in the 2000 BiOp for nesting, brooding and foraging habitat, will be met, additional information concerning important biological elements may need to be acquired. A variety of flow tests, and an intensive experimentally based habitat monitoring program will provide valuable information on hydrological/biological relationships leading to an increased understanding of habitat processes and functionality.

In summary, the Corps believes that the proposed action, including the Corps' commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, is beneficial to the critical habitat, but is also likely to cause some adverse effects. Therefore, the Corps has determined that the PA "is likely to adversely affect" piping plover critical habitat (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECTS OF THE PROPOSED ACTION ON THE PALLID STURGEON

The effects on the pallid sturgeon from Missouri River Operations, including the System, BSNP and Kansas River Project, have been addressed in two prior BA's (1998, 1999) and in the 2000 BiOp. These included a loss of riverine dynamics and aquatic habitat through inundation, channelization, channel degradation, reduced sediment transport and turbidity, and lake operation. The loss of aquatic habitat and riverine dynamics has affected the pallid sturgeon by decreasing the quantity and quality of aquatic habitat in

the Missouri River, thus, (1) reducing larval and juvenile rearing habitat; (2) reducing the availability of seasonal refugia; (3) reducing the forage base of pallid sturgeon by reducing nutrient cycling and habitat diversity in the Missouri River; (4) reducing pallid sturgeon staging and spawning cues; and (5) increasing hybridization with the shovelnose sturgeon.

The 2000 RPA recommended an action to reduce these effects and avoid jeopardizing the continued existence of the pallid sturgeon on the Missouri River. This included: (1) implementing flow enhancement with the goal of providing the hydrologic conditions necessary for reproduction and recruitment; (2) implementing a concurrent habitat restoration program with the goal of restoring habitat quality, quantity, and diversity so that the benefits of dynamic river processes are restored; (3) conducting a comprehensive endangered species and habitat monitoring program to better characterize habitat use and detect annual improvement in the ecosystem to facilitate and guide habitat restoration and flow modification; and (4) establishing an adaptive management framework to implement, evaluate and modify the RPA in response to variable river conditions, pallid sturgeon responses, and increasing knowledge base. The Service believed these measures would ensure that the likelihood of survival and recovery of the pallid sturgeon would not be appreciably reduced.

The Corps believes that the proposed action as described in this BA, meets the objective of the 2000 BiOp RPA concerning the pallid sturgeon. The accelerated shallow water habitat program provides an aggressive habitat restoration effort to meet suitable habitat requirements and restore river processes in a timely manner to aid the survival and recovery of the pallid sturgeon. Current propagation efforts will be enhanced, to increase pallid sturgeon production capabilities and preserve the remaining genetic variability of the species. Intensive, experimentally based focused research studies, including the Fort Peck flow test and investigating areas with existing spring rises and significant amounts of shallow water habitat to locate pallid sturgeon spawning areas will be absolutely critical in understanding and identifying those specific physical and biological conditions necessary for successful reproduction and recruitment. Current population assessment efforts will be enhanced and include standardized protocols to document habitat use, reproduction, recruitment, and long-term pallid sturgeon population trends. Results from the population assessment program will be critical to guide development of effective management strategies. The Corps will assess the biological effectiveness of each of the actions described below and, if based on the scientific finds of our efforts, will pursue alternative courses of actions utilizing the adaptive management framework. The Corps believes, these efforts, including our commitment to evaluate, pursue and adapt to new findings and information through a progressive adaptive management framework, will avoid jeopardizing the continued existence of the pallid sturgeon.

The following sections describe effects to the pallid sturgeon anticipated from the proposed action as described in this BA.

Habitat Creation, Enhancement, and Maintenance

In its 2000 BiOp, the USFWS states that SWH is valuable to all life stages of native big river fish and other river organisms. SWH is thought to be especially important during the first few months of the life of the larval pallid sturgeon. The BiOp concluded 20 to 30 acres of SWH per mile is necessary to preclude jeopardy to the pallid sturgeon. An interim goal (2010) and a long-term goal were established (2020).

An analysis of SWH was conducted by the Corps using data obtained for the physical habitat model developed by the Corps as one way of assessing impacts of alternatives. As part of the development of that model, cross sections were taken at a representative sub-reach of seven reaches of the Lower River and hydraulically modeled. These data provided a basis for determining the amount of habitat fitting into a variety of depth and velocity classes for each of the seven reaches (habitat per mile times reach length). SHW for the purpose of this analysis is habitat that is up to 5 feet deep with a velocity no greater than 2.5 feet per second. The amount of habitat in each depth and velocity class could be determined based on the amount of flow in each river reach. Data for the lower Missouri River are presented, by segment, in Table 4 for the RPA goals and the proposed action. The Gavins Point reach is not included as it already has sufficient SWH (63 acres/mile).

The creation of shallow water habitat will be accelerated with the proposed action resulting in a total of 13,700 acres of shallow water habitat in the lower Missouri River by the year 2010. The year 2020 goal is to have a total of 15,060 acres in order to achieve an average of 20 acres/mile of shallow water habitat in the lower Missouri River. This accelerated habitat development will exceed the short-term habitat creation goal, as outlined in the 2000 BiOp, by nearly 2,000 acres. This will result in meeting the long-term shallow water habitat goal from the Osage River to the mouth and nearly reaching the goal from Kansas City to the Osage River. Substantial gains will also be made in the river reaches upstream from Kansas City. Shallow water habitat is also an indicator of the diversity of in-channel habitat conditions. A wide range of depth and velocity distributions and macro-habitat characteristics such as emergent sandbars, side channels, sandbar pools etc, characterized habitat of the pre- channelized Missouri River. A dynamic alluvial process created and maintained these habitat types. The development of a more dynamic alluvial channel through the proposed action (accelerated SWH program) will provide greater diversity of depth and velocities over a wider range of flows. Further, the increased alluvial process will provide for an erosion/ deposition pattern that will reflect the seasonal/annual variation of run-off and stage. The increase in shallow water habitat and the resulting alluvial process, which will result from the proposed action, may provide important habitat for early life stages of pallid sturgeon and other native riverine fish.

Table 4. Acres of Shallow Water Habitat (SWH) created by the proposed action compared to 2000 BiOp goals			
Reach	Year 2020 Goal (20 ac/mi)¹	Year 2010 Intermediate Goal²	Year 2010 Proposed Action
Ponca to S.C. (Segment 11)	360	NA	960
S.C to the Platte River (Segment 12)	2,800	NA	1,250
Platte River to Kansas City (Segment 13)	4,560	NA	3,865
Kansas City to the Osage River (Segment 14)	4,740	NA	4,059
Osage River to the mouth ³ (Segment 15)	2,600	NA	3,990
Totals	15,060	11,763	13,723
¹ From the 2000 BiOp, Table 22. ² The 2000 BiOp did not specify reach specific goals for year 2010, only an overall increase of 5,870 acres. ³ Acres of SWH for this reach were estimated based on the Grand River to Osage River Reach.			

Monitoring and evaluation of this habitat development will yield information on the contribution these actions are having in maintaining and recovering the pallid sturgeon and other native fishes. The proposed action will continue to develop shallow water habitat to meet the long- term goals by 2020, dependent on the results of the monitoring and evaluation of the habitat. The established goals will be reviewed and may be adjusted based on the results of the monitoring and evaluation.

Habitat creation, enhancement, and maintenance will also include reconnecting the Missouri River channel to its floodplain on the channelized lower Missouri River. Most of the floodplain along the lower river has been cutoff from the river through the construction of levees to protect farmland and urban areas. By reconnecting the floodplain to the river, this will greatly improve the habitat for a large variety of Missouri River fish and wildlife species, including the pallid sturgeon and forage fish, by inundating side channels, backwaters, and other off-channel areas needed as fish spawning and nursery areas. Reattaching floodplain areas, along with the existing natural spring rise that occurs on much of the lower Missouri River, especially downstream of Kansas City, should provide the necessary biological cues and habitat to benefit pallid sturgeon, as well as other fish and wildlife. Floodplain reconnection is already underway in the lower Missouri River with approximately 8,000 acres having been reconnected by the initial construction of the Missouri River Fish and Wildlife Mitigation Project, since

the 2000 BiOp was published. An example of this effort is the Overton Bottoms mitigation site where existing agricultural levees have been breached, or set back, and approximately 3,500 acres of floodplain has been reattached to the river. Most of this area has received floodwaters the past three springs for periods of two to eight weeks. Combined with the native vegetative plantings and natural regrowth of the area, this floodplain reconnection has greatly improved the floodplain habitat for a large variety of fish and wildlife species. The existing mitigation program authorization is to acquire and develop fish and wildlife habitat on 166,750 acres of land in and along the lower Missouri River. As the Corps continues this mitigation project it will develop floodplain habitat for native fish, including the pallid sturgeon, by moving back or breaching existing levees wherever possible and allowing existing natural spring flood flows on the lower Missouri River floodplain. The potential desired floodplain benefits for the pallid sturgeon and forage species will be monitored and evaluated.

Pallid Sturgeon Propagation Support

A “Pallid Sturgeon Propagation Workgroup” was cooperatively established by the Corps and the USFWS in 2002 and comprises members representative of the Corps, USFWS and the States of Montana and Missouri possessing the unique knowledge and experience critical to successful propagation of pallid sturgeon. Propagation efforts are also coordinated through the Upper and Middle Basin Pallid Sturgeon Recovery Workgroups to achieve annual stocking goals. The Propagation Workgroup prioritizes propagation needs each year to facilitate achievement of the “Average Annual Shortfall” (Corps’ responsibility) as identified in the 2000 RPA. A prioritization list is generated and is utilized to determine where the Corps directs assistance for the population/augmentation program each year. The program has been structured to exceed propagation efforts related to the average annual shortfall.

The proposed action will include continuing the pallid sturgeon propagation and augmentation program, and include improvements to existing pallid sturgeon hatchery facilities. It is anticipated that these hatchery improvements will increase pallid sturgeon production capabilities to fully meet all stocking requirements for the Missouri River basin. This will provide a beneficial effect to the pallid sturgeon by increasing the number of pallid sturgeon in all Recovery Priority Management Areas as identified in the Pallid Sturgeon Recovery Plan and the 2000 BiOp. This program will also work toward accelerating the collection of pallid sturgeon brood stock. This will enable the state and federal agencies to direct intensive collection efforts to capture the genetic stocks that inhabit the lower basin. Broodstock collection is essential in order to preserve the remaining genetic variability of pallid sturgeon in the lower Missouri River. Successful collection, spawning, rearing and stocking will ensure that these genetic stocks are not lost and prevent extinction of existing pallid sturgeon populations in the Missouri River.

Research, Monitoring, and Evaluation

Even though the knowledge base regarding the pallid sturgeon has been rapidly improving during the past decade, much of the basic life history is still unknown for the

species. With the lack of observed spawning and field sampling of larval and juvenile pallid sturgeon, in the wild, much of the current understanding is inferred from studies and observations of other sturgeon species or other native big river fish species. The Middle Basin Pallid Sturgeon Recovery Work Group recently identified the top five recovery needs as the following:

- Locate, quantify, and characterize pallid spawning area, frequency, and behavior
- Locate, define, and characterize/quantify juvenile and rearing habitat.
- Determine habitat use by larval pallid sturgeon.
- Evaluate habitat restoration projects and efforts.
- Locate, define, and characterize adult pallid sturgeon habitat.

Documented information concerning the functioning of the Missouri River ecosystem and the habitat requirements needed for survival of pallid sturgeon is extremely limited. This proposed action will provide for a pallid sturgeon population assessment program and a significant research, monitoring, and evaluation effort seeking to acquire greater knowledge and understanding of the pallid sturgeon, filling data gaps, and providing much needed information to guide research, management and future recovery of the pallid sturgeon. The knowledge gained through this program will be incorporated into the adaptive management process and be critical for future management of the Missouri River and for the survival and recovery of the pallid sturgeon.

The research, monitoring, and evaluation program will include studies to: 1) identify the causes for lack of reproduction, lack of recruitment, and hybridization, 2) identify and map the location of gravel/cobble/rock substrates that may provide potential spawning habitat for sturgeon within the prioritized river segments, and 3) investigate modifications to river channel structures to maintain and improve aquatic habitat diversity. This research, monitoring, and evaluation will include investigating areas with existing spring rises and significant amounts of shallow water habitat to try and locate pallid sturgeon spawning areas and quantify spawning requirements for the species. Data collected by this research, monitoring, and evaluation program is critical for the survival of the pallid sturgeon.

The pallid sturgeon population remaining below Fort Peck Dam and above Lake Sakakawea represents an important portion of the total population. Of 872 pallid sturgeon records prior to 1998, 70 percent were reported from the Missouri River and approximately 90 percent of these were from the upper Missouri River. The adult pallid sturgeon within this reach are nearing the end of their life expectancy and individual female pallid sturgeon may only attempt reproduction during one or two more spawning events. Those fish are members of the most genetically pure strain of pallid sturgeon left in the Missouri River. The proposed action will include the Fort Peck spring rise test as included in the 2000 BiOp. The Corps is currently planning two flow tests for releases from Fort Peck Dam to determine the potential effects of warmer water releases at a rate higher than normal on: (1) the integrity of the Fort Peck Dam spillway, (2) downstream river bank and bed erosion, and (3) the response of pallid sturgeon and other native riverine fish species. These tests are commonly referred to as the mini test and the full

test. Low Fort Peck Lake levels have resulted from the current drought, which has delayed the mini test, which is to be completed before the full test is to be conducted. If adverse impacts resulting from the mini test are acceptable and the level of Fort Peck Lake is adequate, the full test would be conducted the following spring. A biological data collection plan has been developed by the USGS and Montana Fish, Wildlife and Parks (MTFWP) and reviewed by the Upper Basin Pallid Sturgeon Workgroup. The Fort Peck Flow Modification Biological Data Collection Plan is a monitoring plan designed to evaluate the influence of proposed flow modifications from Fort Peck Dam on physical and biological response of pallid sturgeon and other native fishes.

Systems Operations

The Missouri River is the nation's longest river extending 2,619 miles from its source in Montana to its confluence with the Mississippi River in Missouri. It drains one-sixth (approximately 529,350 square miles) of the continental United States and 9,700 square miles in Canada. Due to its vast size, the Missouri River possesses a wide range of environmental conditions with various flows and water temperature throughout its length. The spawning requirements of the pallid sturgeon are not currently known and spawning has not been observed on the Missouri River. However, pallid sturgeon larvae have been sampled from the Missouri River in Montana and Missouri indicating that some stretches of the Missouri River apparently do possess the necessary habitat and flows to allow for pallid sturgeon spawning. The Corps recognizes the importance of river hydrology and spawning cues for pallid sturgeon reproduction, recruitment, and ultimately for species survival and recovery. As part of the proposed action, the Corps will investigate areas with existing spring rises and significant amounts of shallow water habitat to try and locate pallid sturgeon spawning areas and quantify the spawning requirements for the species.

The 2000 RPA recommends a spring rise release from Gavins Point Dam to provide, among other biologically important functions, a potential spawning cue for native river fish, especially the endangered pallid sturgeon. The 2000 RPA specifies a modified annual release pattern that has a spring rise above the full navigation service releases of 15 to 20 kcfs. This release is to have a duration of 2 weeks at its peak and a total of 4 weeks including the period over which the releases are gradually increased and decreased. The 2000 BiOp also indicated this spawning cue should be available about once every three years. Because of a lack of observed pallid sturgeon spawning, specific spawning requirements of the pallid sturgeon have not been quantified.

In order to assess the effects of any potential proposed action on the hydrologic component of a potential spawning cue the magnitude, duration and frequency of the event must be identified. In January 2001, the Service requested the Corps to conduct a set of hydrologic analyses. This set of analyses included a spring rise analysis. The Service requested, "For gage sites downstream of Gavins Point, document spring rise spawning cues. Rises should be defined as increases of discharge of at least 20 percent above the mean discharge prevailing for the preceding 15 days, during the period May to July. The rise should take place over three days or less." Specific information on duration was not given.

A model was developed that would access the daily flow data for each Daily Routing Model (DRM) node location from Gavins Point Dam to the mouth. A running average of the daily flows for the previous 15 days was conducted using the data starting on May 1 and ending on June 30 of each year. (The likelihood of spawning cues after June 30 is low, so it was not checked.) The flows for May 1, 2, and 3 were checked to determine if the flows over this 3-day period exceeded the prior 15-day average by at least 20 percent. If the flows on one of the days met the 20 percent increase, the model would continue to check the daily average flow until it dropped to less than 20 percent of the flows for the 15 days prior to May 1. The model continued the day by day check of the prior 15 days, computed an average, and counted the number of days the flows continued to be at least 20 percent above that prior 15-day average. This continued up to June 30. The effect of the proposed action was analyzed on potential spawning cues of 21 days, 14 days, and 7 days downstream of Gavins Point Dam.

Figure 3 displays the percent of years a 21 day spawning cue is provided for the reaches downstream of Gavins Point Dam under the proposed action. For the river downstream of Kansas City, the proposed action provides a cue over a third of the years in the period of record and meets the goal identified in the 2000 BiOp of having a cue at least 33 percent of the years. While all reaches have a spawning cue, the reaches from Sioux City to Nebraska City have the fewest years with a spawning cue and do not meet the goal of 33 percent of the years.

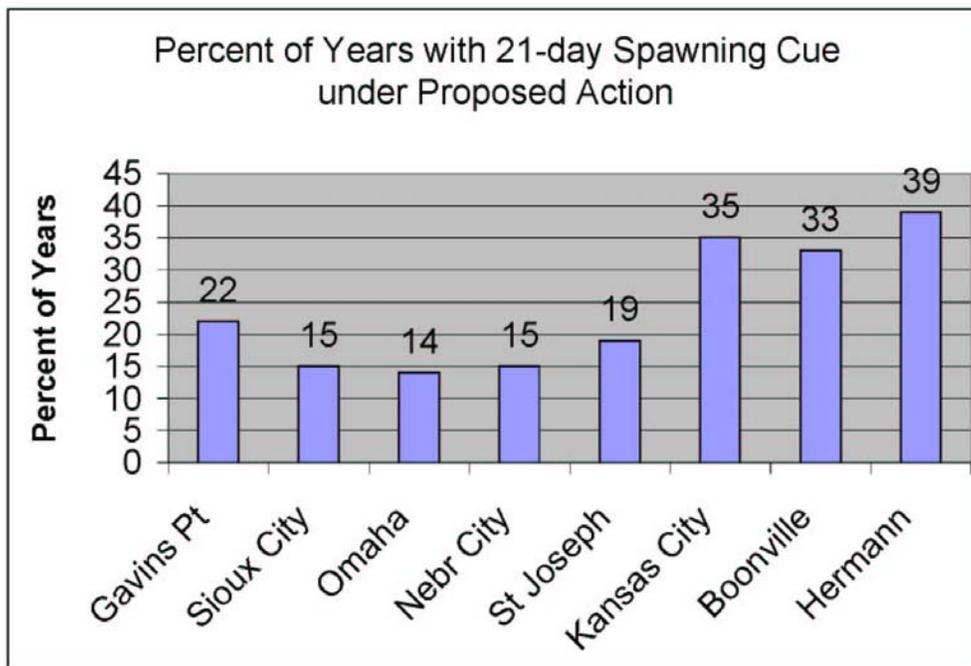


Figure 3 –Percent of Years with 21-day Spawning Cue under Proposed Action.

If the duration of the rise needed for a spawning cue is 14 days, instead of 21 days, then the cue is achieved more often but no additional reaches of the river meet the 33 percent criteria. Figure 4 presents the percent of years a 14 day spawning cue is achieved in the reaches downstream from Gavins Point. The proposed action will provide a 14 day spawning cue over 40 percent of the time for the river downstream from Kansas City, Missouri.

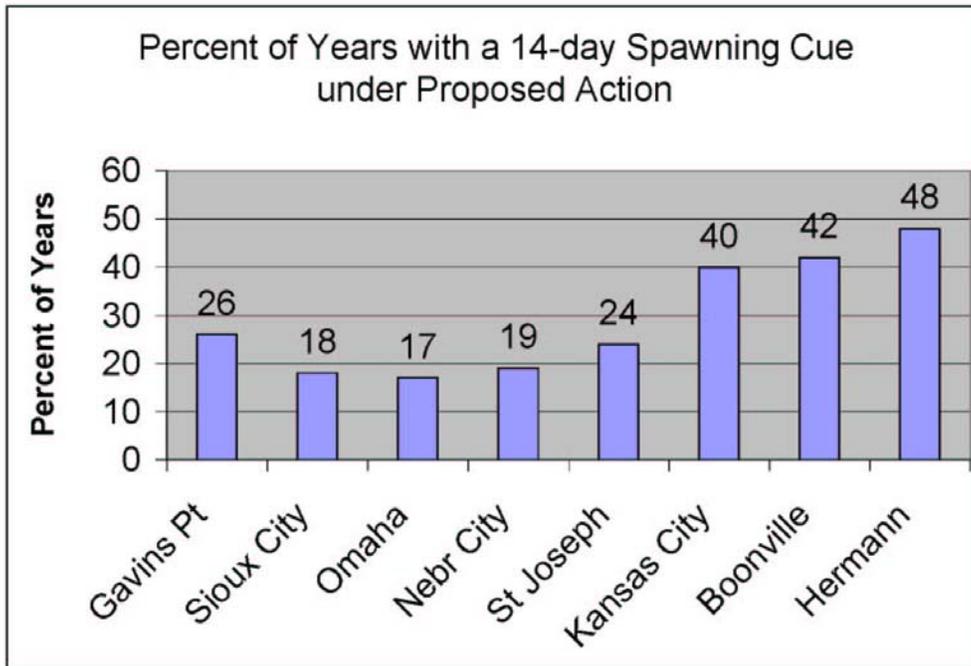


Figure 4 - Percent of Years with 14-day Spawning Cue under Proposed Action.

Figure 5 presents the percent of years a spawning cue is provided in the various reaches if the duration of a rise needed is 7 days. Under this condition Sioux City and Omaha are the only reaches that do not meet the criteria from the Bi Op of having a cue 33 percent of the time. All other reaches meet the criteria.

This analysis demonstrates that the proposed action will provide a spawning cue at every location studied downstream of Gavins Point Dam at some time. The frequency the potential cue is available changes depending on the location. The river downstream of Kansas City meets the criteria from the BiOp.

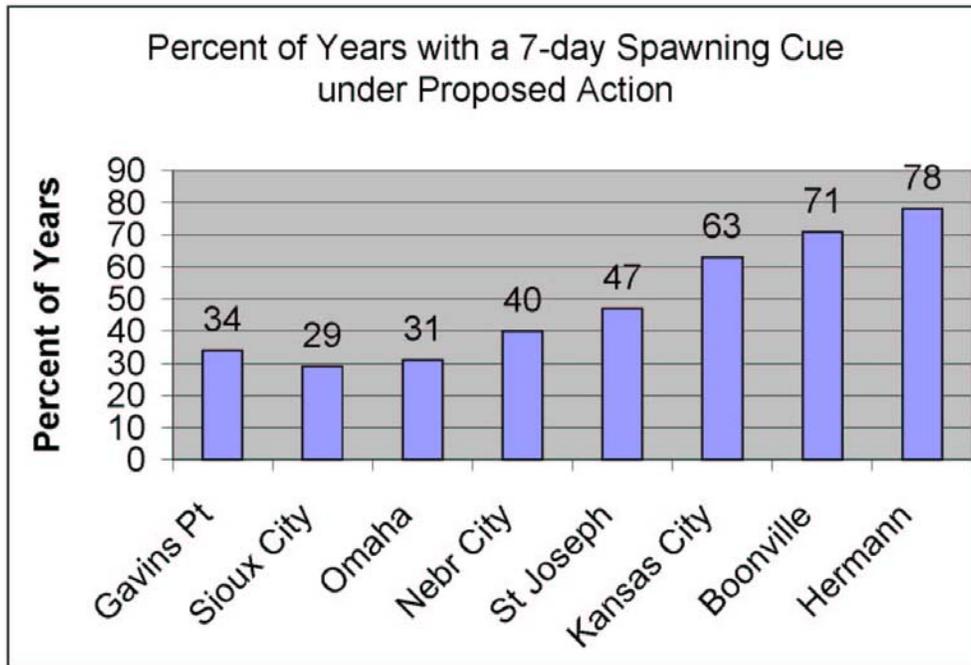


Figure 5 - Percent of Years with 7-day Spawning Cue under Proposed Action.

In conclusion, greater knowledge of what constitutes an adequate spawning cue is required to fully understand the effects of the proposed action on spawning of pallid sturgeon. This effects section demonstrates that, under the proposed action, a variety of spring rises will occur of various magnitudes and durations and with different frequencies depending on the location in the river. The relationship and interaction of water temperature and other physical/ chemical factors and flow to pallid sturgeon spawning is unknown. Without this understanding, it is difficult to determine if any proposed action will adequately meet the spawning needs of the pallid sturgeon. The research, monitoring, and evaluation program included in this proposed action will examine the multiple factors that may be limiting pallid sturgeon spawning and recruitment. As this research and evaluation yields new information and if this research can quantify the spawning requirements for the pallid sturgeon, we will pursue alternative courses of actions based on the scientific findings of our efforts and utilizing the proposed adaptive management framework, and within that framework, the MRRIC.

The proposed action also includes intrasystem unbalancing in the upper three main stem lakes while incorporating drought conservation measures. The USFWS has identified the reservoirs as low priority to pallid sturgeon in the 2000 BiOp, with the exception downstream of Fort Peck dam to Lake Sakakawea. During periods of drought, this action would likely adversely affect pallid sturgeon in the various portions of the

Missouri downstream from Fort Peck Dam, Fort Randall Dam and Gavins Point Dam depending on timing of increased and decreased flows. This action will have reduced flows during the spring when “normal” flows may have been higher serving as a spawning cue. Conversely, at times of “normal” summer low flows, there would likely be increased flows to fulfill downstream needs. Results of downstream monitoring of pallid sturgeon during the Fort Peck flow test will indicate how operation of Fort Peck Dam may impact this species.

Population Assessment

The pallid sturgeon population assessment will include: (1) Total number of fish captured and tag number, (2) GPS coordinates of capture sites, distribution, recapture incidences and numbers, (3) channel and substrate mapping of the habitats used by the fish, (4) tributary use and concentrations of pallid sturgeon, (5) temperature, surface and bottom velocity, turbidity, and depth at capture locations, (6) length of fish frequency, (7) morphological measurements of fish and meristic counts, (8) species characterization utilizing morphological measurements, (9) genetic analysis of fish, and (10) productivity and recruitment. Additional information needs and priorities for the monitoring program will be developed in coordination with the USFWS.

A Pallid Sturgeon Population Assessment Team comprised of Missouri River basin biologists, sturgeon experts, and other scientists has been assembled by the Corps since the 2000 BiOp. This team has partitioned the Missouri River into sampling segments based on differences in the physical attributes of the river (e.g., degrading stream bed, tributary influence, natural hydrograph, etc.) and developed sampling strategies and standardized protocols. Sampling strategies have been outlined into two primary sampling seasons, a sturgeon season and a fish community season. Standardized protocols for habitat classification, gears and techniques, habitat characteristic data collection, data recording and data sheets have been developed and guide current sampling efforts. The following objectives have been established by this team to guide the program:

- Document current and long-term trends in pallid sturgeon population abundance, distribution and habitat usage throughout the Missouri River System.
- Document survival, growth, and habitat use of stocked pallid sturgeon in the Missouri River System.
- Document pallid sturgeon reproduction and recruitment in the Missouri River System.
- Document current and long-term trends in native Missouri River fish species abundance, distribution and habitat usage, with emphasis on the warm water benthic fish community.

When fully implemented, all high priority Missouri River segments as identified in the BiOp will be sampled providing trend information on pallid sturgeon and the fish community. Each segment will represent a piece of the entire puzzle. Jointly, these

pieces will be representative of the overall trends and status of pallid sturgeon and the fish community of the Missouri River. The significance of Missouri River tributaries to the species is recognized by the Corps (i.e., Yellowstone, Platte). The comprehensive biological baseline program will be expanded to include these tributaries within the standardized sampling efforts. The fully implemented program will also provide information on the success of the propagation augmentation program and provide data addressing the BiOp requirements to evaluate survival, movements and habitat use of juvenile pallid sturgeon. Data collected by this program is critical for the survival of the pallid sturgeon.

Kansas River Operation

The 2000 RPA established a shallow water habitat goal of 20 to 30 acres/mile for the lower 170 miles of the Kansas River. Through the research, monitoring, and evaluation program of the proposed action, the existing shallow water habitat will be inventoried on the Kansas River.

Operation and Maintenance of the BSNP

As part of the proposed action, the Corps will continue to coordinate routine annual maintenance with the USFWS. As part of this coordination process, the Corps will continue to explore alternative maintenance practices such as notch enlargement, vein dikes, chevrons, etc., in lieu of standard maintenance practices. These alternative maintenance practices will be aimed at increasing depth and velocity diversity, while maintaining the authorized project functions. These actions will be similar to many of the non-routine maintenance activities that were completed after the 1993 flood, and resulted in the preserving and/or creation of significant fish and wildlife habitat at locations such as Lisbon Bottoms and Jameson Island in Missouri. The USFWS believes that these habitats also likely benefit listed threatened and endangered species. In 1999, larval pallid sturgeon were found for the first time in 50 years on the lower Missouri River at Lisbon Bottoms. The Corps will also continue to implement the modified Missouri River BSNP Fish and Wildlife Mitigation as authorized by Section 334(a) of the 1999 Water Resources Development Act (WRDA 99) and documented in the project's 2003 Supplemental Environmental Impact Statement. This project will be used to construct shallow water habitat in compliance with the 2000 BiOp.

As contained in the PA, the Corps will continue working to maintain no-net-loss of existing shallow water habitat from operations and maintenance activities on the channelized Missouri River. The Corps will continue to coordinate with the USFWS and evaluate its operations and maintenance activities to avoid any take of pallid sturgeon.

Conclusion

The proposed action of the Corps will: 1) have positive effects due to the creation of habitat known to benefit pallid sturgeon and other native fishes; 2) significantly advance the scientific information and understanding of the life history and ecological

requirements for survival of the endangered pallid sturgeon; 3) improve the pallid sturgeon propagation and augmentation program; and 4) provide a strategy for developing future courses of actions if needed utilizing the adaptive management framework. Together, these components are critical for the survival and recovery of the species. There are, however, adverse effects associated with the operation of the main stem reservoir system, the BSNP, and the Kansas River tributary lakes. Therefore, the Corps has determined that the proposed action as described in this BA, while providing beneficial effects, “is likely to adversely affect” the pallid sturgeon (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECT OF THE PROPOSED ACTION ON THE BALD EAGLE

The 2000 BiOp states, after reviewing the condition of the bald eagle, the environmental baseline for the action area, the direct and indirect effects of the current operation of the Missouri and Kansas Rivers under the CWCP and the maintenance of the BSNP, and the cumulative effects of non-Federal actions, it is the USFWS’s biological opinion that the actions, as proposed, are not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for this species; therefore, none will be affected.

The bald eagles recovery is strongly linked to the ban of dichloro-diphenyl-trichloroethane (DDT). Shortly after World War II, the use of DDT and other organochlorine compounds became widespread. Initially, DDT was sprayed extensively along coastal and other wetland areas to control mosquitoes (Carson 1962). Later it was used as a general insecticide. As DDT accumulated in individual bald eagles from ingesting contaminated food, the species' reproduction plummeted. In the late 1960's and early 1970's, it was determined that dichlorophenyl-dichloroethylene (DDE), the principal breakdown product of DDT, accumulated in the fatty tissues of the adult females and impaired calcium release that is necessary for egg shell formation, thus inducing thin shells and reproductive failure.

Today, bald eagle fatalities are primarily linked to power line collisions. The operation of the Missouri River will not jeopardize the existence of the bald eagle; however, the operation can have negative impacts to the cottonwood forests that the bald eagle utilizes. The Corps has initiated a bald eagle/cottonwood forest assessment model. The model is being designed to show where the various cottonwood forests are taking into consideration stand age and composition. This information will be combined with bald eagle survey data to locate primary areas for cottonwood protection and regeneration. In general, the operation of the Kansas River System has had similar effects on the bald eagle and its habitat as has occurred on the Missouri River system. Kansas River meandering has been reduced under System operations and thus, Kansas River operations have adversely affected the maintenance of cottonwoods in the floodplain. Cottonwood forests are quickly being replaced by trees that are not suitable as bald eagle nesting or roosting trees. In addition, the expansion of agriculture onto the floodplain, encouraged

by operations and subsequent flood control, is a major factor contributing to the loss of cottonwood habitat.

Conclusion

In summary, the Corps believes that the proposed action is beneficial to the bald eagle, but is also likely to cause some adverse effects. Therefore, the Corps has concluded that the proposed action “is likely to adversely affect” the bald eagle (as that expression is defined in the Endangered Species Consultation Handbook).

ANTICIPATED EFFECT OF THE PROPOSED ACTION ON THE INDIANA BAT

The only aspect of the life history for the Indiana bat potentially involved with shallow water habitat creation and BSNP maintenance activities is its roosting and foraging in riparian timber. Nearly all maintenance activities for the BSNP, and most activities creating shallow water habitat, are done from a work barge in the river and a minimal number of trees are removed during these activities. Any tree removal is informally coordinated with the USFWS on a site-by site basis to avoid any adverse affects. Also, this species utilizes riparian and upland forests throughout its entire summer range, in addition to the limited riparian timber in the lower Missouri River floodplain.

Conclusion

The Corps has concluded that the proposed action with activities to create shallow water habitat, as well as maintenance activities for the BSNP, “is not likely to adversely affect” the Indiana bat (as that expression is defined in the Endangered Species Consultation Handbook).

RELEVANT REPORTS

The following documents were used in developing this BA. References for the various studies, analysis and species descriptions may be found in these documents.

July 2003 (in progress). Fort Peck Flow Modification Biological Data Collection Plan Summary of 2002 Activities. Patrick J. Braaten, USGS. USACE Contract, Omaha District.

July 2003 (in progress). Draft Environmental Assessment, Least Tern and Piping Plover Habitat Improvement; Bon Homme, Yankton, and Clay Counties, South Dakota and Knox, Cedar, and Dixon Counties, Nebraska; Missouri River Miles 768, 781.5, 836, and 842. USACE, Omaha District.

July 2003. Draft Supplemental Environmental Assessment Least Tern and Piping Plover Habitat Improvement Missouri River Mile 866.6, Charles Mix County, South Dakota and Boyd County, Nebraska . USACE, Omaha District.

July 2003. Draft Environmental Assessment, Tern & Plover Habitat Creation Little Bend, South Dakota Oahe Dam/Lake Oahe. USACE, Omaha District.

June 2003. Draft Report, Ponca State Park Habitat Restoration Plan Detailed Project Report and Integrated Environmental Assessments. USACE Contract, Omaha District.

April 2003. Environmental Assessment for the Test Spraying of the Herbicide Arsenal; Gavins Point, South Dakota. USACE, Omaha District.

April 4, 2003 Additional Supplemental Biological Assessment for the 2002-2003 Annual Operating Plan

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January 22, 2003 Supplemental Biological Assessment for the Current Water Control Plan

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