3.9 WETLANDS, FLOODPLAINS, AND TERRESTRIAL RESOURCES

3.9.1 Introduction

The Proposed Action and alternatives have the potential to indirectly affect wildlife and wetland habitats and functions. Ongoing commercial dredging in the Missouri River has contributed to degradation of the river bed, especially in the Kansas City segment (Stark et al. 2000, USACE 2008 and 2009). River bed degradation affects the river stage level. River stage levels affect the frequency, depth, and duration of surface water interaction with adjacent wetlands in the floodplain, as well as the level of the alluvial aquifer that supports groundwater wetlands. Consequently, commercial dredging has the potential to indirectly affect wetland habitats adjacent to the Missouri River and its floodplain.

This section presents an overview of wetland and terrestrial wildlife resources that could be directly or indirectly affected by commercial dredging under the Proposed Action and the alternatives. A description of wetland types in the Project area and their characteristic vegetation (Section 3.9.4) is provided, along with a discussion of the hydrologic connections between the Missouri River and adjacent wetlands (Section 3.9.5), and a general discussion of functions and values of Project area wetlands (Section 3.9.6). Terrestrial wildlife resources, including special-status species and managed wildlife habitat, are presented in Sections 3.9.7 and 3.9.8. Information used in the preparation of this section was collected from existing sources, including published literature and technical reports.

The LOMR ecosystem from RM 0 to RM 489 includes both the channel of the LOMR and its floodplain, which is the area adjacent to the LOMR that is subject to flooding. The floodplain generally includes all of the land area between the bluffs bordering the river; and the floodplain typically ranges from 1 to 17 miles in width, with an average width of 5 miles (Weaver 1960; Galat, Robinson, and Hesse 1994). Between RM 0 and RM 489, the floodplain is generally 2 to 3 miles wide (Burns and McDonnell 1995). Although much of the floodplain has been converted to agriculture and other uses, substantial amounts of wetlands and riparian forest are still present.

According to the federal definition, wetlands are “those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR 328.3[b]; 40 CFR 2303.[t]). Wetlands normally support, and are identified by, hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987). Wetlands are distributed along the LOMR. They usually occur as small patches along the river banks; on islands

in the river channel; in association with streams, ponds, oxbow lakes and mudflats; or in managed wetland areas (Burns and McDonnell 1995, Kelly 2001).

3.9.2 Regulatory Setting

3.9.2.1 Federal

Clean Water Act Section 404

Section 404 of the CWA requires authorization from the Secretary of the Army, acting through the USACE, for the discharge of dredged or fill material into all waters of the United States, including wetlands. Discharges of fill material generally include, without limitation, placement of fill that is necessary for the construction of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and subaqueous utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material. A USACE permit is required whether the work is permanent or temporary. Examples of temporary discharges include dewatering of dredged material prior to final disposal and temporary fills for access roadways, cofferdams, and storage and work areas.

Executive Order 11990: Protection of Wetlands

EO 11990 (May 24, 1977) directs all federal agencies to refrain from assisting in or giving financial support to projects that encroach on public or privately owned wetlands. It further requires that federal agencies must support a policy to minimize the destruction, loss, or degradation of wetlands. Such a project (that encroaches on wetlands) may not be undertaken unless the agency has determined that (1) there are no practical alternatives to such construction; (2) the proposed action includes all practical measures to minimize harm to wetlands that would be affected by the project; and (3) the impact will be minor.

U.S. Department of Agricultural Programs

Under the Food, Conservation, and Energy Act of 2008 (referred to as the 2008 Farm Bill), the USDA continued the Wetland Reserve Program (WRP). The WRP is a voluntary landowner program to protect, restore, and enhance wetlands on their property (NRCS 2010a). This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection on their property. Landowners obtain technical and financial support for wetland restoration efforts from the USDA Natural Resources Conservation Service (NRCS). The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. Other USDA programs, among many, that target habitat creation, restoration, enhancement, and conservation in agricultural lands include the Environmental Quality Incentives Program, the Conservation Reserve Program (CRP), and the Conservation Stewardship Program (NRCS 2010b).

Water Resources Development Act of 1986

The Water Resources Development Act of 1986 authorized implementation of the Missouri River Mitigation Project. The act provided for acquisition and development of 29,900 acres of land, and development of fish and wildlife habitat on an additional 18,200 acres of existing public land in the states of Iowa, Nebraska, Kansas, and Missouri.

Water Resources Development Act of 1999

The Water Resources Development Act of 1999 authorized modifying the Missouri River Mitigation Project by increasing the amount of acquisition acreage to 118,650 acres.

Water Resources Development Act of 2007

The Water Resources Development Act of 2007 authorized a study of the Missouri River to determine actions required to mitigate the loss of aquatic and terrestrial habitat, recover federally listed species, and restore the ecosystem.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act[1] (16 USC 668-668c), enacted in 1940 and amended several times, prohibits "taking" bald eagles (*Haliaeetus leucocephalus),* including their parts, nests, or eggs, without a permit issued by the Secretary of the Interior.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended[2] is regulated by the USFWS. The MBTA was proposed to put an end to the commercial trade in birds and their feathers that, by the early years of the 20th century, had wreaked havoc on the populations of many native bird species. The MBTA makes it illegal to pursue, hunt, take, capture, or kill or attempt to take, capture, or kill any migratory bird or “any part, nest, or egg of any such bird by any means or in any manner,” except as allowed by permit. While the ESA defines the term “take” to include “to harm and harass,” including habitat modification, “take” under the MBTA is not as broadly defined and thus includes only direct killing of protected birds.

3.9.2.2 State

Clean Water Act Section 401

The USACE cannot issue or verify any permit under Section 404 of the CWA until a water quality certification, or waiver of certification, has been issued pursuant to CWA Section 401. Section 401 gives the USEPA review authority over issuance of Section 404 permits, although Section 401 allows the states to assume the authority for water quality review. Under state laws in Missouri, Kansas, and Nebraska, state agencies review whether an activity might result in a discharge that violates state or federal water quality standards, and the state provides a Water Quality Certification if these standards would be met.

[1] Bald Eagle Protection Act of 1940 (16 USC. 668–668d, 54 Stat. 250) as amended – Approved June 8, 1940, and amended by Public Law (PL) 86-70 (73 Stat. 143) June 25, 1959; PL 87-884 (76 Stat. 1346) October 24, 1962; PL 92-535 (86 Stat. 1064) October 23, 1972; and PL 95-616 (92 Stat. 3114) November 8, 1978.

[2] Migratory Bird Treaty Act of 1918 (16 USC 703–712; Ch. 128; July 13, 1918; 40 Stat. 755) as amended by: Chapter 634; June 20, 1936; 49 Stat. 1556; PL 86-732; September 8, 1960; 74 Stat. 866; PL 90-578; October 17, 1968; 82 Stat. 1118; PL 91-135; December 5, 1969; 83 Stat. 282; PL 93-300; June 1, 1974; 88 Stat. 190; PL 95-616; November 8, 1978; 92 Stat. 3111; PL 99-645; November 10, 1986; 100 Stat. 3590 and PL 105-312; October 30, 1998; 112 Stat. 2956.

Missouri Clean Water Law of 1973

In Missouri, the Clean Water Law of 1973 directs the MDNR to issue Section 401 Water Quality Certification.

Kansas Surface Water Quality Standards

The KDEH prepares Section 401 Water Quality Certification for projects in Kansas.

Nebraska Surface Water Quality Standards

The NDEQ oversees Section 401 Water Quality Certification for projects in Nebraska.

Missouri State Wildlife Conservation

The Missouri Department of Conservation is responsible for managing and protecting wildlife resources in the state of Missouri pursuant to the Code of State Regulations (CSR), Title 3 – Department of Conservation. Game and nongame species are identified and protected under Chapter 4 – Wildlife Code. Rule 3 CSR 10-4.110 prohibits the pursuit, taking, possession, or any use of wildlife except as provided in the Code. Rule 3 CSR 10-4.111 extends "special protection to endangered species and lists those species considered to be threatened with extinction [in the State of Missouri]."

Kansas State Wildlife Conservation

The KDWP is responsible for managing and protecting wildlife resources in the state of Kansas pursuant to the Kansas Nongame and Endangered Species Conservation Act of 1975. This act is defined under the Kansas Statutes, specifically Chapter 32 Wildlife, Parks and Recreation; Article 9 Licenses, Permits, Stamps and Other Issues; Statutes 32-957 through 963; 32-1009 through 1012; and 32-1033; and Kansas Statute Amendments 32960a and 32-960b. These statutes and regulations also regulate special permits for development projects affecting critical habitats of threatened or endangered species.

Statute 32-959, Nongame and Endangered Species Conservation Act, Nongame Species, provides the Secretary of the KDWP with the authority to identify nongame species in need of protection and "establishes limitations relating to taking, possessing, transporting, exporting…nongame species." Statute 32-960, Nongame and Endangered Species Conservation Act, Endangered Species, provides

the Secretary of the KDWP with the authority to identify species that should be considered threatened or endangered by the State of Kansas and provides guidelines on the process of listing such species.

Nebraska State Wildlife Conservation

The Nebraska Game and Parks Commission is responsible for managing and protecting wildlife resources in the state of Nebraska pursuant to the Nongame and Endangered Species Conservation Act. This act is defined under the Nebraska Revised Statutes of 1943, specifically Chapter 37, Game and Park Article 8: Nongame and Endangered Species Conservation Act; Revised Statutes 37-801 through 811. These statutes and regulations also regulate special permits for development projects affecting critical habitats of threatened or endangered species.

Statute 37-806 states that species listed as endangered or threatened under the federal ESA also shall be considered to be endangered or threatened under the Nongame and Endangered Species Conservation Act. The state has the authority to list other species not covered under the ESA. This statute also regulates take of state-listed species.

3.9.3 Floodplains

Floodplain management is regulated by the FEMA and is implemented by local agencies. Federal floodplain maps, called Digital Flood Insurance Rate Maps (DFIRMs) delineate the floodway and the 100-year and 500-year recurrence interval flood levels for floodplains across the country. These maps are used by FEMA to define areas eligible for participation in the NFIP. By participation in the NFIP, local entities are required to implement certain floodplain management regulations, making local floodplain property owners eligible to purchase federal flood insurance. Much of the Project area falls within areas mapped as floodway and 100-year or 500-year floodplain on FEMA floodplain maps. Specific floodplain management regulations in effect at any given location are determined by the local entity responsible for floodplain management.

3.9.4 Wetland Systems and Classes

By indirectly altering wetland hydrology, commercial dredging activity in the LOMR could alter the amount and types of wetlands along and adjacent to the river. If degradation of the river bed resulted in reduced frequency, depth, or duration of flooding, or lowered groundwater levels, wetlands could be

converted to non-wetlands or the vegetation species composition could be altered, changing the type of wetlands present.

Various estimates of the amount of wetland habitat along the LOMR have been made. Table 3.9-1 lists wetland acreages estimated from three different sources. Wetland studies for the Missouri River Master Water Control Manual Review and Update (USACE 1994) estimated that 15,581 acres of wetlands with surface connections to the river were present in the LOMR floodplain between Rulo and St. Louis, and 68,520 acres of rivers and lakes were present in the LOMR floodplain. The environmental resource inventory compiled for the Missouri River Fish and Wildlife Mitigation Project (Burns and McDonnell 1995) used two data sources to estimate the amount of wetlands in the Missouri River floodplain. Based on Landstat imagery, an estimated 77,485 acres of wetlands and 69,820 acres of open-water habitat were present in the floodplain between Rulo, Nebraska and the LOMR confluence with the Mississippi River. Based on the National Wetlands Inventory (NWI) maps, an estimated 96,477 acres of wetlands and 6,170 acres of lacustrine habitat were present in the same area. The large discrepancies between these wetland acreage estimates are caused by the studies using different methods and assumptions. For the purpose of the analysis in this EIS (in Section 4.7), the geospatial data from the USFWS NWI website were used to determine the extent of wetlands in the Project area.

Wetlands in the floodplain are dynamic and change over time; flooding creates new wetlands through scouring and deposits sediment in other wetlands, and some wetlands would silt in without flooding (USACE 1994, Chapman et al. 2003). In addition, a recent study found that many wetlands in the LOMR floodplain were misclassified in the NWI (Kriz et al. 2007). The wetland acreages in Table 3.9-1 were determined prior to 1993 and later flood events; therefore, the effects of these events are not accounted for in the estimates.

The wetlands and deepwater habitats of the United States can be classified according to general similarities in hydrology, geomorphology, chemistry, and biology (Cowardin et al. 1979). Along the LOMR, three habitat systems are present: riverine, palustrine, and lacustrine. Riverine habitats are present in the Project area along rivers, streams, canals, and ditches. Palustrine habitats consist of all wetlands dominated by trees, shrubs, and emergent herbaceous plants. Lacustrine habitats are situated in topographic depressions that are more than 20 acres in size (lakes and ponds). Similar habitats less than 20 acres are also included in the lacustrine system if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 2 meters (m) (6.6 feet) at low water. Each habitat system encompasses several

wetland classes, which are based on the dominant life forms of the vegetation or on the form and composition of the substrate. Wetland classes in the Project area include emergent, scrub-shrub, and forested wetlands; other non-wetland classes include unconsolidated bottom and unconsolidated shore.

Table 3.9-1 Wetland Types and Estimated Quantities in the Project Area[a]

	Wetland Class			
	Forested (acres)	Scrub-Shrub (acres)	Emergent (acres)	Total (acres)
Burns and McDonnell (1995) – based on land use analysis	39,656	9,254	28,575	77,485
Burns and McDonnell (1995) – based on NWI maps	49,375	11,523	35,579	96,477
USACE (1994)[a]	7,974	1,860	5,747	15,581

Notes:

NWI = National Wetlands Inventory.

USACE = U.S. Army Corps of Engineers.

[a] Only includes wetlands with a direct surface connection with the Missouri River.

Sources: Burns and McDonnell 1995, USACE 1994.

Floodplain wetlands along the LOMR also can be characterized according to the flooding history (pre-flood vs. post-flood, referring to the 1993 flood event) and proximity to the river (frequently flooded vs. more influenced by runoff and groundwater) (Galat et al. 1998; Bodie, Semlitsch, and Renken 2000; Kelly 2001). Remnant wetlands are former oxbows or sloughs that are no longer connected with the river but are permanently or semi-permanently flooded. Scours are deep basins excavated by recent flood events and include connected scours (with a direct surface connection to river) and isolated scours (basins formed by floods with no surface connection to the river). Temporary wetlands have seasonal or intermittent flooding, are remnants or are more recently formed, and may be farmed or unfarmed. Managed wetlands are irrigated and managed for the benefit of waterfowl (for hunting).

In addition, the LOMR floodplain wetlands include cropland areas enrolled to USDA programs, such as the Wetland Restoration Program and CRP, where previously manipulated wetland sites, and wetlands farmed under natural conditions, have been restored, enhanced or created. Some cropland soils quickly assume hydric characteristics upon cessation of agricultural disturbances. These previously farmed sites become colonized with forest vegetation, while others remain as herbaceous wetlands. Many of these previously farmed wetland sites are not subject to irrigation, relying on surface runoff and sub-surface hydrology. The enrollment of these sites can last from 10–15 years (in the CRP) to a permanent easement (in the Wetland Restoration Program).

Most of the wetlands remaining in the LOMR floodplain are forested wetlands. The dominant floodplain trees are black willow (*Salix nigra*), peach-leaved willow (*Salix amygdaloides*), cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), American elm (*Ulmus americana*), American sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), and red mulberry (*Morus rubra*) (Weaver 1960, Munger et al. 1972 and 1974, USACE 1994, Galat et al. 1998); common understory shrubs and woody vines include dogwood (*Cornus stolonifera*), Virginia creeper (*Parthenocissus quinquefolia*) and grape (*Vitis vulpina*).

Emergent wetlands, dominated by herbaceous perennials, are also common in the LOMR floodplain. The species composition of the plant communities is dependent on water depth and the amount of sedimentation (Sluis and Tandarich 2004). In temporary wetlands, reed canarygrass (*Phalaris arundinacea*) is often the dominant species, but sedges (*Carex* spp.), nutsedges (*Cyperus* spp.), rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), rice cutgrass (*Leersia oryzoides*), and smartweeds (*Polygonum* spp.) are also common (Weaver 1960, USACE 1994, Chapman et al. 2003). In permanently or semi-permanently flooded wetlands, the characteristic plants include bulrushes (*Scirpus* spp.), cattails (*Typha latifolia*), common reed (*Phragmites australis*), bur reeds (*Sparganium* spp.), and arrowhead (*Sagittaria* spp.) (Weaver 1960, USACE 1994, Galat et al. 1998, Blevins 2004, Sluis and Tandarich 2004). Recently formed or disturbed wetlands are typically vegetated by colonizing species such as prairie cordgrass (*Spartina pectinata*), reed canarygrass, pigweed (*Amaranthus rudis*), eclipta (*Eclipta alba*), millet (*Echinochloa* spp.), foxtail (*Setaria* spp.), and nutsedges (Weaver 1960, Galat et al. 1998).

Wetlands dominated by shrubs are uncommon along the LOMR floodplain. These are generally dominated by small black willow and cottonwood trees, with some sandbar willow (*Salix interior*), and buttonbush *(Cephalanthus occidentalis)* (USACE 1994).

3.9.5 Wetlands and Missouri River Hydrology and Geomorphology

Historically, most of the LOMR floodplain was inundated on a regular basis, which resulted in extensive and diverse wetlands (Galat et al. 1998). A direct surface water connection between the LOMR river and floodplain wetlands no longer is common outside of the levees and occurs only during large flood events (Kelly 2001, Blevins 2004). The hydrology of many wetlands along the LOMR is dependent on the groundwater level, although shallow wetlands may be more dependent on rainfall and surface runoff (Blevins 2004, Kelly 2006). Because groundwater levels are directly correlated with river stage, the river stage affects wetlands that are supported by groundwater (Kelly 2001, Chapman et al. 2003,

Kelly 2006). In wetlands deep enough to intersect the groundwater table, the movement of ground water into wetlands in response to rising river stage has the greatest effect on wetland hydrology (Kelly 2006). Kelly (2000) used hydraulic modeling to predict the effect of river stage on groundwater levels. The primary predicted response would be a result of the duration of the flood pulse; the height of the flood pulse would have less effect. Deeper wetlands that receive groundwater discharge, such as lakes, ponds, and scour wetlands, are deep enough to be affected by changes in alluvial aquifer levels as a result of river stage level; shallow wetlands or wetlands farther from the river would be less likely to be affected (Chapman et al. 2003, Blevins 2004). Section 3.6.2.1 provides additional detail about the connection between river stage and groundwater levels.

USACE (1994) modeled the effects of changing river stage levels on surface water–supported wetlands and found that lower river stages resulted in both a decrease in wetland acreage and a change in wetland types. Although no similar studies have been done on the effects of changing groundwater levels on wetland amounts or types, a long-term decrease in river stage and the surface water elevation resulting from river bed degradation would be expected to cause a similar adverse effect on groundwater-supported wetlands.

3.9.6 Wetland Functions and Values

Wetland functions are the processes by which the normal physical and biological properties of wetlands are supported and maintained (Brinson 1993, Smith et al. 1995). Wetland values are benefits that wetland functions provide to human society, such as flood protection, maintenance of water quality, and recreation (Mitsch and Gosselink 2007). Not all wetlands perform the same functions or level of function; rather, these vary with the wetland category, size, proximity to other wetlands, type and degree of previous and current disturbances, and adjacent land uses. Indirect effects of commercial dredging activity in the LOMR on wetlands adjacent to the river could affect wetland functions.

The specific ecological services historically provided by wetland functions in the Missouri River floodplain are not well documented because few ecological studies were carried out until the latter part of the 20th century, as higher priorities were placed on economic concerns (National Research Council Committee on Missouri River Ecosystem Science 2002, USACE 2004). In general, however, wetlands in the Project area perform functions in three basic categories: hydrology, biogeochemistry, and flora and fauna habitat support.

Wetland hydrology comprises "all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season" (Environmental Laboratory 1987). Wetland hydrology provides the basis for all wetland functions. Wetlands in the Project area carry out three general hydrologic functions: groundwater recharge, groundwater discharge, and flood flow alteration.

Groundwater recharge is the process in which surface flows are stored for a period sufficient for water to percolate into the soil or into the groundwater table. In the Project area, the potential for groundwater recharge is generally low. The terrain is relatively flat, with little runoff because of the sandy soils and presence of ditches and levees (Blevins 2004). Groundwater discharge occurs where wetland basins intercept the groundwater table surface. As noted above, the hydrology of many wetlands along the LOMR is dependent on the groundwater level, and discharge into the wetlands typically exceeds recharge from the wetlands to the groundwater table (Blevins 2004).

Wetlands contribute to flood flow alteration, as short-term water storage decreases the amount and velocity of runoff, reducing peak floods and distributing storm flows over longer periods of time. The dissipation of energy in moving water lessens its erosive impact and contributes to reducing downstream sedimentation. Ditches and levees in the floodplain minimize the flood flow alteration function of the wetlands; however, the wetlands have tremendous potential for flood flow alteration should flood flows top or breach the levees.

Biogeochemistry functions are the characteristics that enable wetland ecosystems to transport and transform chemicals. Wetlands remove dissolved substances from water through various mechanisms such as absorption, adsorption, solubilization, oxidation, biological transformation, and precipitation. Wetlands, by definition, are vegetated; and it is the vegetation, along with microbial organisms that exist on the surface of the plants and in the substrate, that are responsible for a wide range of physical and biochemical processes. Wetlands in the Project area potentially carry out three general biogeochemistry functions: sediment/toxicant retention, nutrient removal/transformation, and production export.

Vegetation slows the velocity of water, reducing its ability to hold particles in suspension. Water in watersheds basins with more wetlands tends to have lower specific conductance (a measure of the total concentration of dissolved substances) and lower concentrations of chloride, lead, inorganic nitrogen, suspended solids, and total and dissolved phosphorus than does water in watershed basins

with fewer wetlands. Certain wetland plants also help remove heavy metals. Wetlands, therefore, improve water quality by removing both dissolved substances and suspended particulates.

Growing vegetation removes dissolved nutrients and compounds other substances from the water and soil, often metabolizing them and sometimes sequestering them within plant tissues. Bacteria growing in the soil or in plant roots also break down or alter these substances so that they are removed from the water, either by plants or as a gas. Missouri River wetlands have a high potential for removing nutrients, including both nitrogen and phosphorus, with high levels of denitrification and nitrogen-uptake (Blevins 2004).

Wetlands are productive environments that provide diversity in the landscape. The flux of nutrients and energy in wetlands is relatively high because of the high growth rate and rapid turnover of the wetland vegetation. The nutrients and carbon fixed by the plants are cycled through the wetlands when the plants are eaten by herbivores or when the plants die and decompose. Nutrients and compounds and other organic matter in wetlands are broken down into organic compounds by bacterial action, which provides food for invertebrates. These invertebrates are the foundation of the food web that supports vast and varied numbers of wildlife species, from shorebirds to amphibians. The flow of water through wetlands provides for the efficient movement and distribution of nutrients and energy throughout the entire ecosystem. Wetlands that are affected by flooding have higher primary and secondary production (transference of energy) (Chapman et al. 2003).

Wetlands provide habitat where many plants and animals fulfill one or more life cycle stages. Wetlands in the Project area carry out two general flora and fauna habitat support functions: maintaining wildlife habitat diversity and abundance, and maintaining aquatic habitat diversity and abundance.

Missouri River wetlands generally have moderate to high potential for wildlife habitat function. Wetlands in the Project area provide habitat for migratory birds and other wildlife and are important habitat for turtles (Funk and Robinson 1974; Bodie, Semlitsch, and Renken 2000). Wetlands also provide support for a diverse array of trophic levels (feeding levels) in both the wetlands and the surrounding upland environments. Many species use wetlands for feeding and uplands for nesting. Forested wetlands and scrub-shrub wetlands have high structural diversity with open-water areas that provide both foraging and breeding habitat. Emergent wetlands have low structural diversity, but emergent wetlands with high plant diversity support birds and amphibians use.

Natural disturbances have influenced wetlands in many ways. Some plant species evolved under specific hydrologic conditions and have a narrow range of tolerance to disturbance. Other plant

species have evolved to tolerate a wide range of hydrologic conditions. The effects of fire (anthropogenic and natural) can influence the vegetation community structure and composition. Historically, much of the wetland micro-topography was influence by flooding in the LOMR, with specific wetlands subject to erosive forces, while other wetlands were recipients of sediment. Disturbance due to flood scouring from the LOMR is much reduced in modern times.

Habitat connectivity, fragmentation, and patchiness all affect the capability of wildlife to move within a wetland, and between the wetland and adjacent upland or aquatic habitats. Barriers between the wetlands and the adjacent uplands and aquatic habitats prevent some species from moving into or out of the wetlands, making the species unable to reproduce or compete their life cycle. Animal species such as large mammals, birds, and flying insects are less affected by these barriers. Changing land uses in or adjacent to wetlands, in addition to altering wetland function as habitat; limit the ability of wildlife to move throughout wetland and aquatic and upland habitats.

Missouri River wetlands historically were extremely important habitat for fish and benthic organisms (Weeks, Vana-Miller, and Pranger 2005). Additional information on aquatic habitat diversity and abundance can be found in Section 3.8.

Anthropogenic disturbance can lower the wildlife habitat function of wetlands and the adjacent upland and aquatic habitats. The more intensely land use disturbs the landscape, the more the characteristic vegetation can change. With disturbance from grazing, plowing, or grading, the characteristic vegetation also can be susceptible to invasive species (both native and exotic). When wetlands are farmed or overgrazed so that the existing wetland vegetation is removed from the soil surface, wildlife usage changes. Habitat for some species is diminished because the vegetation is insufficient to provide food, shelter, or nesting opportunities; while habitat value for other wildlife species may increase due to foraging attributes.

Wetlands along the LOMR have values in addition to the ecological services they provide. Perhaps the most widely recognized value of Missouri River wetlands is for recreation, as discussed in Section 3.11. Because many Missouri River wetlands have been filled or drained, the remaining natural wetlands are important models for restoration efforts (Blevins 2004), and these areas serve as sources of seed stock for population dispersal. In addition to providing general habitat functions, wetlands may provide unique habitat functions for federally listed species (see Section 3.10).

3.9.7 Terrestrial Wildlife Resources in the Project Area

Below is a discussion of the common terrestrial wildlife species and their habitats in the LOMR floodplain. Because dredging-related impacts primarily result in indirect impacts to wetland habitat in the LOMR floodplain, this section focuses on special wetland habitats and species in the floodplain.

3.9.7.1 Special-Status Wildlife Species and Management Areas

Special Wildlife Management Areas

Numerous wildlife habitat areas are managed by federal, state, and local agencies in the LOMR floodplain. Multiple non-governmental organizations (such as the National Audubon Society) also maintain wetland wildlife habitats along the LOMR floodplain.

Some floodplains and lands adjacent to the Missouri River are protected as part of the Big Muddy National Fish and Wildlife Refuge, managed by the USFWS. The refuge was established in September 1994 to conserve and protect fish and wildlife resources, and is part of the National Wildlife Refuge System—a network of approximately 550 refuges across the United States (USFWS 2009). To date, the refuge encompasses over 11,000 acres and consists of eight units, as shown in Figure 3.9-1.

The units range from 343 to 2,550 acres (Table 3.9-2) and consist of a variety of habitats, including chutes, backwaters, scours/ponds, sandbars, bottomland forests, wet prairie/grasslands, and seasonal and permanent wetlands. These units provide excellent refuges for wildlife along the Missouri River, such as scour holes as pools for aquatic turtles and sandbars as important resting and feeding areas for migrating shorebirds.

The USFWS has approval through Congress to allow the refuge to acquire up to 60,000 acres of floodplains and adjacent lands on the LOMR between Kansas City and St. Louis, Missouri, and the USFWS continues to acquire land from willing sellers with Land and Water Conservation Funds (USFWS 2009).

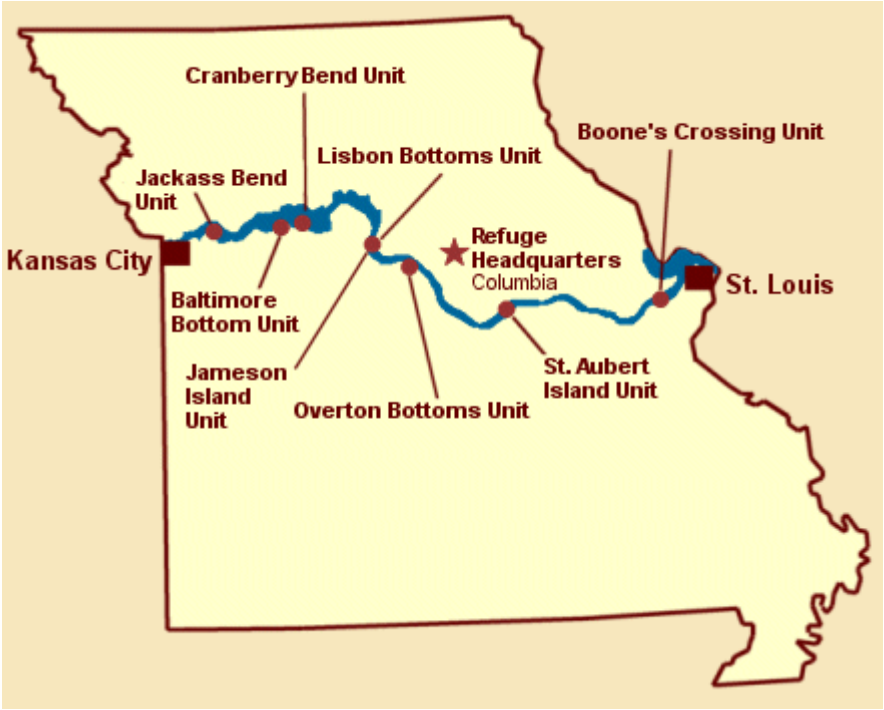

Figure 3.9-1 Big Muddy National Fish and Wildlife Refuge Units

Table 3.9-2 Big Muddy National Fish and Wildlife Refuge Units

Unit Name	Location (County)	Number of Acres
Boone's Crossing Unit	St. Louis County	572
St. Aubert Island Unit	Osage County	1,126
Overton Bottoms Unit	Cooper County	2,550
Jameson Island Unit	Saline County	1,871
Lisbon Bottom Unit	Saline County	2,014
Cranberry Bend Unit	Saline and Lafayette Counties	507
Baltimore Bottom Unit	Lafayette County	1,626
Jackass Bend Unit	Jackson and Ray Counties	343

Multiple additional lands within the LOMR floodplain have been designated or protected by local, state, and federal agencies. Approximately 27,000 acres of land have been purchased from willing sellers, and easements on another 13,200 acres of existing public lands have been obtained in which USACE mitigation efforts are underway or completed. Mitigation efforts include measures such as river structure modification, side channel/backwater and floodplain reconnection; to date, over 50 different

mitigation sites are in various stages of acquisition and development (USACE 2009a, 2010a). In the Water Resources Development Act of 1999 (Section 334[b]), the Missouri River Fish and Wildlife Mitigation Project was reauthorized to include an additional 118,650 acres of land to be purchased from willing sellers on which to develop, restore, or enhance fish and wildlife mitigation sites. Further, the Missouri Department of Conservation has established several Conservation Opportunity Areas, which are priority places identified for wildlife conservation, along the LOMR floodplain (MDC 2010). Some identified areas along the LOMR floodplain include the Loess Hills, Iatan/Weston Missouri River Corridor, Bonne Femme Karst, Missouri River Hills, and Missouri/Mississippi River Confluence Conservation Opportunity Areas. Further, there are multiple state and local parks that are located within the LOMR floodplain.

Special-Status Species

Based on the review of habitat requirements of special-status species, most terrestrial special-status species would not be directly affected by in-channel dredging. Special-status wildlife species present in the habitats located along the LOMR could be impacted by dredging in the same manner as other species that use the same wetland habitats. As such, special-status wildlife species potentially in the LOMR floodplain have been included with the common wildlife species listed in Table 3.9-3 (in Section 3.9.7.2). Bald eagles and migratory birds may be present in riparian and forested wetland habitats along the LOMR floodplain. Below is a description of the use of floodplain wetland habitats by special-status species in the Project area.

Bald Eagle

As of August 9, 2007, the bald eagle is no longer protected under the federal ESA, and Section 7 consultation with the USFWS is no longer necessary. However, the bald eagle remains protected under the Bald and Golden Eagle Protection Act.

Bald eagles are large, opportunistic birds of prey that feed largely on fish and waterfowl (Peterson 1986). Eagles tend to use rivers, lakes, and reservoirs where large trees provide perch sites for roosting and for locating prey. This species prefers trees greater than 11 inches (27.9 centimeters) diameter at breast height (DBH) that are located within 100–600 feet (30.5–182.9 m) of water bodies. Nesting activity is most often initiated between January 1 and March 1, and the most critical time for incubation and rearing of young is between March 1 and May 15. During winter, they gather near large open water areas, usually occupying river habitats between November 15 and March 1. At night, wintering bald eagles may congregate at communal roosts and may travel as much as 12 miles

(19.3 kilometers [km]) from feeding areas to a roost site. Bald eagles are common migrants and winter residents throughout Missouri, Kansas, and Nebraska and since the 1990's the number of bald eagle nests in these states have increased. Bald eagle nests have been observed throughout Missouri, including along the LOMR in some locations (MDC 2007). The bald eagle and their nests has the potential to occur in wooded corridors along the LOMR within the Project area.

Migratory Birds

Several species of migratory birds and their habitats can be found along the LOMR floodplain. Typical bird species are identified in Table 3.9-3. Throughout the United States, 836 bird species are protected under the MBTA (USFWS 2010), several of these species are located along the LOMR for at least part of the year. Migratory birds have use a variety of habitats, but several important bird areas (IBAs) have been identified within and near the LOMR floodplain (National Audubon Society 2010). Most identified IBAs consist of wetlands, prairies, marshlands, and forested areas that are managed by various federal, state, and private partners.

3.9.7.2 Common LOMR Wildlife Species

Species assemblages are a group of closely-related species that co-occur within a particular habitat. Table 3.9-3 includes a list of common terrestrial wildlife species found along the LOMR floodplain. Note that this table is not intended to be an exhaustive list of wildlife species, but its purpose is to highlight the most common species potentially present in the LOMR floodplain.

3.9.8 Upland Terrestrial Land Cover Types at Sand Plant Locations

Potential direct effects of the Project to terrestrial habitats would occur only from construction of sand plants. Land cover on the sand plant parcels was identified using University of Missouri 2005 land cover GIS data. Land cover types included cropland, grassland, woody-dominated wetlands, herbaceous-dominated wetlands, low-density urban, and impervious surface (MSDIS 2010). Wetland vegetation and wildlife were described in Sections 3.9.4 and 3.9.7. Because low-density urban and impervious surface cover types would not likely contain significant wildlife habitat, they are not discussed further in this section. Croplands and grasslands, while subject to different disturbance intervals, serve similar habitat functions. Below is a discussion of common wildlife species that typically would be present in these habitat types.

3.9.8.1 Croplands and Grasslands

Agricultural land is the most common land cover type in the LOMR floodplain. Cropland occupies 64.8 percent of the land area in the LOMR floodplain and ranges from 52.7 percent in the St. Joseph segment to 78.4 percent in the Waverly segment (MSDIS 2010). Agricultural lands may be seasonally or occasionally inundated during periods of high water stage in the LOMR. Crops grown in agricultural lands along the LOMR typically consist of row, close-grown, and forage crops such as small grains, corn, and alfalfa. Grassland occupies 6.3 percent of the land area in the LOMR floodplain and ranges from 3.9 percent in the Waverly segment to 12.3 percent in the St. Joseph segment (MSDIS 2010). Grasslands are typically dominated by native warm season or non-native cool season grasses (MSDIS 2010).

Open lands generally provide poor to moderate quality wildlife habitat relative to the higher quality mixed forest habitat, but herbaceous vegetation within open land areas does provide habitat for small and large mammals, birds, and other species. Small mammals are commonly hunted by raptors, and many of the bird species that use mixed forest habitats also occur within open lands.

Table 3.9-3 Common Wildlife Species found in the Lower Missouri River Floodplain

Wildlife Assemblage	Common Species	Common Habitat Type
Waterfowl, wading, water, and shore birds	Great Blue Heron (*Ardea herodias*) Green Heron (*Butorides virescens*) Canada Goose (*Branta canadensis)* Wood Duck (*Aix sponsa*) Mallard (*Anas platyrhynchos*) Northern Pintail (*Anas acuta*) American Wigeon (*Anas Americana*)	Wetlands
	Killdeer (*Charadrius vociferous*)	Grasslands
Songbirds	House Sparrow (*Passer domesticus*) European Starling (*Sturnus vulgaris*) House Wren (*Troglodytes aedon*) Barn Swallow (*Hirundo rustica*) Blue Jay (Cyanocitta cristata) Eastern Bluebird (*Sialia sialis*) American Robin (*Turdus migratorius*) Dickcissel (*Spiza Americana*) Eastern Meadowlark (*Sturnella magna*)	Farms/towns, grasslands
	Song Sparrow (*Melospiza melodia*) Gray Catbird (*Dumetella carolinensis*) Northern Mockingbird (*Mimus polyglottos*) Brown Thrasher (*Toxostoma rufum*)	Shrubs/brush
	Red-Bellied Woodpecker (*Melanerpes carolinus*) Purple Martin (*Progne subis*) Downy Woodpecker (*Picoides pubescens*) American Crow (Corvus brachyrhynchos) Carolina Chickadee (*Poecile carolinensis*) Black-Capped Chickadee (*Poecile atricapillus*) Tufted Titmouse (*Baeolophus bicolor*) White-Breasted Nuthatch (*Sitta carolinensis*) Blue-Gray Gnatcatcher (Blue-gray Gnatcatcher) Northern Cardinal (*Cardinalis cardinalis*) Indigo Bunting (*Passerina cyanea*) Eastern Towhee (*Pipilo erythrophthalmus*)	Forest
	Red-Winged Blackbird (Agelaius phoeniceus)	Wetlands
Raptors	Bald Eagle (*Haliaeetus leucocephalus)* Northern Harrier or Marsh Hawk (*Circus cyaneus)* Red-Shouldered Hawk (*Buteo lineatus)*	Wetlands, shores of reservoirs, streams, rivers
	Red-Tailed Hawk (*Buteo jamaicensis)* Northern Rough-Legged Hawk (*Buteo lagopus)* Black Vulture (*Coragyps atratus)* Turkey Vulture (*Carthartes aura)* American Kestrel (*Falco sparverius)*	Forest, farmland
	Broad-Winged Hawk (*Buteo platypterus)* Swainson's Hawk (*Buteo swainsonii)*	Migrates through the Project area
Upland game birds	Greater Prairie Chicken (*Tympanuchus cupido*) Mourning Dove (*Zenaida macroura*)	Prairie
	Wild Turkey (*Meleagris gallopavo*)	Forest
	Northern Bobwhite (*Colinus virginianus*)	Shrub/brush
	Rock Dove (*Columba livia*)	Towns/yards

Table 3.9-3 Common Wildlife Species found in the Lower Missouri River Floodplain

Wildlife Assemblage	Common Species	Common Habitat Type
Amphibians	Plains Spadefoot (*Spea bombifrons*) Great Plains Toad (*Bufo cognatus*) Fowler's Toad (*Bufo fowleri*) Woodhouse's Toad (*Bufo woodhousii*) Blanchard's Cricket Frog (*Acris crepitans blanchardi*) Western Chorus Frog (*Pseudacris triseriata*) Northern Crayfish Frog (*Rana areolata circulosa*) Eastern American Toad (*Bufo americanus americanus*) Plains Leopard Frog (*Rana blairi*)	Floodplain
	Gray Treefrog (*Hyla chrysoscelis and Hyla versicolor*) Northern Spring Peeper (*Pseudicris crucifer crucifer*) Great Plains Narrow-mouthed Toad (*Gastrophryne olivacea*) Eastern Narrow-Mouthed Toad (*Gastrophryne carolinensis*) Green Frog *(Rana clamitans melanota*) Pickerel Frog (*Rana palustris*)	Forest, grasslands, wooded hills, marshes
	Bullfrog (*Rana catesbeiana*) Southern Leopard Frog (*Rana sphenocephala*)	Permanent aquatic habitats
Reptiles	Western Painted Turtle (*Chrysemys picta bellii*) Red-Eared Slider (*Trachemys scripta elegans*) Common (Northern) Map Turtle (*Graptemys geographica*) False Map Turtle (*Graptemys pseudogeographica pseudogeographica)* Ouachita Map Turtle (*Graptemys ouachitensis ouachitensis*)	Rivers, sloughs, oxbow lakes, ponds, drainage ditches (semi-aquatic)
	Graham's Crayfish Snake (*Regina grahamii)* Western Ribbon Snake (*Thamnophis proximus proximus)*	Edges of streams, marshes, sloughs, ponds, wooded areas near water
	Ornate Box Turtle (*Terrapene ornate ornate*) Southern Coal Skink (*Eumeces anthracinus pluvialis*) Racerunner (*Cnemidophorus sexlineatus*) Western Slender Grass Lizard (*Ophisaurus attenuatus attenuatus*) Eastern Yellow-Bellied Racer (*Coluber constrictor flaviventris*) Black Rat Snake (*Elaphe obsoleta*) Eastern Hog Nosed Snake (*Heterodon platirhinos*) Prairie Kingnose (*Lampropeltis calligaster calligaster*) Speckled Kingsnake *(Lampropeltis getula holbrooki*) Red Milk Snake (*Lampropeltis triangulum syspila*) Bullsnake (*Pituophis catenifer sayi)*	Pastures, open woods, glades, and prairies
	Three-Toed Box Turtle (*Terrapene Carolina triungulis*) Northern Fence Lizard (*Sceloporus undulates hyacinthinus*) Ground Skink (*Scincella lateralis*) Five-Lined Skink (*Eumeces faciatus*) Broadhead Skink (*Eumeces laticeps*) Western Worm Snake (*Carphophis vermis*) Prairie Ring-necked Snake (*Diadophis punctatus arnyl*) Great Plains Rat Snake (*Elaphe guttata*) Midland Brown Snake *(Storeria dekayi wrightorum)* Northern Red-Bellied Snake (*Storeria occipitomaculata occipitomaculata)* Osage Copperhead (*Agkistrodon contortrix phaeogaster*) Western Ribbon Snake (*Thamnophis proximus proximus)* Osage Copperhead (*Agkistrodon contortrix phaeogaster*) Timber Rattlesnake (*Crotalus horridus)*	Forest, woodlands

Table 3.9-3 Common Wildlife Species found in the Lower Missouri River Floodplain

Wildlife Assemblage	Common Species	Common Habitat Type
Mammals	Raccoon (*Procyon lotor*) Eastern Gray Squirrel (*Sciurus niger*)	Hardwood forests
	River Otter(*Lutra canadensis*) Mink (*Mustela vison*) Opossum (*Didelphis viginiana*) Long-Tailed Weasel (*Mustela frenata*) Beaver (*Castor canadensis*) Muskrat (*Ondatra zibethicus*) Swamp Rabbit (*Sylviagus aquaticus*)	Along rivers, streams, lakes; wooded areas along streams
	Striped Skunk (*Mephitis mephitis*) Red Fox (*Vulped fulva)* White-Tailed Deer (*Odocoileus virginianus*) Gray Fox (Urucyon *cineoargentus*) Coyote (*Canis latrans*) Eastern Cottontail Rabbit (*Sylvilagus aquaticus*)	Forest borders, brushy fields near water
	White-Tailed jackrabbit (*Lepus californicus*) Badger (*Taxidea taxus*) Spotted Skunk (*Civet*) (*Spilogale interrupta*)	Prairie

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