3.10 FEDERALLY LISTED SPECIES

3.10.1 Introduction

This section discusses the presence, potential occurrence, and status of animal and plant species that are listed as threatened or endangered under Section 4 of the ESA of 1973 (50 CFR Section 402.02 [federally listed species]), and describes the habitat necessary to support these species. The term ‘‘endangered species’’ means any species that is in danger of extinction throughout all or a significant portion of its range. The term ‘‘threatened species’’ means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. “Candidate species” are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

State-listed species of conservation concern, federal candidate and delisted species, migratory birds, and other sensitive species are addressed in Section 3.8 (Aquatic Resources) and Section 3.9 (Wetlands, Floodplains, and Terrestrial Resources). Information presented for species occurrence and life history is based on available literature, correspondence and communications with federal and state agencies, websites, and a thorough review of state natural heritage programs.

The Action Area is the geographic region encompassing the channel and floodplain of the Missouri River and main tributary confluences to the Missouri River from RM 0 to RM 489. Land cover types include riverine, riparian, wetlands, agricultural, and other uses. The Action Area also encompasses areas where alternate sources of sand are identified in the Project Description (Section 3.2).

3.10.2 Regulatory Setting

3.10.2.1 Federal

The ESA is the primary federal law protecting threatened and endangered species. The ESA and its subsequent amendments provide for the protection and conservation of federally listed species and the habitats upon which they depend. Under Section 7 of the ESA, federal agencies (such as the USACE) are required to consult with the USFWS to ensure that any federal undertaking, funding, permitting, or authorizing actions would not likely jeopardize the continued existence of listed species or destroy or

adversely modify designated critical habitat. "Critical habitat" refers to a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species, and that may require special management and protection (a more complete definition can be found in the ESA).

In this case, Section 7 requires the USACE to determine the effects of the Environmentally Preferred Alternative on federally listed species and their critical habitat in a Biological Assessment (BA). Upon reviewing the BA, if the USFWS concurs that the Proposed Action is will not affect or may affect but is not likely to adversely affect listed species or their critical habitat, then the informal consultation is complete and the USACE can proceed with the Proposed Action. If the USACE determines that the Environmentally Preferred Alternative is likely to adversely affect listed species or critical habitat or if the USFWS does not concur with a determination that the Environmentally Preferred Alternative is not likely to adversely affect, then the USACE and USFWS will enter formal consultation and the USFWS will write a Biological Opinion which may include Reasonable and Prudent Measures and a jeopardy statement if they conclude that the Environmentally Preferred Alternative will jeopardize the continued existence of a listed species.

3.10.2.2 Consultation with USFWS

On October 30, 2009, the USACE sent a letter requesting USFWS concurrence with their determination that a 1-year extension of the current Missouri River commercial dredging permits would not adversely affect federally listed species. The USACE requested that the concurrence extension last through December 31, 2010. The USFWS replied in a letter dated December 3, 2009, and agreed with the USACE determination that the proposed 1-year permit extension would not adversely affect the pallid sturgeon, piping plover, interior least tern, or their habitats (Scott pers. comm.). During informal consultation, the USFWS stated that additional research had been conducted and new information had become available on the pallid sturgeon since the 2003 biological opinion (USFWS 2003).

The USFWS indicated that a new BA would need to be developed to incorporate recent research in order to support an effects analysis beyond the 1-year extension of the current dredging permits. The USACE sent a letter to the USFWS on January 22, 2010, requesting a list of species potentially affected by dredging in the LOMR. The USFWS responded via email on February 10, 2010, identifying the potential for Project-related effects on the piping plover, interior least tern, pallid sturgeon, and Indiana bat. Further, the USFWS indicated that no federally designated critical habitat occurs in the Action Area. A follow-up conversation with the USFWS on March 23, 2010, identified the potential

occurrence of the decurrent false aster in the portion of the Action Area located in St. Charles County, Missouri.

On January 13, 2011, the USACE sent a Draft BA to the USFWS that concluded that the Proposed Action may affect, but is not likely to adversely affect the pallid sturgeon, least tern, and piping plover and would have no effect on the Indiana bat and decurrent false aster. The USACE and USFWS are still in informal consultation as the USFWS continues to review the Draft BA.

3.10.3 Federally Listed Species

Federally listed threatened or endangered species that are known to occur or with the potential to occur in the general Action Area and that may be affected by the Proposed Action and the alternatives are listed in Table 3.10-1. County-specific lists obtained through the state natural heritage programs were used in combination with species habitat information to determine the species potentially occurring in the Action Area. This list was further refined based on consultations with the USFWS, as described in Section 3.10.2. Table 3.10-1 identifies 11 federally listed species, including one mammal, two birds, three fish, two invertebrates, and three plant species. As noted, no designated critical habitat for any of the species listed in Table 3.10-1 occurs in the Action Area.

Table 3.10-1 also provides a preliminary determination of the potential for the Proposed Action to affect each species or its habitat, which serves as a screening to determine which species will be assessed. This determination is based on the likelihood of occurrence of the species or its habitat in the Action Area. Further, all species assessed in this document are consistent with the species identified by the USFWS as potentially occurring in the Action Area (see Section 3.10.2). Note that on September 1, 2010, the USFWS issued a final rule determining that shovelnose sturgeon (*Scaphirhynchus platorynchus*) should be treated as threatened due to similarity of appearance to the endangered pallid sturgeon in areas where they commonly coexist, such as the Missouri River (75 FR 53598). However, the ruling extends take prohibitions only to activities associated with commercial fishing. All other activities in areas where the two species overlap and which are conducted in accordance with applicable laws and regulations will not be considered take under the regulations designating shovelnose sturgeon as threatened (75 FR 53598). Shovelnose sturgeon have been included in Table 3.10-1, but because impacts to this species due to the proposed Project and alternatives would not be considered take, shovelnose sturgeon are not discussed beyond Table 3.10-1 in this section or in Section 4.8. The five species judged to be potentially affected by the Proposed Action or alternatives are further described in Sections 3.10.3.1 through 3.10.3.5 and in Section 4.8.

3.10.3.1 Indiana Bat

The Indiana bat (*Myotis sodalis*) was listed as endangered on 11 March 1967 (USFWS 2006). Critical habitat for the species was designated on September 24, 1976 (41 FR 41914). Indiana bat critical habitat has only been designated in caves that contain winter roosting habitat (USFWS 1976). Wintering cave habitats are not located within the LOMR floodplains; therefore, no critical habitat for this species is present in the Action Area.

Table 3.10-1 Preliminary Effects Determination for Federally Listed Threatened and Endangered Species

Common Name *Scientific Name*	Federal Status[a]	MO Status[a]	KS Status[a]	NE Status[a]	Habitat	Likelihood of Occurrence in the Action Area	Preliminary Effects Determination [b]
Mammals							
Indiana bat *Myotis sodalis*	E				Occurs seasonally during summer along streams and rivers in northern Missouri. Females raise young in maternal colonies under the bark of trees. Males may summer in riparian and floodplain areas or in caves. The species hibernates through the winter in caves and abandoned mines in the Ozarks.	Maternal colonies may occur in riparian or upland trees on river banks.	Yes
Birds							
Least tern (interior population) *Sterna antillarum*	E	E	E	E	Breeding birds nest on sparsely vegetated sand bars and the shoreline of rivers, lakes, and reservoirs. Coastal breeding birds nest on sandy shorelines of beaches and estuaries.	Species is a migrant through the Action Area. Species may nest in suitable habitat on the Missouri River and its tributaries.	Yes
Piping plover *Charadrius melodus*	T		T	T	Breeding birds nest on sparsely vegetated sandy or gravel beaches on the shoreline of rivers, lakes, and reservoirs and alkali lakes. Coastal breeding birds nest primarily on sandy beaches and barrier islands.	Species is a migrant through the Action Area. Species may nest in suitable habitat on the Missouri River and its tributaries.	Yes
Fish							
Pallid sturgeon *Scaphirhyncus albus*	E	E	E-CH	E	Inhabits large, turbid rivers with swift current and firm sand or gravel bottom.	Species mostly confined to the Missouri and lower Mississippi Rivers.	Yes

Table 3.10-1 Preliminary Effects Determination for Federally Listed Threatened and Endangered Species

Common Name *Scientific Name*	Federal Status[a]	MO Status[a]	KS Status[a]	NE Status[a]	Habitat	Likelihood of Occurrence in the Action Area	Preliminary Effects Determination [b]
Fish (continued)							
Shovelnose sturgeon *Scaphirhynchus platorynchus*	T[c]				Inhabits main channel of large rivers with swift currents and firm substrate. Can be found in deep scours or along sand and gravel bars during certain times of the year.	Species occurs the Missouri and Mississippi River basins.	No. Take prohibitions only apply to activities associated with commercial fishing [c]
Topeka shiner *Notropis topeka*	E	E		E	Inhabits pools of small streams with clear water and sand, gravel, or rubble bottoms.	Species occurs in central Missouri and northward into the prairie region. The strongest population is in the Moniteau Creek watershed, outside of the Action Area.	No. The Action Area is outside of the species known range.
Invertebrates							
American burying beetle *Nicrophorus americanus*	E		E	E	Historical habitat preferences are unknown. Occurs in grasslands and oak-hickory forest with an open understory.	The Action Area is outside of the species known range.	No. The Action Area is outside of the species known range.
Scaleshell mussel *Leptodea leptodon*	E	E			Occurs in clear, nonpolluted riffles with moderate current and firm gravel, cobble, or sand substrates.	None. Species is considered extirpated by the USFWS.	No. Species does not currently exist in the Action Area.
Plants							
Decurrent false aster *Boltonia decurrens*	T	E			Occurs in moist, sandy soil in floodplains, along shores of lakes, banks of streams, and in disturbed lowland areas or open wetlands.	Species occurs in the eastern half of St. Charles County.	Yes
Eastern prairie fringed orchid *Platanthera leucophaea*	T	E			Occurs in wet prairies and fens, sometimes in wet sites along spring branches and streams.	Species historically occurred in eastern Missouri.	No. Species does not currently exist in the Action Area.
Western prairie fringed orchid *Platanthera praeclara*	T	E		T[d]	Occurs in mesic portions of upland prairies and bottomland prairies.	Species occurs in northwest Missouri (Atchison and Holt Counties).	No. Species not likely to occur in the Action Area.

Table 3.10-1 Preliminary Effects Determination for Federally Listed Threatened and Endangered Species

[a] Species Status:

CH = Critical habitat has been designated in the State of Kansas.
E = Endangered.
T = Threatened.
KS = Kansas.
MO = Missouri.
NE = Nebraska.
USFWS = U.S. Fish and Wildlife Service.

[b] Preliminary Effects Determination: A "Yes" indicates that the species will be addressed in the effects analysis. A "No" indicates that the Proposed Action and the alternatives are not likely to affect the species. The 'No" determination reason is provided, and the species is not addressed in the effects analysis.

[c] On September 1, 2010, the USFWS issued a final rule determining that shovelnose sturgeon (*Scaphirhynchus platorynchus*) should be treated as threatened due to similarity of appearance to the endangered pallid sturgeon in areas where they commonly coexist, such as the Missouri River (75 FR 53598). However, the ruling extends take prohibitions only to activities associated with commercial fishing. All other activities in areas where the two species overlap and which are conducted in accordance with applicable laws and regulations will not be considered take under the regulations designating shovelnose sturgeon as threatened (75 FR 53598).. Therefore, shovelnose sturgeon will not be considered further in Section 4.8 as take is not currently prohibited for activities associated with commercial sand and gravel dredging within the LOMR.

[d] Nemaha County, Nebraska.

Sources: www.ngpc.state.ne.us/, www.mdc.mo.gov/nathis/endangered/endanger/, www.kdwp.state.ks.us/news/Other-Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/County-Lists

The Indiana bat weighs approximately one-quarter of an ounce and has a wingspan of 9–11 inches (USFWS 2006). The fur is dark-brown to black and is similar in appearance to many other related species. The Indiana bat is a very social species, and large numbers of individuals cluster together during hibernation (USFWS 2006). The Indiana bat mates during fall before they enter caves to hibernate. During hibernation, the bats cluster in groups of up to 500 individuals per square foot, and the largest hibernation caves can support from 20,000 to 50,000 bats. Common prey includes a variety of flying insects found along rivers or lakes and in uplands.

Summer habitat located in riparian or upland trees on river banks may contain maternal colonies, and the Indiana bat also forages in or along the edges of forested areas during summer. After migrating to summer areas, females roost under the peeling bark of dead and dying trees in maternity colonies of 100 or more bats. Young bats are nursed by the mother, who leaves the roost tree only to forage for food. The young stay with the maternity colony throughout their first summer (USFWS 2006).

The USFWS developed a recovery plan in 1976 which was revised in 1983 (USFWS 2006) and again in 2007 (USFWS 2007a). Some public lands such as national wildlife refuges, military areas, and U.S. Forest Service lands are managed for Indiana bats, but none of the potential summer habitat in the Action Area was specifically identified in the recovery plan. Measures have been implemented, such as gate installation, at important wintering caves in Missouri to reduce cave disturbance (MDC 2000).

The Indiana bat is found throughout most of the eastern half of the United States. Almost half of all Indiana bats hibernate in caves in southern Indiana, and states with Indiana bat populations over 40,000 (in 2005) included Missouri, Kentucky, Illinois, and New York. Other states within the current range of the Indiana bat include Alabama, Arkansas, Connecticut, Iowa, Maryland, Michigan, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia (USFWS 2006).

Indiana bats are permanent residents along the entire Action Area. The Indiana bat occurs seasonally during summer along streams and rivers in northern Missouri. The species hibernates through winter in caves and abandoned mines in the Ozarks. Between early spring and autumn, Indiana bats migrate to and use summer roosting and foraging areas located in riparian, floodplain, and upland forests (MDC 2010b, USFWS 2007a). Between 2007 and 2009, the Missouri population of Indiana bat has declined by 14 percent (USFWS 2010a). Current threats to the species include changes in summer habitats from alterations to land cover, reduction of roosting and foraging forested habitat, and white-nose syndrome (MDC 2010b, USFWS 2010b). Because alteration and elimination of forested areas have

been found to impact Indiana bat summer habitat, the elimination of roosting trees could adversely impact Indiana bats. As stated above, the Action Area does not contain designated critical habitat for the Indiana bat.

3.10.3.2 Interior Least Tern

The interior population of the least tern (*Sterna antillarum*) was listed as endangered on June 27, 1985 (50 FR 21,784-21,792) (USFWS 1990). The least tern is also listed as a state endangered species by Missouri, Kansas, and Nebraska. The state of Kansas has designated five locations along the Kansas River, extending upstream from its confluence with the Missouri River, as critical habitat for the interior least tern (KDWP 2009). No critical habitat has been designated on the LOMR.

The interior least tern is a migratory species with recognized distinct interior and coastal populations. The interior population occurs along major rivers in the interior United States, including the Missouri and Mississippi Rivers and their major tributaries. The coastal populations nest on sandy substrate of barrier islands, beaches, and estuaries. Coastal breeding areas in North America include the Pacific Coast south of the San Francisco Bay region, the Gulf Coast, and the Atlantic Coast up to central Maine. The least tern winters in coastal areas of Central and South America.

The interior least tern is the smallest North American tern and is a colonial nester (Thompson et al. 1997). Shallow nests, or scrapes, are built in sand or fine substrate gravel with sparse vegetation. A 2005 breeding bird distribution survey (USFWS 1990) identified that, although least tern populations occurred over much of the species historical range, populations were limited to river reaches with suitable nesting habitat along rivers and reservoir shorelines. Colonies also were identified at sand pits, industrial sites, alkali flats, and on rooftops (Lott 2006). The 2005 breeding bird survey identified 17,591 interior least tern individuals (USFWS 1990).

The interior least tern is primarily piscivorous (fish-eating) but may occasionally consume aquatic invertebrates (Thompson et al. 1997). Least terns feed in shallow waters of rivers, reservoirs, and lakes and forage by hovering over and diving into the water to catch fish (USFWS 1990).

The USFWS published a recovery plan for the interior population of least terns in 1990 (USFWS 1990). The recovery plan identified threats to this species, which included the physical and functional loss of breeding habitat due to river management actions. Loss of habitat results from channelization, dredging, and impoundment of rivers that eliminates nesting habitat. Further, nesting habitat is

functionally affected by managed water levels which have the potential to inundate occupied or potential nesting habitat.

Small flocks of interior least terns migrate between wintering and nesting habitat through Missouri from late April to mid-May and from August through September (MDC 2010a). The distribution of least tern colonies in Missouri is limited to the Mississippi River south of St. Louis. Historical interior least tern breeding habitat was located along the Missouri River (USFWS 1992); however, the 2005 breeding bird survey (Lott 2006) did not identify any least tern nest sites in Missouri, and no nest sites were observed on the Missouri River south of its confluence with the Lower Platte River in Nebraska. Suitable sand bar nesting habitat has been mostly eliminated in the proposed Action Area because of river channelization (Smith and Renken 1991, USFWS 2003). Past channelization projects along the LOMR have resulted in a 97-percent reduction in sand bar areas (Galat et al. 2005).

The distribution of least tern colonies in Kansas is limited to two colonies on the Kansas River and two populations on the Arkansas River system. Although state-designated critical habitat has been identified along a portion of the Kansas River near its confluence with the Missouri River, no colonies were observed in the designated critical habitat.

While interior least tern individuals may occur along the LOMR during migration, nesting has not been found to occur within the Action Area. Historically, the interior least tern nested along the LOMR to St. Louis, Missouri (USACE 2004); therefore, this species may use the LOMR for breeding if suitable nesting habitat is present.

3.10.3.3 Piping Plover

The piping plover (*Charadrius melodus*) was federally listed on December 11, 1985 (50 FR, 50726–50734) (USFWS 1990). The populations in the Great Lakes–Big Rivers region, which does not include the Action Area, are listed as endangered. Piping plover populations outside of this region are listed as threatened. The state of Missouri considers the piping plover a transient species in Missouri.

The USFWS has designated critical habitat for this species in the northern Great Plains, which includes portions of Nebraska (50 FR 67, 57638–57717). However, critical habitat in Nebraska is outside of the Action Area. Kansas has designated critical habitat for piping plover on the Kansas River for the segment that extends from the confluence of the Smoky Hill River and Republican River downstream to the confluence of the Kansas and Missouri Rivers in Kansas City, Missouri (KDWP 2009).

The piping plover is a migratory species with recognized distinct interior and coastal populations. The interior populations include the Great Lake–Big Rivers population and those that occur in the Great Plains region. This species breeds along major rivers in the interior United States, including the Missouri and Mississippi Rivers and their major tributaries. The coastal populations nest on sandy substrate of barrier islands, beaches, and estuaries on the Atlantic Coast from North Carolina to Maine. The piping plover winters on the Atlantic and Gulf Coasts from North Carolina to Texas, Mexico, Central America, and the Caribbean.

Piping plovers are a transient species that rarely occur in Missouri during migration between wintering grounds and breeding areas (The Audubon Society of Missouri 2009). Migration habitat use is poorly understood, but plovers likely use inland and coastal stopover sites when completing this migration (USFWS 2008). The importance of the Missouri River as migration habitat is unknown (USFWS 2003). Typically, the piping plover migration between wintering and nesting habitats peaks in spring and fall (USFWS 2008).

The USFWS published a recovery plan for the Great Lakes and Great Plains piping plover (USFWS 1988). The Great Plains region, as defined for the recovery plan, did not include rivers in Missouri or Kansas. The recovery plan identified threats to this species as the physical and functional loss of breeding habitat due to recreational activities and river management actions. Recreational effects to habitat include vehicular and pedestrian traffic on suitable nesting sites. Channelization, dredging, and impoundment of rivers also eliminates sand bar nesting habitat.

Piping plover nests consist of shallow scrapes in sand on sand bars, beaches, or shorelines. Piping plovers feed on freshwater and marine benthic invertebrates and terrestrial invertebrates (Elliott-Smith and Haig 2004). They feed in shallow waters near the shoreline or on beaches (USFWS 1990).

Historical breeding habitat primarily consisted of unvegetated sand bars within major river systems, alkali wetlands, and lake and reservoir shorelines with suitable nesting substrate (USFWS 1988). A 1986–1987 breeding survey identified 680 pairs of piping plover in the Great Plains region, which includes portions of the LOMR flowing through Nebraska (USFWS 1988). Breeding of piping plovers was documented in northern Kansas along portions of the Kansas River in 1996 and 1997 (Busby et al. 1997). Two to four breeding pairs were observed along the Kansas River between 1998 and 2006, but no nests were documented in 2007 or 2008 (USFWS 2009b).

The 1998 recovery plan goal was 465 piping plover breeding pairs throughout their range. The number of breeding pairs has increased steadily since 1998 until it surpassed the recovery plan goal in 2005.

The number of breeding pairs has fluctuated below the recovery plan goal since 2005 but has been approximately three times the baseline number of breeding pairs identified in the recovery plan (USFWS 2009b). Piping plover breeding has not been documented in the Action Area. Due to impoundment and channelization of the LOMR, virtually no piping plover nesting habitat is located along the Action Area (USFWS 2003). Further, no portion of the LOMR in the Action Area has been designated as critical piping plover habitat (USFWS 2002).

3.10.3.4 Pallid Sturgeon

The pallid sturgeon *(Scaphirhyncus albus)* was listed as endangered on September 6, 1990 (55 FR 36641). The pallid sturgeon is also listed as endangered by the states of Missouri, Kansas, and Nebraska. The USFWS has not designated critical habitat for this species (USFWS 2010c). Kansas has designated critical habitat for pallid sturgeon in portions of the Missouri River in Kansas (KDWP 2004).

In 1993, the USFWS released the Pallid Sturgeon Recovery Plan (USFWS 1993). The short-term recovery objective was to prevent species extinction by establishing three captive broodstock populations in separate hatcheries. The long-term objectives were to downlist and, eventually, delist the species through protection, habitat restoration, and propagation activities by 2040 (USFWS 1993). In addition, the Pallid Sturgeon Recovery Plan (USFWS 1993) identified six Recovery Priority Management Areas (RPMAs) for implementation of recovery tasks based on the most recent pallid sturgeon records of occurrence and the potential of these areas to contribute to the recovery of the species. The Action Area falls within the RPMA 4, which consists of the portion of the LOMR downstream of Gavins Point Dam to the confluence of the Missouri and Mississippi Rivers (USFWS 1993).

The primary range and habitat of the pallid sturgeon are located in the Missouri River and the portions of the Mississippi River and some of its tributaries downstream of the Mississippi River confluence with the Missouri River (USFWS 2010c). The distribution of the pallid sturgeon in Missouri, Kansas, and Nebraska is restricted to the LOMR mainstem, with some limited use of the downstream portions of some large tributaries. Since 1994, pallid sturgeon populations have been augmented with hatchery-reared fish (USFWS 2007b). Pallid sturgeon stocking data between 1994 and 2009 are presented in Table 3.10-2 and illustrated in Figure 3.10-1. The collection of individuals from all stocked cohorts indicates that hatchery supplementation is contributing to the pallid sturgeon population in RPMA 4. Between 1999 and 2005, 156 pallid sturgeon were captured in RPMA 4. Wild fish comprised 51 of the

captured fish, while 82 captured fish were of hatchery origin and 24 fish were of unknown origin (USFWS 2007b). Unpublished 2009 sampling data provided by the USACE showed the capture of 589 hatchery-reared pallid sturgeon, 81 wild fish, and 26 fish of unknown origin; a total of 696 pallid sturgeon were captured in RPMA 4 in 2009 (Covington pers. comm. [a]).

Table 3.10-2 Pallid Sturgeon Stocking Data (1994–2009)

Year	Number Stocked	Year	Number Stocked
1994	2,412	2002	0
1995	0	2003	14,555
1996	0	2004	35,372
1997	2,012	2005	8,611
1998	0	2006	4,658
1999	0	2007	5,643
2000	0	2008	6,101
2001	6,864	2009	7,604

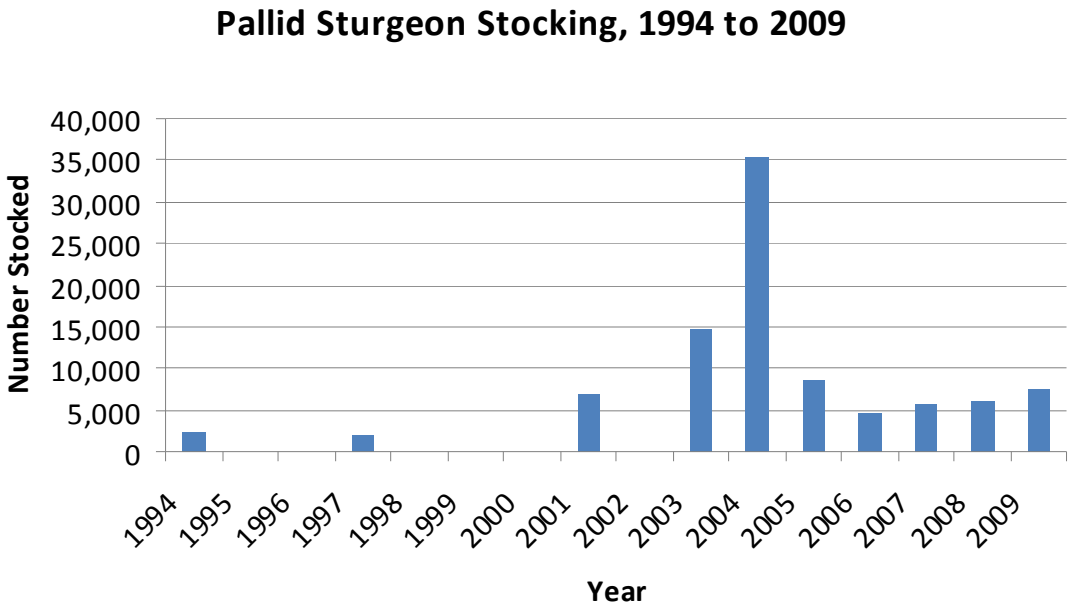

Figure 3.10-1 Pallid Sturgeon Stocking in the Missouri River (1994–2009)

Source: Covington pers. comm. [b].

The pallid sturgeon is morphologically adapted to life in swift waters on the bottom of large, turbid, free-flowing rivers (Kallemeyn 1983, Gilbraith et al. 1988). This species evolved in the diverse environments of the Missouri and Mississippi Rivers where the floodplain, backwaters, chutes, sloughs, islands, sand bars, and main channel provided numerous microhabitats (USFWS 1993). Historically, these habitats were constantly changing. Since the 1930s, construction of dams on the upper river and channelization of the LOMR have resulted in dramatic long-term changes to the character of the LOMR (see Chapter 1). As a result of these modifications, much of the dynamic nature of the LOMR system has been eliminated (see Chapter 1).

According to the USFWS (2003), the pallid sturgeon has been captured in tributary mouths, over sand bars, along main channel borders, and in deep holes—all of which can provide overwintering habitat. The importance of tributaries of the LOMR to pallid sturgeon is largely unknown. Tagged wild pallid sturgeon have been found to move short distances up some tributaries, which suggests that pallid sturgeon use tributaries opportunistically for feeding when conditions allow (DeLonay et al. 2009). In addition, small pallid sturgeon have been captured in off-channel shallow-water habitat areas (USFWS 2003). Fishery sampling programs conducted by the USFWS have often found pallid sturgeon along with shovelnose sturgeon (*Scaphirhynchus platorhynchus)* indicating some overlap in habitat requirements. Within their range, pallid sturgeon migrate both daily and seasonally. Bramblett (1996) found that pallid sturgeon can move as far as 13 miles a day, at a rate as fast as 6 miles per hour (mph). Home range for the pallid sturgeon was found to be greatest during spring, presumably associated with spawning, and could be as large as 198 miles (Bramblett 1996). The size of the home range during spring and summer was not found to be significantly different, but the size of the home range in fall and winter was found to be significantly different from that of the spring (Bramblett 1996).

The pallid sturgeon can also be found at a variety of depths. A recent study (DeLonay et al. 2009) in the LOMR documented the sturgeon's movement and water depth occurrence over a year long period. A male and female were implanted with ultrasonic telemetry transmitters and archival temperature/depth recording tags in 2003. Within a year, the female remained within a 2-mile (3.2-km) reach of the river. The tagged male traveled 100 miles (161 km) in a 3-month period. Both fish inhabited depths ranging from 4.5 to 35.4 feet (1.4 to 10.8 m), with an average depth of 13 feet (4 m). Areas with less than 6.5 feet (2 m) were rarely used by the tagged fish.

River discharge and photoperiod (ratio of light and dark hours) may contain important environmental cues for the timing of migration and other movements (Bramblett 1996). With increasing discharge, the pallid sturgeon tends to be found farther upstream (Bramblett 1996). Because the pallid sturgeon is not

thought to spawn every year, Bramblett (1996) suggests that their relative location in the river from year to year may be indicative of whether individuals are spawning.

Within the LOMR, Delonay et al. (2009) conducted telemetry studies in 2007 and 2008 with female pallid sturgeon to determine spawning migrations in the upper (Platte River, Nebraska to Big Sioux River, Iowa) and lower (Osage River, Missouri and Grand River, Missouri) segments of the LOMR. During the studies, 218 pallid sturgeon were captured; of these, 190 were of hatchery origin and 28 were wild fish. Four gravid females were implanted with telemetry devices; no ripe males were collected. Three of the four gravid females were observed to travel a distance of between 85 and 185 river miles upstream to their presumed spawning grounds located near Glasgow, Missouri (RM 230.1), downstream of the Kansas River confluence with the LOMR (RM 366.4) and slightly upstream of the Kansas River confluence with the LOMR (RM 369.5). All three females in the downstream LOMR study area, when recollected, were determined to have spawned. The females were observed, after reaching their upstream migratory destination, swimming back and forth within approximately 0.3- to 0.5-mile-long portions of the LOMR along revetted outside bends. Delonay et al. concluded that these movements were characteristic of spawning behavior. The spawning location of the fourth female in the upper segment of the LOMR could not be determined because of disruptions of upstream movements due to periods of lowered water temperatures. This presumed spawning all occurred in early May, when water temperatures were between 60 and 64 °F. Post-spawning downstream movement was variable, but all three tagged females had migrated downstream into the Mississippi River by fall. The authors noted that, although the study demonstrated that pallid sturgeon are spawning in the LOMR, researchers do not know if spawning was conducted under optimal conditions, if the eggs hatched, and if any juvenile fish survived.

For the portion of the LOMR between the Platte River and its confluence with the Mississippi River, the USFWS determined that larval and juvenile pallid sturgeon abundance is limited by the quantity of shallow-water habitat that provides rearing and refugia habitat for this life stage (USFWS 2003).

3.10.3.5 Shovelnose Sturgeon

On September 1, 2010, the USFWS issued a final rule determining that shovelnose sturgeon (*Scaphirhynchus platorynchus*) should be treated as threatened due to similarity of appearance to the endangered pallid sturgeon in areas where they commonly coexist, such as the Missouri River (75 FR 53598). However, the ruling extends take prohibitions only to activities associated with commercial fishing. All other activities in areas where the two species overlap and which are conducted in

accordance with applicable laws and regulations will not be considered take under the regulations designating shovelnose sturgeon as threatened (75 FR 53598). Therefore, shovelnose sturgeon will not be considered further in Section 4.8 as take is not currently prohibited for activities associated with commercial sand and gravel dredging within the LOMR.

3.10.3.6 Decurrent False Aster

The decurrent false aster *(Boltonia decurrens)* is listed as threatened and occurs in the eastern half of St. Charles County, Missouri. The decurrent false aster is a perennial plant that grows from 1 to 5 feet tall and occasionally reaches heights of over 6 feet (MDC 2010a). This species blooms from July to October and bears seeds from August to October. The blooms occur in branched groups of composite heads with yellow disk flowers and white to purplish ray flowers. Decurrent false aster is closely related to *Boltonia asteroides* var. *recognita*, which is a common weedy species of false aster. Both of these species are sometimes found in the same habitat.

Habitat for this species is located in moist, sandy soils and is primarily found in wetlands, on the borders of marshes and lakes, and on the margins of bottomland oxbows and sloughs (Missouri Department of Conservation 2010). Decurrent false aster favors colonization in recently disturbed areas, and flooding may play a role in maintaining its habitat. The primary threat to the decurrent false aster is the loss of suitable wetland habitat (MDC 2010).

The distribution of decurrent false aster is restricted to the portion of the Mississippi River floodplain south of the confluence of the Illinois River with the Mississippi River (MDC 2010, NatureServe 2009). Decurrent false aster has the potential to occur along Missouri River floodplains within St. Charles County, Missouri (in the St. Charles segment) (MDC 2010, Ledwin pers. comm.).

3.10.4 References

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