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FINAL
FISH AND WILDLIFE
COORDINATION ACT REPORT
FOR THE
MISSOURI RIVER LEVEE SYSTEM
UNITS L-455 AND R-471-460
FLOOD DAMAGE REDUCTION STUDY
KANSAS AND MISSOURI

PREPARED FOR THE

The Kansas City District
U.S. Army Corps of Engineers
Kansas City, Missouri

Prepared by
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August, 2006

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EXECUTIVE SUMMARY

The Kansas City District, Army Corps of Engineers (Corps), is in the process of developing a feasibility study for flood damage reduction measures for the city of St. Joseph, in Buchanan and Andrew Counties, Missouri and the towns of Elwood and Wathena, in Doniphan County, Kansas. This Final Fish and Wildlife Coordination Act Report describes the study area, identifies important aquatic and terrestrial resources, evaluates impacts of flood damage reduction measures, and describes mitigation measures.

The project area is highly urbanized inside the existing levee system. The primary impact from a fish and wildlife perspective will be the loss of terrestrial habitat from levee construction, permanent loss of wetlands from levee construction, and temporary loss of terrestrial habitat due to construction activities and borrow construction. One borrow area, known as Elwood Bend, has been proposed for purchase for inclusion in the Missouri River Fish and Wildlife Mitigation Program (MRFWMP). Inappropriate use or pattern of borrow from this area could diminish its value to the MRFWMP. The Fish and Wildlife Service (Service) recommends the following:

RECOMMENDATIONS

1. The take of borrow from areas riverward of the levees should be closely coordinated with the Missouri River Fish and Wildlife Mitigation Project (MRFWMP) team to creatively construct areas that will conform to the objectives of the MRFWMP. This is particularly important in the proposed borrow area south of the City of Elwood, known as Elwood Bend, as it has been identified for inclusion in the MRFWMP. The MRFWMP team should be closely consulted about the take of borrow from the area and about the construction plans for the final design of the borrow areas. The MRFWMP should also be given approval rights for the borrow design plans. If the Corps and the project sponsors are unable to work with the MRFWMP, the Elwood Bend area should be eliminated from the plan.
2. Riparian and wetland habitats should be avoided to the maximum extent practicable when selecting borrow sites for the proposed levee raises and compensatory mitigation should be undertaken for unavoidable impacts. Since channelization, levee construction and floodplain development have already resulted in dramatic loss of riparian and wetland habitats in the Missouri River basin, the Corps should focus on bare or cropland areas for borrow.
3. Reconsideration of the Levee Setback alternative. The Levee Setback alternative was eliminated from further consideration because total benefits from this alternative were far less than the cost of construction. However, the MRFWMP team is considering setting back levees to improve habitat. Coordination with the MRFWMP may make it feasible to set back some portions of levees as part of this project thereby reducing impacts from those portions of the levees that would still need to be raised.

4. Levees and levee easements should be seeded with native, warm-season grasses such as switch grass.
5. Removal of mature cottonwoods, and other native vegetation should be avoided where possible, and if they are removed, replace woody vegetation by establishing 2 acres of native vegetation for every acre impacted.
6. The Corps should create wetland mitigation habitat to compensate for the loss of wetland acreage from construction of the projects at a minimum of 1.5:1 ratio for emergent wetland and at a 2:1 ratio for forested wetland. If farmed wetland is directly impacted by borrow activities it should be mitigated at a 1.0 to 1.0 ratio.
7. Encourage wetland development and hydrological reconnection to the river at existing and proposed borrow areas.
8. Best Management Practices to prevent the transport of invasive species to or from the construction sites should be included as an integral component of the project.

The following recommendations describe opportunities to provide fish and wildlife enhancement through the project.

9. Establish native vegetation riverward of levee segments where riparian woodlands are sparse or nonexistent or where the invasive species, reed canary grass (*Phalaris arundinacea*), has become established. If possible, borrow from reed canary grass areas and replace with permanent water or seasonal inundation such as chutes, deeper water wetlands, backwaters, and floodplain ponds that would eliminate reed canary grass.
10. All disturbed areas should be immediately planted with native vegetation following construction. Due to the presence of reed canary grass, an exotic and aggressively invasive species, these areas would likely become a monoculture of reed canary grass if allowed to revegetate naturally.

INTRODUCTION

This Final Fish and Wildlife Coordination Act Report (FCAR) evaluates the effects on fish and wildlife resources of proposed alternatives identified for increasing the level of flood protection for areas in Kansas and Missouri near St. Joseph, Missouri and Elwood, Kansas. The considered alternatives consist primarily of earthen levee raises of two levee units, Levee Unit L-455 and Levee Unit R-471-460. These units collectively comprise the protective works that provide flood protection for areas in the city of St. Joseph, in Buchanan and Andrew Counties, Missouri and the cities of Elwood and Wathena, in Doniphan County, Kansas (Figure 1).

The south St. Joseph Levee Unit L-455 is located on the left bank of the Missouri River in Buchanan County, Missouri. It extends from the mouth of Whitehead Creek (Missouri River mile marker 447.3) ten miles downstream to Contrary Creek (Missouri River mile marker 437.3) and provides flood protection for a flood prone area within the southwest section of the City of St. Joseph. The Levee Unit R-471-460 is located on the right bank of the Missouri River between river miles 441.7 and 456.6 in eastern Doniphan County, Kansas, and northwestern Buchanan County, Missouri.

The right bank levee, R-471-460 was overtopped during the flood of 1993. The stated need for the Missouri River Levee System Units L-455 and R-471-460 Flood Damage Reduction Project in Kansas and Missouri is to allow passing of the one percent flood event with 90 percent reliability under both the existing and future conditions. This level is currently lacking and the Federal Emergency Management Agency (FEMA) is considering de-certification for the right bank levee. If the levee is decertified the economic impact of a flood event will be borne entirely by the local communities

Work on this project is based on agreements in the FY2006 Scope of Work to evaluate impacts to fish and wildlife resources from the NED-Preferred alternative, and Alternatives 2 and 3. On July 20, 2006, the Corps added Alternative 4 and requested that we evaluate it. This study was carried out under authority and in accordance with provisions of the U.S. Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et seq.).

The Fish and Wildlife Service has not provided any previous Planning Aid Letters or Planning Aid Reports on the Missouri River Levee System Units L-455 and R-471-460 Flood Damage Reduction Project in Kansas and Missouri. The Service provided a Draft Fish and Wildlife Coordination Act Report dated June 2006. We have reviewed the Corps' Pre-Draft Environmental Impact Statement (EIS), Draft Environmental Assessment (EA), and Draft Mitigation Plan.

The Kansas Department of Wildlife and Parks (KDWP) and the Missouri Department of Conservation (MDC) have cooperated in the preparation of this report and concur with its contents.

MRLS L-455 and R460-471
FEASIBILITY STUDY AREA

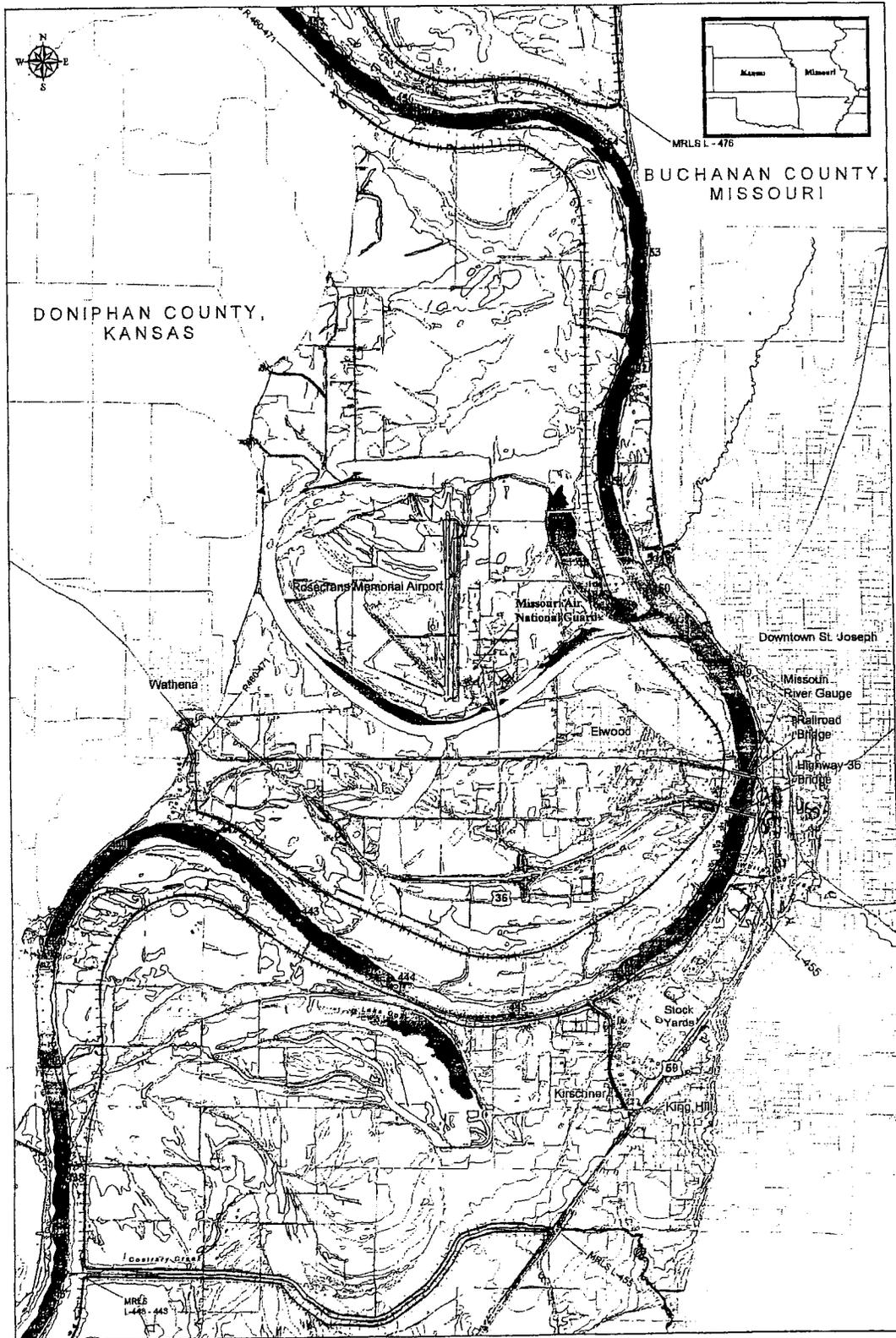


Figure 1.

DESCRIPTION OF THE PROJECT AREA

The site of St. Joseph was first noted in the journal of Lewis and Clark during their Journey of Discovery in 1804. Following the organization of the State of Missouri in 1821, Joseph Robidoux established the Blacksnake Hills trading post in 1826 at this site. In 1843 Robidoux platted the town of St. Joseph naming it after his patron saint. The town remained relatively small until the 1848 California Gold Rush when it became important as a departure point for the westward journey to the gold fields for hundreds of thousands of settlers and again in the 1850s during the Pike's Peak gold rush. In 1859 the railroad reached St. Joseph assuring its role as a supply and distribution point to the western half of the country. St. Joseph's proximity to the Missouri River and accessibility by way of river, rail, and land was to provide the impetus for phenomenal growth throughout the 19th century. The Pony Express operated in 1860 and 1861 with St. Joseph serving as its eastern terminus. In the 1870's St. Joseph became established as a leading wholesale center. A stockyard was opened in 1887 and several meat packing plants were established during the next forty years. The city currently has a population of approximately 74,000.

Elwood, Kansas was first established in 1856 under the name of Roseport. It also benefited from its association with the Missouri River serving as an important steamboat port with ferry service to St. Joseph. In the 1850s, thousands of emigrants outfitted in Elwood for their journey to Oregon and California. It was the first Kansas station on the Pony Express and the site of the first railroad construction west of the Missouri River. Much of the old town was washed away when the Missouri River undermined the banks. The current town has a population of approximately 1,176.

The Missouri River, one of the largest rivers in the United States, originates in southwestern Montana and flows about 2,315 miles to join the Mississippi River near St. Louis, Missouri. It drains approximately 424,300 square miles above Saint Joseph, Missouri. The River Mile (RM) references used in this report are measured upstream from the confluence of the Missouri River with the Mississippi River. The topography of the study area is generally represented by hills and uplands, which rise from 100 feet to 200 feet above the Missouri River floodplain. The Missouri River borders the eastern bluffs in the northern part of the city, and then crosses over to border the western bluffs opposite the southern part of the city. Its floodplain is three to five miles wide at Saint Joseph. Tributaries to the Missouri River in the St. Joseph study area in Missouri include Blacksnake Creek, Whitehead Creek, and Contrary Creek. On the Kansas side, Peters Creek joins the Missouri River south of the town of Wathena. Several unnamed tributaries to the Missouri River are also in the Kansas portion of the project area. An area called French Bottoms occupies the interior of an old oxbow of the Missouri River. Browning Lake is the remainder of the old channel. The Rosecrans Memorial Airport was built in the French Bottoms.

The project area is predominantly an alluvial flood plain underlain by bedrock of the Pennsylvanian System, Kansas City Group. Pennsylvania strata generally consist of inter-bedded sandstone, shale, limestone, clay, and coal. Limestone is the most abundant

resource present and it is mined for materials primarily used for road and highway construction.

In addition to limestone, sand and gravel are locally important mineral resources. The historic production of these resources is from flood plain and in-channel deposits of major streams. Crushed limestone has replaced stream gravels as the predominant coarse aggregate in cement. Upland terrace and glacial deposits are important sources of sand and gravel in the southeastern and northwestern portions of Missouri.

Soils within the project area have primarily developed as a result of the wind-borne deposition of fine-grained material (loess) and the deposition of material on land by streams (alluvium). Loess deposits are visible on the exposed valley walls adjacent to the Missouri River. Missouri River floodplain soils belong to the Haynie-Urban Land-Leta association. Soils of the upland, loess hills are of the Knox-Judson-McPaul and the Marshall-Ladoga-Gara associations. The soil associations generally consist of deep, nearly level, well drained to somewhat poorly drained soils comprised of river-deposited sand, silt, and clay.

The flood plain or bottoms area is three to five miles wide in the St. Joseph study area and is characterized by low-lying, nearly level terrain. The uplands are composed of steep to moderately sloping hills composed of loess or loamy soils. Buchanan County and Doniphan County consist of several soils types, which are either hydric, prime farmland, or both.

Water quality of the Missouri River tributaries in St. Joseph has been severely impacted by urban development. Significant segments of five out of the seven tributaries in the study area have been placed underground in conduits and are used as a combined sanitary/storm water sewer system. The remaining two tributaries, Roy's Branch and Contrary Creek, drain relatively undeveloped areas.

The Missouri River near St. Joseph is classified as a permanent flow general warm water fishery resource. A general warm water resource provides protection to both game and non-game fish occurring in the area. The River provides a water source for irrigation, livestock/wildlife watering, aquatic life protection, boating, drinking water supply, and industrial withdrawal.

Terrestrial Resources

A review of historical conditions on the Missouri River can facilitate an understanding of how the river formerly functioned, and suggest the ecological functions and processes that were essential to development of such an abundant and rich array of fish and wildlife resources. However, clearly defining historical conditions is somewhat problematic, since most of the more detailed quantitative and qualitative descriptions of the Missouri River occurred during or after major episodes of human impact. Nevertheless, we can broadly surmise how the presettlement Missouri River appeared.

The Missouri River, presettlement, was free-flowing, without the restrictions of dams and diversions. The river water was extremely sediment laden and turbid, in comparison, current flow is fairly clear. Flows varied dramatically and fluctuated widely in response to rains. Sustained high flows occurred in the spring and early summer in response to snow melts.

The higher flow events resulted in over bank flooding, often over extensive reaches of the valley floor. Overflow areas were covered by dense forests of riparian vegetation. Some accounts place the riparian band as extending up to 14 -15 miles along each side of the river and encompassing at least one-half million acres. Extensive swamps, marshes, floodplain pools, and other diverse and expansive wetlands were also nourished by the regular flooding events.

Bank erosion and river meander, the basic forces for most riverine ecological processes and functions, were unimpeded. Erosion was most active on the outsides of the numerous meander bends, where the highest velocities impinged directly on the earthen substrates. As one bank was eroded, the opposite bank experienced sediment accretion. Some of the meanders became cut off from the river, forming oxbow lakes and other broad, highly diverse channel overflow areas. Erosion also resulted in the input into the river of large volumes of woody debris of a broad range of sizes, types, and complexities into the river. The fish, wildlife, and riparian vegetation of the river were in a dynamic equilibrium, adjusted to, and dependent upon the cycle of erosion, deposition, and changing channel pattern as the river slowly swung back and forth across its meander belt. The ecological health and productivity of the river at any point in time were dependent on periodic rejuvenation associated with these natural processes and changes.

Significant environmental changes and impacts have occurred in the past one-hundred and fifty years. Only fragments remain of the extensive riparian forests and wetlands which have been largely removed through urbanization and land clearing for agricultural purposes. The river is controlled by dozens of dams on the main stem and tributaries. The river is sediment starved. The lower river is channelized and largely confined by levees and bank stabilization, and overall, is a mere remnant of the ecologically dynamic and complex system of the past (USFWS 2005).

Remnants of the "oak-hickory-maple" upland forest vegetation type are present on the steep hillsides adjacent to the Missouri River floodplains. In addition to the species of sugar maple, white and black oak, and hickories for which this upland vegetation type is named, other hardwood species present include American sycamore, beech, black walnut, bur and chinkapin oak, hackberry, American and slippery elm, hawthorn, honeylocust, redbud, and dogwood. The understory consists of regeneration of the above species and the ground layer includes: violets, poison ivy, Virginia creeper, greenbrier, and honeysuckle and other species.

Most of the vegetation in the study area has been greatly impacted by urban development and agricultural land clearing. In general, the upper reaches of the tributaries draining the area are located in the more established, residential neighborhoods and the lower reaches

are located in the intensively developed business district and croplands. The banks along Roy's Branch, Contrary Creek, and limited areas along the upper reaches of the other tributaries do contain tracts of riparian timber. A mix of sycamore, cottonwood, maple, oak, and hickory dominates these areas. Other areas along the upper reaches of the tributaries are in residential development, parkland, or various stages of successional recovery.

Three vegetation types generally dominated the project area: floodplain forest (*Populus-Salix*), oak-hickory-maple forest (*Quercus-Carya-Acer*), and openings of bluestem prairie (*Andropogon-Panicum-Sorghastrum*). Although the project area's floodplains have been largely cleared for development and agriculture, there are bands of riparian forest habitat located riverward of the levee units. Predominant tree species found in these riparian bands include eastern cottonwood, willows, box elder, green ash, silver maple, and American sycamore. The understory includes reproduction of these species, plus some redbud, dogwood, black cherry, and various shrubs. The ground layer in the riparian bands varies from sparse to dense vegetation and contains primarily poison ivy, Virginia creeper, honeysuckle, greenbrier, and gooseberry, and various other species. A monoculture of reed canary grass was observed in much of the area between the levee easement and the band of riparian forest at the water's edge on the Kansas side of the project area.

Mammals associated with the remaining wooded riparian habitat include the white-tailed deer, eastern cottontails, and red and gray squirrels. Aquatic and terrestrial furbearers are important parts of the ecosystem, and those present in the area include the beaver, mink, and muskrat (dependent on the aquatic habitat) and opossum, coyote, raccoon, and striped skunk (dependent on terrestrial habitat). However, small mammals, such as mice, voles, rats, and bats account for the majority of the species present. The white-tailed deer is the only naturally occurring large mammal still common in developed urban areas. Eastern wild turkeys are present in the open, less developed floodplain areas.

The avifauna of the study area includes permanent residents, summer residents, transients, and winter residents. The project area provides year-around habitat for approximately 31 bird species, with another 67 species using the project area for nesting and another 14 species as winter residents only. Over 110 species use the river corridor during the fall migration. Summer resident species associated with aquatic habitats include waterfowl, wading birds, and selected passerines. Summer waterfowl are dominated by wood ducks which nest in wooded bottomlands and rear their young in nearby aquatic habitats. Nesting by other waterfowl, primarily mallards, is minor. Wading birds, such as the great blue heron and green heron, utilize shallow areas as foraging habitat.

Waterfowl and shorebirds are dominant transient species associated with aquatic habitats. The most numerous and impressive migration is that of the snow goose, particularly in the spring. Other migrating species include the Canada goose, mallard, and pintail.

Amphibians found in the study area include the American toad, Rocky Mountain toad, Blanchard's cricket frog, Cope's gray treefrog, Great Plains toad, Woodhouse's toad, northern cricket frog, eastern gray treefrog, boreal chorus frog, western chorus frog, smallmouth salamander, plains spadefoot toad, plains leopard frog, bullfrog, Great Plains narrowmouth toad. Reptiles that may be found in the study area include the snapping turtle, painted turtle, false map turtle, ornate box turtle, slider, smooth softshell turtle, spiny softshell turtle, five-lined skink, Great Plains skink, northern prairie skink, six-lined racerunner, western worm snake, ringneck snake, eastern hognose snake, racer, rat snake, prairie kingsnake, red milksnake, gophersnake, northern water snake, brown snake, western ribbon snake, common garter snake, copperhead, and timber rattlesnake. The northern leopard frog and western fox snake may also be present in the study area (Collins 1993).

Wetlands

Wetlands exist within the project area as small pockets, old meander scars, and within the riparian strips. An old oxbow of the Missouri River (French Bottoms) was cut off when the river changed its course during the flood of 1952. Remnants of the oxbow remain as Browning Lake, an area protected by levee unit R471-460. Lake Contrary is in the area protected by levee L-455. It is currently being studied by the Corps for a restoration project.

National Wetland Inventory database (NWI) maps for the project area indicate that there are many wetlands in the project area. These wetlands are permanently flooded, seasonally flooded, temporarily flooded, or semi-permanently flooded and include forested, broad leaved deciduous, and scrub shrub vegetation. In addition, there are areas classified as palustrine unconsolidated bottom, intermittently exposed (PUBG) which are typically mud or sand flats. Some of the wetlands are natural and some are man-made.

Historically, wet mesic bottomland forest was the most extensive bottomland forest natural community in Missouri (Nelson 1987). This community has a diversity of tree species such as pin oak, cottonwood, river birch, green ash, and hackberry, cherry, sweetgum, hawthorn, dogwood, hickories, wildplum, persimmon, maples, elm, and sassafras. A well-developed understory is often present, containing poison ivy, elm, nettle, and honeysuckle. These communities provide habitat for a wide variety of resident and migratory wildlife. Forested wetlands have been found to support significantly higher abundance and diversity of bird species compared to upland forests (Brinson 1981).

A jurisdictional wetland determination will be necessary if levee alignments or borrow areas directly impact wetlands. The quantity and quality of existing wetlands will determine the amount of compensation necessary to offset project losses. A wetland mitigation plan would be developed in coordination with at least the Corps, Service, Environmental Protection Agency (EPA), Kansas Department of Wildlife and Parks (KDWP) and the Missouri Department of Conservation (MDC). This plan would include site locations, time frames, construction plans, a monitoring plan, progress reports, and

standards of success. This plan would be a condition of any Section 404 permit issued for the project. The plan should be implemented regardless of the regulatory nature of the wetland. Minimum replacement ratios for compensatory wetland mitigation should be based on the following guidelines:

U.S. Fish and Wildlife Service, Region 6
Wetland Mitigation Policy Guidance (8/97)
Recommended Minimum Replacement Ratios

<u>Mitigation Type</u>	<u>Ratio</u>	<u>Type of Wetland Being Mitigated</u>
Advance Creation	1.5:1	forested, scrub-shrub
	1:1	emergent
Concurrent Creation	2:1	forested, scrub-shrub
	1.5:1	emergent
Advance Restoration	1.5:1	forested, scrub-shrub
	1:1	emergent
Concurrent Restoration	2:1	forested, scrub-shrub
	1.5:1	emergent
Advance Enhancement	3:1	forested, scrub-shrub
	2:1	emergent
Concurrent Enhancement	4:1	forested, scrub-shrub
	3:1	emergent

Aquatic Resources

The Missouri River has undergone considerable change since the Louisiana Purchase in 1803. The historical Missouri River provided a wide array of habitats within its wide, shallow bed. The braided channels were divided by sand islands and varied in depth and speed of current, from swift chutes to calm sloughs, backwaters, and oxbows. The River had constant flow, although the volume varied enormously. Its water was muddy except at low stages (Cross and Collins 1995). Modifications to the natural Missouri River floodplain ecosystem have been immense and ongoing for more than 150 years. Presently, 35 percent of the river's length is impounded, 32 percent is channelized or stabilized, and the remaining 33 percent is freeflowing (Schmulbach and others, 1992). Major civil works projects involved channelization, channel maintenance, and impoundment and reservoir operation. Agricultural, industrial, and urban development within the basin also significantly modified the Missouri River and its adjoining floodplain.

Presently all of the Missouri River from Sioux City, Iowa to its mouth at Saint Louis, Missouri is channelized. Even during flooding only about 10 percent of the original floodplain is inundated, as high agricultural and urban levees confine the river to a width of approximately 500 feet from Kansas City north (USFWS 1980). The impacts of channelization have been numerous and severe on the physical, chemical, and biological

structure and function of the Missouri River and its floodplain. The most damaging of these alterations to aquatic communities has been the nearly complete isolation of the river from its floodplain, subsequent loss of floodplain habitat, drastic reduction in area and diversity of river channel habitats, and increased velocity of the main channel.

Missouri River fish populations have been significantly affected by channel alterations in the project area. Most indigenous fish species still remain, but have suffered serious population declines. Cross and Collins (1995) state that fishes characteristic of the Missouri River are typical of large turbid rivers and include sturgeon (pallid and shovelnose), paddlefish, goldeye, gizzard shad, smallmouth buffalo, bigmouth buffalo, blue sucker, channel, blue, and flathead catfish, burbot, sauger, and freshwater drum. The abundant minnow fauna consists of species adapted to muddy water which includes the flathead chub, sicklefin chub, sturgeon chub, speckled chub, plains minnow, western silvery minnow, silverband shiner, river shiner, and sand shiner (Cross and Collins 1995). Other fish species that may be present near the project site include river carpsucker, shortnose gar, longnose gar, gizzard shad, chestnut lamprey, goldeye, red shiner, brassy minnow, silver chub, quillbacks, black buffalo (Pflieger 1997, Cross and Collins 1995). Introduced species include common carp, bighead carp, and grass carp (Cross and Collins 1995).

Threatened and Endangered Species

Section 7(c) of the Endangered Species Act (87 Stat. 884, as amended), requires Federal Agencies to ask the Secretary of the Interior, acting through the Service, whether any listed or proposed endangered or threatened species may be present within an area proposed for construction. If the project may affect listed species, the Corps of Engineers should initiate formal Section 7 consultation with this office. If there will be no effect, or if the Fish and Wildlife Service concurs in writing there will be beneficial effects, further consultation is not necessary. An activity which harasses any listed species and disrupts its normal breeding, feeding, or sheltering activities to the extent that harm or injury results is a prohibited taking under the ESA.

As a result of habitat losses and flow regime changes, two species dependent on the river are federally-listed as endangered or threatened and are found in this section of the Missouri River.

The bald eagle (*Haliaeetus leucocephalus*), federally listed as threatened, may be expected to occur along any river or at any reservoir in Kansas or Missouri. Eagles utilize areas where live large trees and snags provide perch sites in proximity to open water, where they feed on fish and waterfowl. This project may adversely impact the bald eagle by removing trees from the levee footprint and from the borrow areas. In addition, if any project activity appears likely to harass or disturb any bald eagle observed at or near any construction site the Service should be notified prior to commencement of the activity, so that an assessment may be made of the potential for adverse impacts.

The pallid sturgeon (*Scaphirhynchus albus*), federally listed as endangered, occurs throughout the Missouri River reach. This species has been recently captured in the Missouri River in the project area. (Miller 2006 per. comm.). Information gained by recent capture and tagging research indicates that pallid sturgeons use nearly all the habitats found in the Missouri River during their life spans. Sturgeons have been found in tributary mouths, over sandbars, along main channel borders, and in deep holes elsewhere in the Missouri River. Small sturgeons have been captured in off-channel backwaters. Adults are often found in deep, swift flowing water, especially during winter months while young and larval pallids are found in areas of lower velocities out of the thalweg.

Because so little is known about the pallid sturgeon, much of the previous information available about the reproduction or spawning activities of the pallid sturgeon was, extrapolated from what is known about shovelnose sturgeons. Shovelnose sturgeon spawn over substrates of rock, rubble, or gravel in the main channel of the Missouri/Mississippi Rivers and major tributaries, or on wing dams in the main stem of larger rivers. Spawning was suspected to occur in the relatively swift water in or near the main channel. Initiation of shovelnose sturgeon spawning migrations have been associated with increased flows in May and June and water temperatures from 61° F to 70° F (USFWS 1993).

Destruction and alteration of habitats by human modification of the river system is believed to be the primary cause of declines of the pallid sturgeon. It is unlikely that successfully reproducing populations of pallid sturgeons can be recovered without restoring habitat elements of the Missouri and Mississippi Rivers necessary for the species continued survival. The construction of levees has contributed to the alteration of pallid sturgeon habitat by eliminating major natural floodways, which annually inundated and isolated many floodplain lakes, reduced the area of the floodplain, and changed erosion and accretion processes. In addition, bank stabilization, sediment trapping in reservoirs and channelization has led to bed degradation. The reduced amount of floodplain the river can access has diminished the availability of organic matter used by aquatic invertebrates which make up a large proportion of the of the pallid sturgeon's diet during early life stages. In addition, aquatic invertebrates are a primary food source for small fish which the pallid prefers as adults. Portions of the Missouri River 20 miles upstream and downstream of the mouths of the Kansas River and Platte Rivers are high priority reaches for recovery of the pallid sturgeon (USFWS 1993).

Kansas State Law (K.S.A. 32-504, 32-507: effective May 1, 1981) requires persons undertaking or sponsoring a publicly funded or State or Federally Assisted action which is likely to impact endangered or threatened wildlife habitats where they are likely to occur, to obtain a project action permit from the Secretary of the Kansas Department of Wildlife and Parks (KDWP) prior to initiation of such action. This list should be requested from the Environmental Services Section, Kansas Department of Wildlife and Parks, 512 SE 25th Ave., Pratt, KS 67124-8174.

KDWP maintains an internet site containing county lists and species information at http://www.kdwp.state.ks.us/news/other_services/threatened_and_endangered_species. State of Kansas listed threatened and endangered species for Doniphan County, Kansas listed on this site include sicklefin chub (*Macrhybopsis meeki*), flathead chub (*Platygobio gracilis*), western silvery minnow (*Hybognathus argyritis*), chestnut lamprey (*Ichthyomyzon castaneus*), eastern spotted skunk (*Spilogale putorius interrupta*), silverband shiner (*Notropis shumard*) peregrine falcon (*Falco peregrinus*), silver chub (*Macrhybopsis storeriana*), smooth earth snake (*Virginia valeriae*), and sturgeon chub (*Macrhybopsis gelida*). In addition, the following Federally listed threatened and endangered species are also listed by the State as occurring in Doniphan County, Kansas: American burying beetle (*Nicrophorus americanus*), Eskimo curlew (*Numenius borealis*), least tern (*Sterna antillarum*), and piping plover (*Charadrius melodus*).

The State of Kansas lists the following species as Species in Need of Conservation: black tern (*Chlidonias niger*), blue sucker (*Cycleptus elongates*), brassy minnow (*Hybognathus hankinsoni*), cerulean warbler (*Dendroica cerulea*), eastern hognose snake (*Heterodon platirhinos*), plains minnow (*Hybognathus placitus*), river shiner (*Notropis blennioides*), short-eared owl (*Asio flammeus*), southern flying squirrel (*Glaucomys volans*), and timber rattlesnake (*Crotalus horridus*). As these lists are subject to change the Corps should contact the Kansas Department of Wildlife and Parks, Environmental Services directly.

According to the Missouri Department of Conservation's Natural History Data Base (1999) there are occurrences of state listed species or communities in the project area. Species and concerns should be requested from the Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102.

DESCRIPTION OF THE PROJECT ALTERNATIVES

The five alternatives considered for this Coordination Act Report are: 1) Raise the Right Levee Section using earthen material to the one-hundred year level of flood protection with 90 percent reliability, and a corresponding raise to the Left Levee Section in specific areas to accept the slight rise in water surface elevations resulting from the initial raise (PREFERRED); 2) Raise the Right Levee Section to an Increased Level of Protection (500-year event plus 1.5 feet of freeboard), with a corresponding raise to the Left levee unit; 3) Raise the Right Levee Section to a Further Increased Level of Protection (500-year event plus 3.0 feet of freeboard), with a corresponding raise to the Left levee unit, and 4) Raise the Right Levee Section only using earthen fill to the 100 year level of flood protection with 75 percent reliability and 5) the "No Action" Alternative. The Corps of Engineers' Draft EA identifies Alternative 1 as the Preferred Alternative.

Alternative 1: Modifying Existing Levees to Design Level to provide a higher level of flood protection than that which currently exists. This is the current preferred alternative. This modification is accomplished by raising the existing levee using earth fill. A significant portion of the levee unit R-471-460 would be raised to a level sufficient to pass the one percent (100-year) flood with a 90 percent level of reliability, allowing for re-certification of the levee by FEMA. The anticipated right bank raise varies along its

length from zero to 3.37 feet. Increases in levee height would result in corresponding increases in levee toe width and seepage berms. The overall width increase from the expanded levee and seepage berms would range from approximately 35 feet to 372.5 feet landward of the right bank levee unit and approximately 29 feet to 50 feet riverward of this same levee unit. Extension of the levee toe width and seepage berms would impact a total of approximately 285 acres of land landward of the levee and approximately 77 acres of land riverward of the existing levee.

Additionally, a raise to the right bank levee would require minor raises (less than one foot) at specific locations along the left bank levee to accept the increased rise in water surface elevation resulting from the initial work. These increased elevations to the left bank will also increase toe width and seepage berms by approximately 136.5 feet to 490 feet landward of the levee unit and approximately 41.5 feet riverward of the existing levee. Extension of the levee toe width and seepage berms will impact approximately 43 acres of land landward of the levee and approximately 54 acres of land riverward of the existing levee.

Expanding the levees would result in the permanent removal of approximately 1.6 acres of secondary tree growth and 4.7 acres of shrubland landward of the levees and 5.4 acres of secondary tree growth and 8.0 acres of shrublands riverward of the levee. The permanent impact to these habitats is expected to be substantial because it will be kept from growing on the levee areas through normal levee maintenance practices. The Corps is proposing to measures to mitigate the loss through the on-site planting of 7.0 acres of "in-kind" trees and 12.7 acres of shrubland vegetation.

Proposed borrow areas include riverward areas in both Kansas and Missouri (Figure 2). In Kansas, the borrow areas consist of approximately 1,139 acres of land located from River Miles 454.9 to 451.9 and from River Miles 446.7 to 443.4. For Missouri, the borrow area consists of approximately 30.4 acres of land along River Miles 442.6 to 442.9. Over the entire project area, including the impacts from borrow material excavation and riverward berm expansion, approximately 388 acres of secondary tree growth and approximately 136 acres of shrubland could be temporarily impacted. The Corps is proposing to allow these areas to naturally revegetate over time. Additional steps have been proposed to minimize effects to this habitat. Minimization measures include, but are not limited to, avoiding this habitat by first using bare and/or cropland areas, varying bottom depths of excavated borrow sites, creating islands within the borrow site through avoidance of specified areas, spacing borrow areas apart from one another by approximately 500 feet to provide areas of no disturbance, and avoiding any larger "old growth" trees.

Construction work to extend the seepage berms would result in temporary impacts to approximately 274 acres of primarily agricultural land with minor amounts of secondary tree growth and shrubland on the right bank levee and 44 acres of similar land use on the left-bank levee. The Corps is proposing to allow these areas to revert back to their existing conditions as no levee maintenance activities will be conducted over the top of seepage berm areas.

St. Joe Levees - Easements with Accreted Lands

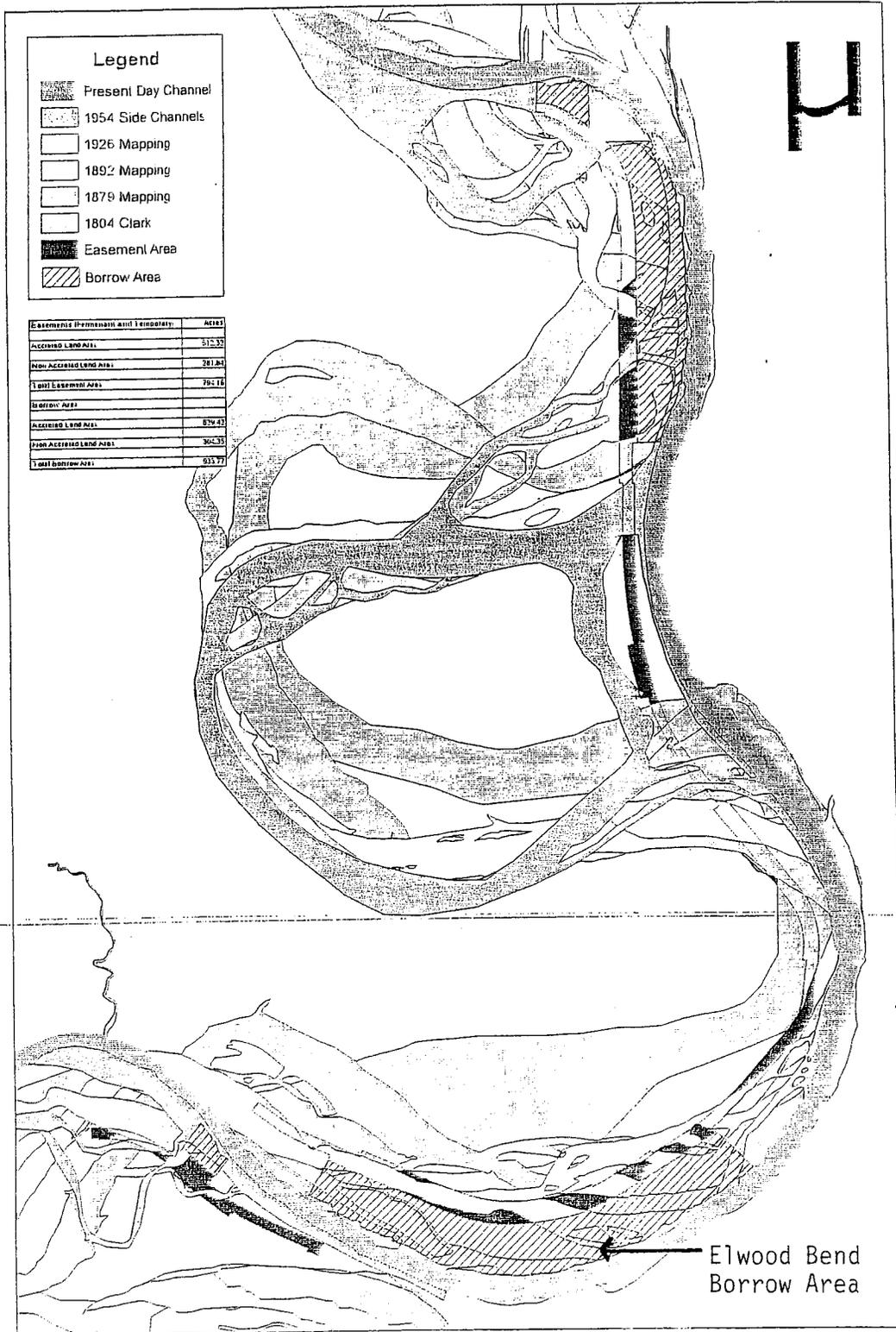


Figure 2. Borrow Areas

Graphic Source: Kansas City District, Corps of Engineers

Modifying the two levees would permanently impact approximately 4.4 acres of emergent wetlands landward of the levees and approximately 0.5 acre of forested wetlands riverward of the two levees. The areas would be filled and sloped, thereby inhibiting the ponding of water. The Corps is proposing to mitigate a total of 4.4 acres of emergent wetlands and 0.5 acres of forested wetlands on site and adjacent to the impacted wetlands concurrently with construction activities. Wetland impacts are proposed to be offset through the scraping and reshaping of the impacted areas to expand the existing wetland area equal to that which was lost.

Some of the wetlands along both levees may be enrolled in the Wetland Reserve Program. To the extent possible, these areas will be avoided and lands outside these protected areas will be used for borrow sites. Should WRP lands be impacted the Corps will utilize measures provided in the NRCS Engineering Field Handbook, May 1997, Chapter 13 "Wetland Restoration, Enhancement, or Creation" and the "Erodible Land and Wetland Conservation and Reserve Program" provisions of the Food Security Act of 1985, as amended, to avoid/reduce impacts and to provide for a more natural setting following construction. These minimization measures would be similar to those identified above.

Grassland strips occurring on and adjacent to the levee and the toe would be temporarily impacted during construction grading, sloping, and grubbing as the width of the levee and seepage berm expand. Impacts would be temporary but would cease to provide habitat to existing wildlife during project construction and for approximately two to three years after project completion or until the grassland vegetation is well established. The completed levee slopes would be seeded and mulched with a native warm-season mix following project completion.

Alternative 2: Modifying Existing Levees to an increased level (500-year event plus 1.5 feet of freeboard) of protection would raise the levees by an average of 2.5 feet along its entire length, an increase to the levee toe width, and extension to the seepage berms associated with the levee and the excavation of approximately 1,139 acres riverward of R471-460 and 30 acres riverward of L-455 of borrow material. Although impacts from this alternative exceed the project boundary set at no more than 500 feet from the center line of the existing levee, they were only reported to the boundary limit. Impacts would be greater than Alternative 1. Approximately 7.6 acres of secondary tree growth and 14.4 acres of shrubland would be impacted. A total of 6.2 acres of wetlands are anticipated to be filled as a result of this alternative. Mitigation ratios similar to Alternative 1 are proposed.

Alternative 3: Modifying Existing Levees to a further increased level (500-year event plus 3.0 feet of freeboard) of protection would result in raising the existing levee by approximately 3.5 feet along the entire levee, an increase to the levee toe width, an extension to the seepage berms associated with the levee, and the excavation of approximately 1,139 acres riverward of R471-460 and 30 acres riverward of L-455 of borrow material. Although impacts from this alternative exceed the project boundary set at no more than 500 feet from the center line of the existing levee, they were only

reported to the boundary limit. Impacts from this alternative would be greater than either Alternative 1 or Alternative 2. Alternative 3 would result in the permanent impact of 2.7 acres of secondary tree growth and 8 acres of shrubland landward of the levees and 5.4 acres of secondary growth trees and 8 acres of shrubland riverward of the levees. Wetland impacts are calculated at approximately 7.3 acres from this alternative. Mitigation ratios similar to Alternative 1 are proposed.

Alternative 4: Modifying the existing right bank levee to provide a higher level of flood protection than currently exists using earthen fill (100-year plus 1.5 feet freeboard). This alternative would not allow for re-certification of the levee by FEMA. The right bank levee would be raised by zero to 1.2 feet, with an increase to the levee toe width, an extension to the seepage and stability berms associated with the levee, and borrow excavation within an area approximately 1,139 acres riverward of R471-460, and approximately 30 acres riverward of L-455. A raise to the left bank would not be required. Approximately 1.3 acres of secondary tree growth and approximately 4.0 acres of shrubland landward of the levees and approximately 4.5 acres of secondary growth trees and 6.2 acres of shrublands riverward of the levees would be lost. Wetland impacts are calculated at approximately 3.7 acres of emergent wetland landward of the levees and approximately 0.5 acres of forested wetlands riverward of the levees. Mitigation measures ratios to Alternative 1 are proposed.

“No Action” Alternative: The “No Action” alternative would involve no construction activity and no change in project operations. No borrow material would be obtained so no impacts to forested areas or shrub habitat would occur. The no action alternative would maintain these vegetation resources in the study area as status quo. Additionally, because the borrow areas would not be used, no reshaping of riverward areas to increase functions of existing wetland acreage and fishery habitat would occur.

OTHER PROJECT ALTERNATIVES

Several structural modifications were considered to reduce the frequency of damaging overflows including channel modifications, upstream reservoirs and levee setbacks. These modifications were eliminated from further consideration due to economic infeasibility, ineffectiveness in providing an adequate level of protection for the study area, the costs outweighed the benefits, or the environmental impacts that would result from a particular alternative were far greater than the preferred alternative.

Levee Setbacks would have removed a section of levee unit R471-460 from river mile 449 downstream to river mile 447.5 and reconstructed it landward. The objective of this alternative was to achieve a uniform 3,000 foot floodway within the study area consistent with the original Pick-Sloan Plan for flooding width above Kansas City, Missouri. This alternative was removed from further consideration because total benefits were less than the cost of construction. However, the cooperating agencies of the Missouri River Fish and Wildlife Mitigation Project (MRFWMP), which includes the Corps, are looking at levee setbacks as one component of the project. If levee setbacks were completed in

cooperation with the MRFWMP, with the costs shared by both projects, the cost/benefit ratio might be more favorable and would help meet the objectives of both projects.

The Corps has also considered dredging the river for levee fill. This could have negative implications for the pallid sturgeon and other fish.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

The Missouri side of the project area is primarily urban consisting of industrial, commercial development with major roads and bridges, secondary roads, and housing developments on and above the floodplain. The Kansas side of the levee project contains similar development. Existing wildlife habitat is scarce, and of generally low quality due to habitat fragmentation and loss of habitat from the development that has been ongoing for more than a hundred and fifty years. Without the flood damage reduction project FEMA may de-certify the levee leaving the local communities to bear the economic impact of further flood events. This may result in the decrease of future development in the floodplain and flood prone areas of the Missouri River behind the levees and may even cause the abandonment of existing development. Cropland may also be abandoned, converted to other open space uses or enrolled in the Conservation Reserve Program (CRP) or the Wetland Reserve Program (WRP). All of these actions could actually increase the quantity and quality of wildlife habitat available in the area.

FISH AND WILDLIFE WITH THE PROJECT

The project would presumably keep the levees in compliance with FEMA and under their certification. With payments for flood damages more secure and many people believing that the likelihood of flooding is diminished, more floodplain and floodprone land landward of the levees would likely be developed. This would result in more wildlife habitat being converted and more habitat fragmentation.

The proposed borrow area known as Elwood Bend contains some of the highest quality wildlife habitat in the project area in a large unfragmented tract. Work in this area will displace wildlife that currently use the area due to disturbances from noise, dust, human activity, machinery and destruction of habitat. Depending on construction timing, this displacement could result in serious consequences to wildlife such as loss of reproduction and possible death of individual animals from accidents (crossing roads and unknown hazards in new areas), starvation, competition for other areas, etc. There is little refuge habitat in close proximity to the project area and available habitat is presumably at carrying capacity which further reduces the likelihood of wildlife surviving the displacement and intensifies the competition for the limited habitat available. Although the temporal displacement may be relatively short, the repercussions could be long-term. Impacts to migrating songbirds are of particular concern. Existing wildlife travel corridors linking the borrow areas and other areas of suitable floodplain upstream and downstream of the borrow area should be maintained during project construction. If the

Elwood Bend area is used as a borrow site, it would also be beneficial to allow early successional stages of woody and annual vegetation to grow landward of the levee to facilitate movement through the cropland outside of the growing season.

Large trees suitable for bald eagle habitat are present in the Elwood Bend borrow site and in other areas riverward of the levee. Trees 50 feet or greater in height and/or trees greater than 24 inches diameter at breast height (dbh) should be avoided. Many smaller trees are also present in the site. While these trees are young now, they are closer to a mature and more valuable stage than newly established trees and should be avoided if at all possible.

Habitat gains in quality could be realized if the Corps works closely with the MRFWMP team and constructively takes borrow to enhance habitat to meet the objectives of that program. However, there is an abundance of cropland and bare ground inside and outside the levee that could be used for borrow areas instead of the Elwood Bend area. Soils taken from these areas would be relatively free of the trash and debris (tree roots, vegetation, etc.) common to borrow taken from vegetation riparian areas. Borrow locations should be located in cropland or other bare ground as much as possible. Another option is to take borrow from areas infested with reed canary grass, an invasive species, and replace with permanent water or seasonal inundation such as chutes, deeper water wetlands, backwaters, and floodplain ponds that would eliminate this species.

The loss of levee brome grasses during heightening of the existing levee system will be a short-term loss. Re-seeding the levee to warm season grasses such as switch grass would reduce erosion, better insure the integrity of the levee system during floods and provide higher value wildlife habitat than brome.

Previous modifications within the Missouri River channel and floodplain has had an adverse effect on fish and wildlife habitat. The Missouri River surface area has declined more than 50 percent. The river channel is now deep, has swift currents, and decreased habitat diversity. River backwaters, chutes, sandbars, and oxbow lakes have been lost to floodplain development. Both proposed borrow areas are riverward of the levee. One is primarily cropland and should not cause significant impacts to wildlife. The other is the Elwood Bend area as previously discussed. Work in this area could cause significant short and long-term impacts to wildlife.

Construction activities would cause temporary, short-term impacts to fish and wildlife from noise, dust, and the presence of workers and machinery. Runoff from construction areas, access roads, staging areas and unprotected fills could degrade water quality inside the levee system. Accidental spills of fuels, lubricants, hydraulic fluids, and other petrochemicals would be harmful to aquatic life.

Removal of fill from the cropland area has the potential to cause the loss of farmed wetland. Farmed wetland should be delineated within the borrow site and should be avoided if possible. If an unavoidable loss is incurred, the quantity and quality of the farmed wetland will determine the amount of compensation necessary to offset project

losses. The wetland mitigation plan for all wetland impacts should be developed in coordination with the Corps, Service, EPA, KDWP and MDC. This plan should include site locations, time frames, construction plans, a monitoring plan, progress reports, and standards of success. This plan should be a condition of any permit issued for the project. The proposed Mitigation Plan is lacking many of these components. The completed plan should be implemented regardless of whether impacted wetlands are classified as jurisdictional for purposes of the Clean Water Act.

Mitigation Discussion

The Service has established a mitigation policy used as guidance in determining resource categories and recommending mitigation measures (46 FR: 7644-7663).

We have determined that most of the wildlife habitat that would be affected by the raising of existing levees (levee footprints and easements) is in Resource Category No. 4 (habitats of medium to low value). For this category, loss of habitat value should be minimized.

Forested wetland and riparian woodland are consistent with Resource Category No. 2 that is, habitats are of high value that are relatively scarce or becoming scarce on a national or regional basis. Losses attributed to the project would require in-kind mitigation (replacement of habitat value lost with equal habitat values of the same kind of habitat as those eliminated). The cost of mitigating habitat losses should be included as a project cost.

Whenever possible, we recommend upland trees within the construction right-of-way remain undisturbed. While the trees may be young now, they are closer to a mature and more valuable stage than newly established trees.

Trees at least 50 feet tall and /or 24-inches dbh within 100 feet of the water's edge should be avoided. Removal of these trees may adversely affect the habitat of the bald eagle.

Under the Migratory Bird Treaty Act (MBTA), construction activities in prairies, wetlands, stream and woodland habitats, including the removal of upland borrow, and those that occur on bridges (e.g., which may affect swallow nests on bridge girders) that would otherwise result in the taking of migratory birds, eggs, young, and/or active nests should be avoided. To minimize impacts to birds protected under the MBTA, construction areas should be surveyed for the presence of nesting birds during the general migratory bird nesting season of March through August. Disturbance of nesting areas should be avoided until nesting is completed.

Vegetation clearing and construction related soil disturbances can cause sediment-laden runoff to enter waterways. To minimize impacts associated with erosion, contractors should employ silt curtains, coffer dams, dikes, straw bales or other suitable erosion control measures adjacent to floodplain water bodies or tributaries affected by the project.

Sediment control measures are not necessary adjacent to the Missouri River because it is sediment starved, although downstream water supply intakes are a concern. Construction related petrochemical spills can also negatively impact fish and wildlife resources. Therefore, measures should be implemented prior to construction to minimize the likelihood of petrochemical spills.

Invasive species have been identified as a major factor in the decline of native flora and fauna and their ecosystems and impact aquatic resources. Invasive species of particular concern in Kansas are the zebra mussel (*Dreissena polymorpha*), purple loosestrife (*Lythrum salicaria*), Johnson grass (*Sorghum halepense*), sericea lespedeza (*Lespedeza cuneata*), and reed canary grass (*Phalaris arundinacea*). Executive order 13112 Section 2 (3) directs Federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere and to ensure that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions. Proactive measures to prevent the inadvertent spread of exotic and invasive species would appear to satisfy this directive. Therefore we recommend the implementation of the following Best Management Practice (BMP).

All equipment brought on site will be thoroughly washed to remove dirt, seeds, and plant parts. Any equipment that has been in any body of water within the past 30 days will be thoroughly cleaned with hot water (hotter than 40°C or 104°F) and dried for a minimum of five days before being used at this project site. In addition, before transporting equipment from the project site all visible mud, plants, and fish/animals will be removed, all water will be eliminated, and the equipment will be thoroughly cleaned. Anything that came in contact with the water will be cleaned and dried following the above procedure.

Section 2 of the Fish and Wildlife Coordination Act requires the Service to identify project related opportunities to enhance fish and wildlife. The enhancement recommendations discussed below refer to project related creation of wildlife habitat, over and above that required to mitigate losses attributable to project construction.

Native trees, grasses, and forbs, noted for their high wildlife value, could be established along the landward and stream side base of the existing levee system. This might help offset future losses due to increased encroachment along the river once flood protection is increased once again. Switch grass often takes longer to become fully established; however when established, stands of native vegetation provide excellent soil binding characteristics, valuable wildlife habitat and require fewer maintenance costs. The Service, Missouri Department of Conservation, the Kansas Department of Wildlife and Parks, and the Natural Resource Conservation Service offer assistance programs and could work with the cities of St. Joseph, Elwood and Wathena and the project sponsors to develop vegetation management plans.

RECOMMENDATIONS

1. The take of borrow from areas riverward of the levees should be closely coordinated with the Missouri River Fish and Wildlife Mitigation Project (MRFWMP) team to creatively construct areas that will conform to the objectives of the MRFWMP. This is particularly important in the proposed borrow area south of the City of Elwood, known as Elwood Bend, as it has been identified for inclusion in the MRFWMP. The MRFWMP team should be closely consulted about the take of borrow from the area and about the construction plans for the final design of the borrow areas. The MRFWMP should also be given approval rights for the borrow design plans. If the Corps and the project sponsors are unable to work with the MRFWMP, the Elwood Bend area should be eliminated from the plan.
2. Riparian and wetland habitats should be avoided to the maximum extent practicable when selecting borrow sites for the proposed levee raises and compensatory mitigation should be undertaken for unavoidable impacts. Since channelization, levee construction and floodplain development have already resulted in dramatic loss of riparian and wetland habitats in the Missouri River basin, the Corps should focus on bare or cropland areas for borrow.
3. Reconsideration of the Levee Setback alternative. The Levee Setback alternative was eliminated from further consideration because total benefits from this alternative were far less than the cost of construction. However, the MRFWMP team is considering setting back levees to improve habitat. Coordination with the MRFWMP may make it feasible to set back some portions of levees as part of this project thereby reducing impacts from those portions of the levees that would still need to be raised.
4. Levees and levee easements should be seeded with native, warm-season grasses such as switch grass.
5. Removal of mature cottonwoods, and other native vegetation should be avoided where possible, and if they are removed, replace woody vegetation by establishing 2 acres of native vegetation for every acre impacted.
6. The Corps should create wetland mitigation habitat to compensate for the loss of wetland acreage from construction of the projects at a minimum of 1.5:1 ratio for emergent wetland and at a 2:1 ratio for forested wetland. If farmed wetland is directly impacted by borrow activities it should be mitigated at a 1.0 to 1.0 ratio.
7. Encourage wetland development and hydrological reconnection to the river at existing and proposed borrow areas.
8. Best Management Practices to prevent the transport of invasive species to or from the construction sites should be included as an integral component of the project.

The following recommendations describe opportunities to provide fish and wildlife enhancement through the project.

9. Establish native vegetation riverward of levee segments where riparian woodlands are sparse or nonexistent or where the invasive species, reed canary grass (*Phalaris arundinacea*), has become established. If possible, borrow from reed canary grass areas and replace with permanent water or seasonal inundation such as chutes, deeper water wetlands, backwaters, and floodplain ponds that would eliminate reed canary grass.

10. All disturbed areas should be immediately planted with native vegetation following construction. Due to the presence of reed canary grass, an exotic and aggressively invasive species, these areas would likely become a monoculture of reed canary grass if allowed to revegetate naturally.

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