

APPENDIX C

CORPS ACTIONS TO BENEFIT THE SPECIES

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RESERVOIR SYSTEM, THE LOWER MISSOURI RIVER,
AND THE KANSAS RIVER**

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The main elements of the 2000 BiOp Reasonable and Prudent Alternative (RPA) are adaptive management; flow enhancement including unbalanced intrasystem regulation; habitation restoration/creation/acquisition; and species-specific measures for the terns/plovers, pallid sturgeon and bald eagle. Specific details of the actions implemented in 2001 and 2002 can be found in the 2001 Annual Report dated August 30, 2002 and the 2002 Annual Report dated October 31, 2003 for the 2000 BiOp. The following discuss specific actions to benefit listed species that the Corps intends to continue to implement subject to congressional appropriations. These are discussed to provide context to the proposed action in this BA.

FORT PECK SPRING RISE TESTS

The 2000 BiOp included release changes from Fort Peck Dam as a component of the RPA. Prior to full implementation of this release change, the RPA included two tests, the “mini test” and the “full test”. These two tests are included as features in response to the 2000 BiOp. Depending on the results of the tests, the Corps may implement a Fort Peck Dam release change, however, inclusion of this as an element in a revised Water Control Plan is not part of the Proposed Action.

Preliminary biological data collection is an essential component in determining the responses and effects of the mini and full tests on pallid sturgeon and the species that have been selected for this project. The multiple components of this data collection will provide science critical to recovering fish populations throughout the Missouri River basin. The two tests are planned 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. Low Fort Peck Lake levels resulting from the current drought have delayed the mini test. The full test will be conducted in the spring following the mini test if adverse impacts resulting from the mini test are acceptable and if the level of Fort Peck Lake is adequate.

Mini Test

The initiation of the mini test will be a specified date set between May 15 and June 1, depending on weather and other logistical concerns. This date will be set a minimum of 1 month prior to the test, and public notice will be made. The discharge rates and timing of flows are described in Table C-1.

Table C-1. Mini Test Scenarios.

Mini Test Scenarios			
Duration (days)	Spillway Release (1000 c.f.s.)	Power House (1000 c.f.s.)	Combine Release Total (1000 c.f.s.)
Adjustment: Initial powerhouse release at 8K, reduce to 4K while increasing spillway release from 0 to 4K.			
4	4	4	8
Adjustment: Increase powerhouse release from 4 to 8K while reducing spillway release from 4 to 0K.			
1 ¹	0 ¹	8	8
Adjustment: Increase powerhouse release from 8 to 11K. Reduce powerhouse release from 11 to 7K while increasing spillway release from 0 to 4K.			
4	4	7	11
Adjustment: Increase powerhouse release from 7 to 14K while reducing spillway release from 4 to 0K.			
4	0	14 ²	14 ²
Adjustment: Reduce powerhouse release from 14 to 11K while increasing spillway release from 0 to 4K.			
4	4	11	15
Adjustment: Reduce powerhouse release from 11 to 7K while increasing spillway release from 4 to 8K (maintain a maximum total of 15K). Further reduce powerhouse release from 7 to 4K.			
4	8	4	12
Adjustment: Increase powerhouse release from 4 to 7K.			
4	8	7	15
Adjustment: Reduce powerhouse release from 7 to 4K while increasing spillway release 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 release from 11 to 5K while increasing powerhouse release from 4 to 7K. Day 2 – Reduce spillway release from 5 to 0K while increasing powerhouse release from 7 to 9K. Day 3 – Further reduce powerhouse release from 9K to desired release (7 or 8K).			
NA	0 ¹	Normal	Normal

1. Monitoring Period. Spillway release 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 releases are stopped. After completion of monitoring, the spillway and powerhouse releases will be adjusted to the next release combination.
2. Approximate powerhouse release will vary depending upon pool elevation.
3. Release combination duration may vary from 4-9 days depending upon monitoring results.
4. Release combination duration as required may vary to provide data without the fish barrier.

For the purpose of blending releases and altering Missouri River water temperature, the mini 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 releases will be

phased such that the total release remains roughly the same. As the spillway release is altered (raised or lowered), a corresponding change in the powerhouse release is required to maintain a constant combined flow total.

The spillway exit channel enters the Missouri River at an angle, which may direct releases toward the opposite or left bank. To minimize spillway release impacts on the left bank, powerhouse releases will be used to provide a backwater effect on the spillway exit channel. When the release scenario causes an increase in the combined total release, the increase will first be accomplished with the powerhouse to the extent practical. After the river is stabilized, powerhouse releases will be reduced while spillway releases are increased.

Constant releases from both the spillway and powerhouse are required for the duration of each release combination. Severe winds or extreme inflows may affect the lake elevation enough that the spillway releases vary during the test. Spillway release measuring equipment will be monitored during the mini test. If the monitoring equipment indicates a spillway release change greater than 500 cubic feet per second (cfs), adjustments to the spillway gate setting will be performed. No adjustment to powerhouse release is expected during the constant release period. Powerhouse peaking or variation from a constant release will not be allowed during the mini test. If unforeseen powerhouse release variation occurs, the test period will be lengthened accordingly.

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

The Milk River flows will be addressed in the specific mini test “stop” protocol. If a test segment is interrupted due to the “stop” protocol, that segment will be restarted from the beginning after the issue is addressed. If the test is delayed for 20 days or until August 1, 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 release data collection period, the mini test will be restarted at the 4-day constant release stage when it was stopped after the “stop” protocol item has been cleared. This will add a corresponding period of 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 National Environmental Policy Act (NEPA) documentation is required before this test can be conducted. Appropriate “stop” protocols have been identified.

Full Test

The full test will continue to address concerns about long-term spillway operations with engineering tests and will 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 be as described or as modified, based on the results of the mini test.

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

After pre-test releases are adjusted between the powerhouse and the spillway, 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 thousand cubic feet per second (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 rise until the pre-determined post-test release is reached. The test is expected to last for a total duration of 32 days.

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

Also, a full test “stop” protocol will be developed that addresses stopping or adjusting the releases if there are high tributary flows, endangered cultural resources, structural damages, etc. The peak full test release 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 release data collection period, the full test will be restarted at the 4-day constant flow stage when it was stopped after the “stop” protocol item has been cleared. This will add a period of release 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. The success of the full test would then be evaluated and a decision will be made whether or not to redo the full test.

If the test is delayed for 20 days or until August 1, 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 within a 2-week summer window. The window for the conducting the test will be established based on the temperature information from the mini test and data collected during monitoring. The start date for the full test will be set a minimum of one month prior to the test, and public notice will be made.

Monitoring and Evaluation of the Missouri River Reach Below Fort Peck

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 release changes 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 platorynchus*,
- 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. Evaluation of pallid sturgeon movement would also include data from a USFWS study evaluating movements of adult pallid sturgeon in the Missouri and Yellowstone Rivers and other relevant studies.

The initial monitoring plan will address approximately 7 years. It is anticipated that this will include 4 “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 Lake. At the end of the 7-year period, the data will be given a comprehensive evaluation, and the plan will be reevaluated. If the tests cannot occur due to lack of available water, corresponding years may be added to the 7-year initial plan evaluation period. The Corps is currently in the third “no test” year due to low lake levels.

Research Associated with the Fort Peck Spring Rise Tests

Through ongoing scoping for the tests, the Corps has 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. The data gaps include:

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

- Food habits 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

The food habits analysis began at the same time as the first year of monitoring and evaluation. An additional component was initiated in 2003 to evaluate the behavior and drift characteristics of sturgeon. The first field component drift test was initiated in June 2003 using 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 indicate.

HABITAT RESTORATION/CREATION/ACQUISITION

The fourth major element of the 2000 BiOp RPA is habitat restoration, creation, or acquisition. Considerable progress has been made toward reaching the 2000 goals in the areas of emergent sandbar habitat, shallow water habitat, flood plain reconnection, and riverine and reservoir habitat monitoring and evaluation. Program management plans and budgets have been developed that will allow the Corps to meet the 2005 and 2010 goals.

Shallow Water Habitat

Shallow water habitat (SWH) may be achieved through flow management, river widening, (notching/dike modifications), restoration of side channels, or combinations thereof. As mentioned above, the Corps has taken many steps toward achieving the SWH goals prescribed in the 2000 BiOp. The most immediate goal is the development of 2,000 new SWH acres between 2000 and 2005. The second milestone is the creation of 5,870 acres of SWH by 2010.

During the period Fiscal Year (FY) 2001 through FY 2003, the Corps made modifications to the Bank Stabilization and Navigation Project (BSNP) that resulted in the creation of 1,365 acres of SWH. Plans are in-place and the necessary real estate interests have been obtained for continuation of the SWH program to achieve the 2005 goal. 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, Tobacco Island and California Bend (NE); 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. Construction activities planned for FY 2004 and FY 2005 include continuation of the river control structure modification and notching programs, where possible, and construction of chutes at Glovers Point (RM 712), Hole-in-the-Rock (RM 706), Lower Decatur Bend (RM 686), Lower Hamburg Bend (RM 552), and Kansas and Nishnabotna Bends (RM 543) (see Figure C-1 for general locations on the river). In addition to the construction activities, several design and monitoring efforts are underway to ensure that construction of SWH can continue to meet the prescribed goals for 2010.



Figure C-1. Location of chutes where shallow water habitat will be constructed in FY 2004 and FY 2005 to meet the 2005 goals of the 2000 BiOp.

These actions will require collection of physical and biological baseline data, NEPA documentation, and design and construction work. To meet these goals, river conditions must be conducive to construction work. Extremely high river stages would prevent construction from proceeding on schedule, and extended periods of low flow would slow

a number of construction efforts. Low flows have the greatest likelihood of impacting the short-term goals. Long-term goals should not be impacted.

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.

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. 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 Mitigation Project, 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 have been opened up to the river. This area has received

floodwaters the past three springs for periods of 2 to 8 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 Project authorization allows the Corps to acquire and develop habitat on 166,750 acres. The Corps proposes to continue this project 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 BiOp 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.

Plans will be developed by January 1, 2004 articulating how habitat goals, as recommended in the 2000 BiOp, will be achieved. Implementation of the plans will start in the spring 2004. Work can begin prior to spring 2004 if all National Environmental Policy (NEPA) compliance is complete. Plans will emphasize opportunities to supplement and maintain flow-created habitat recognizing that most habitat will be created during flood and high water events. Plans will include expected frequency (from historical data) of potential habitat creating high water events.

Based on these habitat goals, there would be a total of 6,255 acres of ESH by 2005. The Corps is currently assessing the existing ESH to determine how much additional acreage will need to be created. Until those data are available, the Corps' best estimate is that half of the 6,225 acres of ESH already exists. Of the remaining 3,127 acres to be created, half would be created by vegetation removal procedures on existing sandbars and islands and the other half would need to be physically created.

All available habitat creation, enhancement, maintenance, and reconstruction methods will be used 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 using 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 using 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 spraying with aquatically approved pre- or post-emergent herbicide application (e.g., glyphosate or imazapyr), by using 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 and peninsula cutoffs and providing site security through slope reductions and/or substrate modifications.

O&M of the BSNP

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 and private property.

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 cannot quantify the extent of habitat benefits from those efforts.

Since 2001 the Corps has coordinated the Missouri River BSNP maintenance schedule with the USFWS Columbia Field Office. The purpose of this coordination is to: (1)

assure no net loss of SWH, and (2) look for opportunities to increase environmental value of the river through alternative maintenance practices. This coordination will continue.

Riverine and Reservoir Habitat Monitoring and Evaluation

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

SPECIES-SPECIFIC MEASURES

The last element of the RPA specified measures specific to pallid sturgeon, least tern, and piping plover, and bald eagle. In addition to the RPA, the Incidental Take Statement identified reasonable and prudent measures with its terms and conditions to minimize take for pallid sturgeon, least tern, piping plover and bald eagle. The following sections address specific actions being taken for each of these species. Detailed information on all of the reasonable and prudent measures can be found in the 2001 and 2002 Annual Reports for the 2000 BiOp.

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, and Neosho NFH, all operated by the USFWS; the Miles City State Fish Hatchery (Montana SFH); and the Blind Pony State Fish Hatchery (Missouri SFH). The locations of these hatcheries are shown in Figure C-2. Funding will continue to be provided by the Corps for these types of activities.

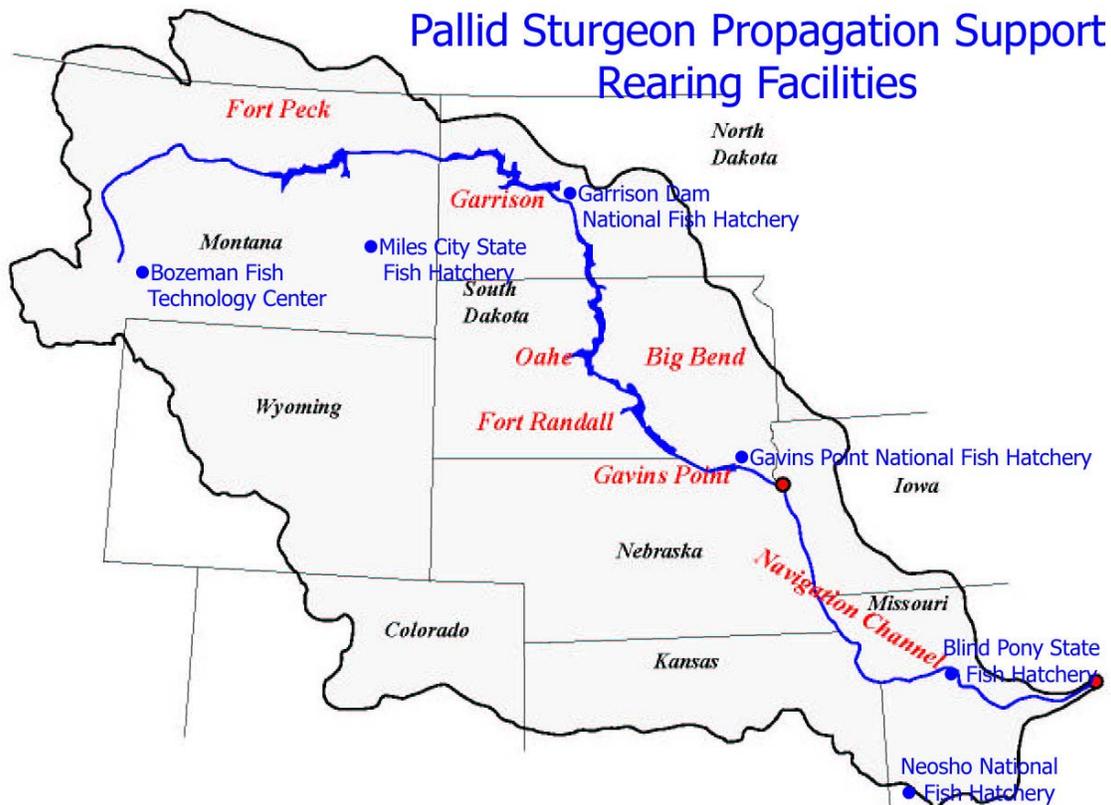


Figure C-2. Fish hatcheries providing pallid sturgeon propagation support.

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 used 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, and 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 RPMAs 1-4, as identified in the Pallid Sturgeon Recovery Plan, and are (numbers of fish stocked in 2002): 1) the Missouri River above Fort Peck Lake (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); and 4) the Missouri River From Gavins Point Dam to the mouth (7,406). Table 23 of the 2000 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."

Additional stocking efforts have been accomplished in 2003 utilizing age-1 hatchery reared juveniles (2002 year class). The following stocking activities occurred through a series of stocking efforts from April through October 2003. 4,124 juvenile pallid

sturgeon were stocked in the Missouri River's Fort Peck Reach including the lower 70 miles of the Yellowstone River during the summer of 2003. Additional 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 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 River (Gavins Point Dam to the mouth), 7,848 pallid sturgeon were stocked at the 3 primary stocking locations (Mulberry Bend (NE) Bellevue (NE) and the Franklin Island State Park near Booneville, Missouri). The total stocking effort of the 2002-year class was 12,573. Recent propagation efforts have met stocking requests in each of the RPMAs and have fulfilled the requirements of the "Average Annual Shortfall." The propagation program will enable augmentation efforts to exceed the requirements identified in the 2000 BiOp.

Population Assessments

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 the understanding of, 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 databases. Maintaining a scientifically rigorous, coordinated monitoring program will be imperative to supporting adaptive management decisions based on “good science”.

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 (Fort Randall Reach, Platte River to the Kansas River, and Glasgow to the mouth). 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. The Montana Fish, Wildlife and Parks (MTFWP) have conducted additional monitoring efforts in the Fort Peck reach. These efforts have been funded and supported primarily by other sources, including Western Area Power Administration (WAPA). The Corps provided funds to the Missouri Department of Conservation (MDC) in 2001 to initiate its “Sturgeon Monitoring Program”; however, the continued program is supported primarily through the MDC. It is the intent of the Corps to integrate and expand population assessment activities with these crews. In August 2003, the Corps met with the MTFWP and is working with the USFWS to achieve implementation of the standardized assessment program in the Fort Peck reach. State and Federal agencies (SDGFP, USFWS, IDNR, MDC) have provided budget estimates for conducting assessment activities on various portions of the Lower River that are currently not being sampled (the Gavins Point Dam to Ponca segment, the Ponca to the Platte River segment, the Kansas River to the Grand River segment, the Grand River to Glasgow segment and the Kansas River downstream of the Johnson County Weir). The Corps intends to reach full implementation of this program by the spring 2004.

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 River by the USFWS and NGPC crews, in addition to 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 Travnicek, 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 70 pallid sturgeon. The majority of these are the result of previous stocking efforts initiated in the

late 90's as 50 of the 70 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. These data 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 as a part 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 warm water benthic fish species. With this action the Corps will continue funding these cooperative assessment projects.

Corps' Pallid Sturgeon Population Assessment in Response to the 2000 BiOp.

The 2000 BiOp 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 Corps' program 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.

- Document survival, growth, and habitat use of stocked pallid sturgeon in the Missouri River.
- Document pallid sturgeon reproduction and recruitment in the Missouri River.
- 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 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 2000 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 Corps recognizes the significance of the Missouri River tributaries to the species (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 2000 BiOp recommendations to evaluate survival, movements and habitat use of juvenile pallid sturgeon. 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 2000 BiOp.

Diet Evaluation

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 objective of this project is 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 this effort, as an information gap and a priority to better understand the species. Currently, the diet evaluation research project 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 this effort will continue to completion.

The results of this project 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, Monitoring and Captive Rearing

Since 1999, the Corps has funded Dr. Roger L. Boyd, of Baker University, to conduct annual breeding surveys of the least terns and piping plovers nesting on the Kansas River. These surveys include collecting and evaluating productivity, habitat, and other pertinent data needed for the Corps to decide whether the Kansas River provides a source or sink for these species. This evaluation will be made by the Corps after the 2005 nesting season. Annual breeding survey reports are prepared for the Corps by Dr. Boyd and coordinated with the USFWS. The Manhattan office of the USFWS has agreed with the Corps' plan to use data from these annual breeding survey reports to make the "source or sink" evaluation in 2005.

In conjunction with the monitoring program, the Corps has undertaken, and will continue with this action, several management activities that 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 augment its outreach and interpretive programs to enhance public awareness of endangered species.

The 2000 BiOp commended the Corps for its comprehensive least tern and piping plover monitoring program, which has provided state-of-the art information on habitat and birds critical to river management decisions. 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 in the Missouri River basin, 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, record keeping of nest locations, and observation of chicks from hatching to fledging. An adult census of both species will be conducted to assess population trends. Monitoring personnel are, and will continue to be, trained by Corps biologists in least tern and piping plover biology and survey techniques to ensure the capture of consistent and quality data. The Corps also proposes to complete the comprehensive review of its captive rearing program. On February 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 the Corps' 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 that 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 Annual Report for the 2000 BiOp.

Bald Eagle/Cottonwood Population Assessment.

The 2000 BiOp states that 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 operations on the Missouri and Kansas Rivers 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
- Exercise Section 10/404 permit authority to protect, maintain, and enhance riparian forest usable by bald eagles
- Pursue restoration of stands of cottonwoods and sycamores in the Kansas River floodplain in all permit reviews
- Where cottonwood regeneration is lacking and could affect the bald eagle, pursue restoration opportunities through existing authorities.
- Develop a management plan for riverine forest areas not experiencing over bank flooding that will allow for natural regeneration, periodic seed germination, and seedling establishment at a sufficient rate such that regeneration is maintaining pace with or exceeding mortality.

The bald eagle/cottonwood model, contracted with the Corps of Engineers Research and Development Center (ERDC) that has been initiated, will help the Corps and other agencies address the conservation recommendations of the USFWS. The model includes mapping and evaluating the health of the cottonwood forests that currently provide or may provide wintering, non-breeding, and breeding habitat for bald eagles on the Missouri River.

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 research, monitoring, and evaluation (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 effort, the Corps proposes to continue its focused research effort by investigating the relationship between nest initiation chronology of least terns and piping plovers, 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.