4.9 LAND USE AND RECREATION

4.9.1 Introduction

This section describes impacts to land use and recreation related to the Proposed Action and alternatives. As discussed in Section 3.11, dredging under the Proposed Action and alternatives could affect land use and recreational resources adjacent to the river through changes in water levels, river bed degradation, and locations of dredging facilities and related activities.

Dredging along the LOMR is a historical and ongoing activity. Land use and recreation impacts would therefore occur only if implementation of the Proposed Action or alternatives would result in (1) a change in or conflict with an existing land use; or (2) a change in the availability or quantity of recreational opportunities as a result of changes in the rate of river bed degradation, processing amounts at existing facilities, or water surface elevations; construction of new facilities; or changes in the location of dredging activities.

4.9.2 Assessment Methods

4.9.2.1 Land Use

This section describes the methods used to analyze potential impacts on land use associated with the Proposed Action and the alternatives. As stated above, land use impacts would occur if implementation of an alternative would result in a change in or conflict with an existing land use. The analysis of land use impacts therefore primarily focuses on the new facilities that would be constructed under the Proposed Action, Alternative A, Alternative B, and Alternative C: Master's–Waldron in the Kansas City segment and Rau–Washington in the St. Charles segment. Consideration of land use impacts from construction of the new facilities is based on their potential to directly affect the land use on which the facilities would be built or to indirectly affect adjacent land use. Changes in the quantity of material processed at existing onshore facilities or alternate sources are also considered.

4.9.2.2 Recreation

This section describes the methods used to analyze potential impacts on recreation associated with the Proposed Action and the alternatives. The anticipated recreational opportunities, functions, and values under the Proposed Action and alternatives were compared with existing conditions to determine whether a decrease in recreational opportunities would occur, or whether dredging activities would

conflict with existing or planned recreational use. This analysis qualitatively addresses the severity and intensity of potential impacts within the context of existing conditions.

The analysis of recreation impacts considers (1) the direct impact of dredging on boaters because of the location of the dredges; and (2) the indirect impact of dredging on trail and boat ramp access from potential river bed degradation or changes in water surface elevation. Water surface elevations are critical for boat ramps, which rely on a predictable range of water levels in order to operate. Changes in river bed elevation and water surface elevation can alter sediment transport processes, and result in further changes in water surface elevation. Dredging affects river bed elevation (and therefore sediment transport and water surface elevation) and would be greatest in the segments with onshore facilities. Therefore, recreation impacts related to river bed degradation, such as lack of access to boat ramps, are likely to be greatest in segments with onshore facilities, as discussed in further detail below.

The discussion of recreation impacts related to the effects of the alternatives on wetlands is based on findings related to groundwater and terrestrial species in Section 4.7. These indirect impacts to wetland-related recreational use would result from a lowering of groundwater levels and would not necessarily occur in the same location as dredging activities. A loss of wetland area could reduce opportunities for wildlife viewing, bird watching, hiking, hunting, and educational opportunities. Any loss also would be contrary to the goals of the SCORP for Missouri and Kansas.

Impacts on recreation trails are discussed for land-based trails of statewide or national importance. Impacts on recreation trail access could be caused by varying water levels and their capacity to reduce or increase the occurrence of washouts, and could be indirectly linked to dredging activities. The Historic Trail follows the actual river with the exception of the 165-mile portion from St. Charles to Boonville, which is part of the Katy Trail. Recreationists on the river portion of the Historic Trail are considered boaters. Therefore, impacts on recreationists using the river portion of the Historic Trail are categorized with direct impacts to recreational boating from the presence of dredges and barges.

Dredging activities have the potential to affect fish and fish habitat in the LOMR—including those considered as sport fish, such as channel catfish, flathead catfish, sauger, crappie, white bass, largemouth bass, bluegill, and paddlefish. Changes in recreational fishing opportunities are based on expected effects on fish species, as discussed in Section 4.6.

4.9.3 Proposed Action

4.9.3.1 Changes in Existing or Planned Land Uses

St. Joseph, Waverly, and Jefferson City Segments

No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segments under the Proposed Action. Existing sand plants in these segments would process an increased amount of material, which would not affect the adjacent agricultural or industrial land uses. Therefore, no change in land use or adverse impact to adjacent land use would occur in these segments under the Proposed Action.

Kansas City Segment

Under the Proposed Action, The Master's Dredging Company would construct a new 20- to 60-acre onshore facility in the Kansas City segment near RM 388 on land designated by Platte County for agricultural use. The proposed facility would be constructed on land with a soil designation of prime farmland and a zoning designation of agricultural. Whether the land is in current agricultural production is unknown. The facility would convert up to 60 acres from an agricultural designation in Platte County, which would conflict with the designated land use. Industrial use is not allowed under the current agricultural zoning designation. Platte County would require a zoning change and a special use permit. The maximum 60 acres that would be converted represents 0.06 percent of the 93,138.7 acres of prime farmland in Platte County. This reduction in prime farmland would be minimal.

The land adjacent to the proposed facility is designated by Platte County as agricultural; however, the proposed industrial facilities would not conflict with adjacent land uses because the sand plant would not prevent or hinder agricultural use. All other Dredgers in the Kansas City segment would use existing facilities that are in compliance with local land use designations. Under the Proposed Action existing sand plants would continue to operate as they do now, except that processing amounts would increase.

St. Charles Segment

Under the Proposed Action, the Edward N. Rau Contractor Company would construct a new onshore facility (Rau–Washington) in the St. Charles segment near RM 67. The sand plant would be built on land designated by the City of Washington for heavy industrial use and therefore would not conflict with the zoning designation. The land appears undeveloped and is partially vegetated. The area adjacent

to the proposed facility site is also zoned for heavy industrial use; therefore, the proposed facility would not indirectly affect adjacent land use. Existing facilities in the St. Charles segment would continue to operate as they do now, except for processing an increased amount of material, which would not result in a land use conflict with adjacent agricultural or industrial land use.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, changes in existing or planned land uses would not occur at alternate source locations.

4.9.3.2 Changes in Recreational Boating

St. Joseph Segment

Under the Proposed Action, an increase in barge trips on the river related to the increase in material dredged could affect recreation boating, both in terms of the area available for boating and the quality of experience.[1] As stated in Section 4.4, the number of barge trips would increase by 252 percent compared to existing conditions. Interference with recreational boating related to additional barges would be lessened to the extent that (1) alternative boating areas are available in the LOMR; (2) barges are not concentrated in one area; and (3) Condition C of the dredging restrictions is enforced. Under Condition C, the Dredgers must not dredge within 200 feet of any dike, revetment, or other structure (e.g., boat ramp) built or authorized by the U.S. Government; nor within 100 feet of any normal bank line or island, without special authorization. Also, many recreational boating trips likely would occur outside of the main channel, where the dredges and barges would operate. The number of dredges on the river would not change.

Kansas City, Waverly, Jefferson City, and St. Charles Segments

Under the Proposed Action, barge trips would increase because of increased material extraction by 53 percent (Kansas City segment), 48 percent (Waverly segment), 74 percent (Jefferson City segment), and 166 percent (St. Charles segment). Views of barges and necessary rerouting of recreational boating trips due to additional barges on the river would be reduced to the extent that (1) alternative boating areas are available in the LOMR; (2) barges are not concentrated in one area; and (3) Condition C of the dredging restrictions is enforced. Many recreational boating trips likely would occur outside of the main channel, where the dredges and barges would operate. The number of dredges on the river would not change.

[1] Boat ramps are addressed in Section 4.9.4.4 for the Proposed Action.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, changes in recreational boating at alternate source locations would not occur.

4.9.3.3 Changes in Access to Boat Ramps

St. Joseph Segment

As discussed in Section 3.5, boat ramps are susceptible to local scour and deposition as channel flow characteristics change over time; this can damage the base of the ramps and limit access to the river during low-flow periods when the ramp base may be exposed. Based on the data provided in Section 4.2, the areas adjacent to the onshore facilities in the St. Joseph segment (where the most dredging would occur under the Proposed Action) would likely experience slight river bed degradation in the short term and moderate to substantial river bed degradation in the long term. The St. Joseph segment also would experience a slight reduction in low-flow water surface elevations in the short term and moderate to substantial reductions in low-flow water surface elevations in the long term. The increases in river bed degradation and low-flow water surface elevations in the long term would increase the likelihood of scour problems and damage to boat ramps. Between RM 445 and RM 455, up to 4 feet of river bed degradation could occur as a result of dredging activities. The likelihood of scour problems and damage to boat ramps would be reduced to the extent that boat ramps are maintained to address damages and fluctuations in water surface elevations.

In the St. Joseph segment, the Holliday–St. Joseph reach has seven boat ramps. If a boat ramp in the Holliday–St. Joseph reach does not receive routine maintenance, suffers substantial scour damage, or does not operate at low-flow water surface elevations caused by increased dredging, that boat ramp could be unusable for entire seasons or portions of seasons during low-flow periods. Nearby alternate ramps could be used; therefore, no substantial loss of recreation opportunity or access would occur. However, given the magnitude of potential river bed degradation between RM 445 and RM 455 under the Proposed Action, several ramps could be inoperable at the same time, resulting in decreased access to boat ramps.

Kansas City Segment

In the Kansas City segment, the Holliday–Riverside reach, the Holliday–Randolph reach, and the proposed Master's–Waldron reach each has two boat ramps, which would allow continued access during low-flow periods if a ramp was damaged by scour. Under the Proposed Action, moderate river

bed degradation in the short term and substantial river bed degradation in the long term is likely to occur in the Kansas City segment. Reductions in low-flow water surface elevations would be moderate in the short term and substantial in the long term. If multiple boat ramps were damaged and forced to close, boat ramp access would be lost. If only one ramp in a specific reach was forced to close, the decrease in accessibility would be less because the other boat ramp would remain available. The likelihood of disruptions to boat ramp access in the Kansas City segment would increase in the long term under the Proposed Action.

Waverly Segment

In the Waverly segment, the Capital–Lexington and Capital–Carrollton reaches each have two boat ramps, which would allow continued access during low-flow periods if a ramp was damaged by scour. Under the Proposed Action, the Waverly segment would experience slight river bed degradation or aggradation in the short term, and slight degradation in the long term. Under the Proposed Action, the Waverly segment is expected to experience a slight decrease or increase in low-flow water surface elevations in the short term, and a slight decrease in the long term compared to existing conditions. These slight geomorphic effects would not likely lead to substantial ramp damage, to the point of necessitating closure. The Proposed Action would not likely result in disrupted access to recreational boat ramps in the short term or the long term in the Waverly segment.

Jefferson City Segment

In the Jefferson City segment, reaches with sand plants each have at least two boat ramps—except for the Capital–Jefferson City reach and the Capital–Boonville reach, each of which has one boat ramp. Access to the LOMR in the reaches with multiple ramps would not likely be disrupted during low-flow periods under the Proposed Action, as long as only a portion of ramps (or no ramps) in a reach was closed. Under the Proposed Action, the Jefferson City segment would experience moderate river bed degradation in the short term and substantial river bed degradation in the long term. Decreases in low-flow surface water elevations would be slight in the short term and moderate in the long term. If the boat ramp in the Capital Sand–Jefferson City reach (Noren boat ramp) and the boat ramp in the Capital Sand–Boonville reach (Franklin Island boat ramp) required closure during low-flow periods because of scour damage, boaters would need to find alternative public access points. One option for boaters using the Noren boat ramp would be the Capital View Access on Cedar Creek approximately 0.5 mile upstream from its confluence with the Missouri River. This site offers canoe access although canoes would need to be hand carried down to the launch site (MDC 2010). Although this instance would reduce boat ramp access, proper maintenance of the ramps to address scour issues would lessen the

likelihood of boat ramp closure. Under the Proposed Action, the likelihood of boat ramp access disruptions in the Jefferson City segment would increase in the long term.

St. Charles Segment

In the St. Charles segment, several sand plant reaches have only one nearby boat ramp. Under the Proposed Action, the St. Charles segment likely would experience moderate river bed degradation in the short term and substantial river bed degradation in the long term. Reductions in low-flow water surface elevations would be moderate in the short term and moderate to substantial in the long term under the Proposed Action. Where multiple boat ramps are present in a reach, a reduction in recreation access due to scour damage is unlikely because if one ramp is inaccessible, another ramp would be available nearby. However, if (1) proper maintenance to address scour issues was not completed on a single available ramp in a reach; and (2) river bed degradation damaged that ramp, boat ramp access would be disrupted and related recreational opportunities would decrease. The likelihood of disruptions to boat ramp access would increase in the long term in the St. Charles segment under the Proposed Action.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, changes in access to boat ramps at alternate source locations would not occur.

4.9.3.4 Changes in Wetlands-Related Recreational Opportunities

St. Joseph, Kansas City, Jefferson City, and St. Charles Segments

Under the Proposed Action, changes in groundwater levels could result in conversion of forested wetlands, scrub-shrub wetlands, and emergent wetlands suitable for several wetland-dependent state-listed species, migratory birds, and common wildlife species to upland forests, scrublands, and grasslands or seasonal wetlands more suitable to upland-dependent species. Conversion of wetlands to uplands also could remove these areas from federal regulation under Section 404 of the CWA and allow them to be cleared, filled, and used for agriculture, residential or commercial development. Conversion of wetland habitat to upland habitat could reduce recreational opportunities specifically related to wetlands, such as watching, hunting, trapping, and fishing wetland fish and wildlife species, particularly if the reduced opportunities occurred within designated recreation areas. However, within designated recreation areas, recreational opportunities such as hiking and camping, watching, hunting, and trapping upland wildlife would increase if wetlands were converted to uplands. The same impacts

could occur on private lands unless the landowner chooses to clear or develop those new uplands that were previously regulated as wetlands. Table 4.9-1 shows the acreage of potential wetland conversion for each segment by type of wetland habitat, as an indication of the potential disruptions to wetlands-related recreational opportunities.

Table 4.9-1 Potentially Converted Wetlands under the Proposed Action (acres)

Segment	Forested Wetlands	Scrub-Shrub Wetlands	Emergent Wetlands
St. Joseph	0	0	295.53
Kansas City	0	1.34	52.37
Waverly	0	0	0
Jefferson City	0	1.93	55.4
St. Charles	6.66	2.36	91.34

Waverly Segment

Under the Proposed Action, changes in groundwater levels potentially resulting in conversion or alteration of wetlands would not occur in the Waverly segment, or would be slight. Therefore, wetlands-related recreational opportunities in the Waverly segment are not expected to change.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, changes in wetland-related recreational opportunities at alternate source locations would not occur.

4.9.3.5 Changes in Access to Portions of Land-Based Recreation Trails

St. Joseph and Kansas City Segments

No land-based recreation trails of statewide or national importance are located in the St. Joseph or Kansas City segment. Therefore, no impacts on recreation trail access would occur in these segments under the Proposed Action.

Waverly Segment

Portions of the Katy Trail that are in the floodplain of the LOMR can be subject to washouts during flood events. These washouts can result in a temporary loss of access to portions of the trail and can damage the trail. An increase in high-flow water surface elevations could increase the likelihood,

frequency, extent, and magnitude of washouts. Under the Proposed Action, high-flow water surface elevations would not change in the Waverly segment; therefore, no change in the likelihood, frequency, extent, or magnitude of washouts would occur. Recreational trail closures related to washouts would not occur in the Waverly segment under the Proposed Action.

Jefferson City Segment

Portions of the Katy Trail and the paved portion of the Historic Trail in the Jefferson City segment are located in the floodplain and are prone to washouts during flood events. Under the Proposed Action, high-flow water surface elevations in the Jefferson City segment would increase in the long term, which could prolong or result in more frequent access limitations during flood events. Limits to trail access related to washouts under the Proposed Action would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR. The potential access limitations would be temporary and would occur during periods of low use (i.e., during or immediately following storms).

St. Charles Segment

Portions of the Katy Trail and the paved portion of the Historic Trail in the St. Charles segment are located in the floodplain and are prone to washouts during flood events. Under the Proposed Action, high-flow water surface elevations in the St. Charles segment would decrease in the short term and are likely to increase in the long term. Lower high-flow water surface elevations in the short term would result in reduced potential for washouts along the trail and increased recreational opportunities. In the long term, increased high-flow water surface elevations would lead to a greater likelihood, frequency, extent, and magnitude of washouts, resulting in more recreational trail closures related to washouts. Limits to trail access related to washouts under the Proposed Action would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR. The potential access limitations would be temporary and would occur during periods of low use (i.e., during or immediately following storms).

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, access to land-based recreational trails at alternate source locations would not change.

4.9.3.6 Changes in Recreational Fishing Opportunities

St. Joseph, Waverly, and Jefferson City Segments

The Proposed Action would increase the potential for fish entrainment, elevated noise, and elevated turbidity. Temporary localized noise avoidance behaviors in noise-sensitive fish species also would be expected with an increase in dredging. Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-native species). No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segment under the Proposed Action. To the extent that sport fish populations decline because of the increased dredging that would occur under the Proposed Action, recreational fishing opportunities also would decline.

Kansas City Segment

The Proposed Action would increase the potential for fish entrainment, elevated noise, and elevated turbidity as well as temporary localized injury or mortality to fish eggs, larvae, and macroinvertebrates by entrainment. Temporary localized noise avoidance behaviors in noise-sensitive fish species would be expected with an increase in dredging. Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-native species). Sand plant construction under the Proposed Action would require land-clearing activities that could result in overland runoff or erosion from uncontained storm water. This would increase the chances of discharge of pollutants (e.g., gasoline, oil, and grease) into water bodies and aquatic habitats, which could affect fishes and other aquatic life through toxic or sub-lethal effects on reproduction, growth, and recruitment. To the extent that sport fish populations decline because of increased dredging and sand plant construction, recreational fishing opportunities also would decline.

St. Charles Segment

The Proposed Action would substantially increase the number of dredging areas in the St. Charles segment, with a corresponding increase in the potential for entrainment, elevated noise, and elevated turbidity. The Proposed Action would result in an increase in temporary localized injury or mortality to fish eggs, larvae, and macroinvertebrates by entrainment. Temporary localized noise avoidance behaviors in noise-sensitive fish species also would be expected related to an increase in dredging. Localized increases in suspended sediment downstream of the dredge would benefit species that are

associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-native species). Sand plant construction would require land-clearing activities that could result in overland runoff or erosion from uncontained storm water. This would increase the chances of discharge of pollutants (e.g., gasoline, oil, and grease) into water bodies and aquatic habitats that could affect fishes and other aquatic life through toxic or sub-lethal effects on reproduction, growth, and recruitment. To the extent that sport fish populations decline because of increased dredging and sand plant construction, recreational fishing opportunities also would decline.

Alternate Sources

No alternate sources of supply would be required under the Proposed Action. Consequently, no changes would occur related to fish populations with no associated change to recreational fishing opportunities.

4.9.4 No Action Alternative

4.9.4.1 Changes in Existing or Planned Land Uses

All Segments

Under the No Action Alternative, no new facilities would be constructed that could conflict with zoning designations or affect adjacent land use. Abandonment of existing facilities could leave unused equipment and cleared and graded swaths of land near the river. Although this land would no longer be used for staging dredges or processing, the land could be used for other industrial uses requiring proximity to the river. The land would not necessarily be appropriate for conversion (at least in the short term) to recreational uses.

Alternate Sources

A substantial increase in reliance on alternate sources of sand and gravel would occur under the No Action Alternative. This analysis assumes that, in the short term, increased demand for sand and gravel would be met through supplies from currently permitted sources. An increase in production at the alternate source facilities has the potential to conflict with adjacent land uses. However, whether a land use conflict would occur cannot be determined without knowing the increase in production quantities, changes in operations, and specific facilities that would be used. In the long term, construction of new alternate source facilities has the potential to result in land use conflicts, depending

on the location of the planned facility.

4.9.4.2 Changes in Recreational Boating

All Segments

Under the No Action Alternative, no Dredgers would operate in the LOMR. Barge traffic in the river would be substantially reduced, increasing the river area available for recreational boaters and increasing recreational opportunities.

Alternate Sources

Potential alternate sources of material include dredging from the Mississippi River and would result in an increase in barge traffic on the Mississippi River. The Kansas River is dredged with pipeline dredges, and barges are not used. Increased barge traffic would result in a greater likelihood of barges interfering with the recreational boating experience on the Mississippi River. The interference with the recreational experience resulting from the presence of additional barges would be reduced to the extent that (1) alternate boating areas are available in the river; (2) barges are not concentrated in one area; and (3) dredgers remain a certain distance from the shoreline and boat ramps. Many recreational boating trips likely would occur outside of the main river channel, where the dredges and barges would operate.

4.9.4.3 Changes in Access to Boat Ramps

All Segments

Under the No Action Alternative, changes in river bed elevations in the short term would range from slight river bed degradation to moderate aggradation. In the long term, changes in river bed elevations would range from slight river bed degradation to moderate aggradation—except for aggradation in the Kansas City reach, which could be substantial. Changes in low-flow surface water elevations in the short term would range from no change to a moderate increase. In the long term, changes in low-flow surface water elevations would range from no change in the Waverly segment; to a slight increase in the St. Joseph, Jefferson City, and St. Charles segments; to a potentially substantial increase in the Kansas City segment. Aggradation would reduce the potential for scour damage at boat ramps in the LOMR because of the lower likelihood of the sediment supporting the base of the ramps being eroded away. A reduction in the potential for scour damage would increase the likelihood that ramps could stay open during low-flow periods and maintain boat access. The Kansas City segment could

experience the highest increase in consistency of access because of the greater potential for substantial aggradation and increases in low-flow water surface elevation in the long term under the No Action Alternative.

Alternate Sources

Under the No Action Alternative, dredging activities likely would increase on the Kansas and Mississippi Rivers. Although the specific amount of increase in dredging is not known, some river bed degradation could occur on these rivers. If dredging increases on the Kansas River, accelerated degradation is likely to occur in the reaches where increased dredging occurs. Dredging may be halted when degradation reaches a certain threshold, dictated by dredging regulations on the Kansas River. Impacts on boat ramps would vary depending on the location of the dredging activities, extent and proximity of dredging, and associated changes in water surface elevation and river bed degradation rates. Any increase in river bed degradation could potentially increase scour at boat ramps on the Kansas and Mississippi Rivers. As a result, recreational access provided by boat ramps at alternate source locations could be disrupted.

4.9.4.4 Changes in Wetlands-Related Recreational Opportunities

All Segments

Under the No Action Alternative, no indirect impacts to wetlands related to dredging activities would occur in the LOMR. However, if open-pit mines are developed in the Missouri River floodplain in the long term, wetlands could be lost or converted to other habitat types, such as upland habitat. A loss in wetlands-related recreational opportunities would accompany the loss or conversion of wetlands.

Alternate Sources

The potential indirect effects of using alternate sources have not been quantified because the locations of alternate sources are not known at this time. However, river bed degradation associated with alternate sources of sand and gravel under the No Action Alternative could result in localized indirect effects on floodplain wetlands as a result of changes in surface water and groundwater surface elevations on the Kansas and Mississippi Rivers. This loss of wetlands could affect several state-listed species, migratory birds, and numerous common wildlife species by removal of suitable habitat. The loss of habitat could reduce recreational opportunities related to wetlands, particularly in designated recreation areas.

4.9.4.5 Changes in Access to Portions of Land-Based Recreation Trails

St. Joseph and Kansas City Segments

No land-based recreation trails of statewide or national importance exist in the St. Joseph or Kansas City segments. Therefore, recreation trail access would not change in these segments under the No Action Alternative.

Waverly Segment

Under the No Action Alternative, high-flow water surface elevations would not change in the Waverly segment. Therefore, the potential for washouts to occur and limit access along the Katy Trail and the Historic Trail would not change. Use of or access to the Katy Trail would not change under the No Action Alternative.

Jefferson City Segment

Under the No Action Alternative, high-flow water surface elevations likely would continue to follow existing long-term trends in the Jefferson City segment and likely would increase in the long term. The potential long-term increase in high-flow water surface elevations could increase the frequency or extent of washouts along the Katy Trail and the paved portion of the Historic Trail. Limits to trail access related to washouts would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR. The access limitations would be temporary and likely would occur during periods of low use (i.e., during or immediately following storms).

St. Charles Segment

High-flow water surface elevations are likely to increase in the St. Charles segment in the short term and long term under the No Action Alternative. The potential increase in high-flow water surface elevations could increase the frequency or extent of washouts along the Katy Trail and the paved portion of the Historic Trail. Limits to trail access related to washouts would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR. The access limitations would be temporary and likely would occur during periods of low use (i.e., during or immediately following storms).

Alternate Sources

It is not currently known how much dredging would increase along the Kansas and Mississippi Rivers; however, river bed degradation likely would occur in areas of increased dredging. If high-flow water

surface elevations decreased because of river bed degradation, the likelihood of washouts could decrease along any recreation trails located in the floodplain of either river, and access and recreational opportunities would increase. Recreation trail access could improve under the No Action Alternative.

4.9.4.6 Changes in Recreational Fishing Opportunities

All Segments

Because the No Action Alternative does not include dredging in the LOMR, fish populations would not experience entrainment or temporary behavioral modifications related to noise. No new facilities would be constructed in any segment under the No Action Alternative. Recreational fishing opportunities would not change in the long term.

Alternate Sources

Dredging in the Mississippi and Kansas Rivers under the No Action Alternative would result in similar impacts on aquatic species related to entrainment, noise, and turbidity as described for the LOMR. Development or expansion of upland, floodplain, or instream open-pit mines would not directly affect aquatic resources but could result in the removal of riparian habitat and introduction of contaminants via storm water (Section 4.5). These changes in water quality could result in behavioral changes, toxicity, and decreased reproductive success in fish. To the extent that these changes result in declining fish populations, recreational fishing opportunities would decrease.

4.9.5 Alternative A

4.9.5.1 Changes in Existing or Planned Land Uses

St. Joseph, Waverly, and Jefferson City Segments

No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segment under Alternative A. Existing facilities in these segments would experience an increase (St. Joseph segment) or decrease (Waverly and Jefferson City segments) in processing quantities, which would not affect adjacent agricultural or industrial land use. Therefore, no change in land use or adverse effects to adjacent land use would occur in these segments.

Kansas City Segment

Under Alternative A, The Master's Dredging Company would construct a new 20- to 60-acre onshore sand plant in the Kansas City segment near RM 388 on land designated by Platte County for

agricultural use. The proposed facility would be constructed on land with a soil designation of prime farmland and a zoning designation of agricultural. Whether the land is in current agricultural production is unknown. The sand plant would convert up to 60 acres from an agricultural designation in Platte County, which would conflict with the designated land use. Industrial use is not allowed under the current agricultural zoning designation. Platte County would require a zoning change and a special use permit. The maximum 60 acres that would be converted represents 0.06 percent of the 93,138.7 acres of prime farmland in Platte County. This reduction in prime farmland therefore would be minimal.

The land adjacent to the proposed facility is designated by Platte County as agricultural; however, the proposed industrial facilities would not conflict with adjacent land uses because the sand plant would not prevent or hinder agricultural use. All other Dredgers in the Kansas City segment would use existing facilities that are in compliance with local land use designations. Existing facilities would continue to operate as they do now, except that processing amounts would decrease under Alternative A.

St. Charles Segment

Under Alternative A, the Edward N. Rau Contractor Company would construct a new onshore facility (Rau–Washington) in the St. Charles segment near RM 67. The sand plant would be built on land designated by the City of Washington for heavy industrial use and therefore would not conflict with the zoning designation. The land appears undeveloped and is partially vegetated. The area adjacent to the proposed facility site is also zoned for heavy industrial use; therefore, the facility would not conflict with an adjacent land use designation. Existing facilities in the St. Charles segment would continue to operate as they do now, except that processing quantities would be lower under Alternative A. Reduced processing quantities would not disrupt adjacent land use.

Alternate Sources

Under Alternative A, reliance on alternate sources of sand and gravel would increase compared to existing conditions. This analysis assumes that increased demand for sand and gravel in the short term would be met through supplies from currently permitted sources. An increase in production at the alternate source facilities has the potential to conflict with adjacent land uses. However, whether a land use conflict would occur cannot be determined without knowing the increase in production quantities, changes in operations, and specific facilities that would be used. In the long term, construction of new alternate source facilities has the potential to result in land use conflicts, depending on the location of the planned facility.

4.9.5.2 Changes in Recreational Boating

St. Joseph Segment

Under Alternative A, increases in barge traffic would occur related to increased dredging. Barge trips would increase by 7 percent in the St. Joseph reach. Interference with recreational boating related to additional barges would be reduced to the extent that (1) alternative boating areas are available in the LOMR; (2) barges are not concentrated in one area; and (3) Condition C of the dredging restrictions is enforced. Also, many recreational boating trips likely would occur outside of the main channel, where the dredges and barges would operate. The number of dredges on the river would not change.

Kansas City, Waverly, Jefferson City, and St. Charles Segments

Under Alternative A, less dredging (26–80 percent) would occur in the Kansas City, Waverly, Jefferson City, and St. Charles segments compared to existing conditions. Less dredging would result in a reduction of barge traffic and less interference with recreational boaters.

Alternate Sources

Under Alternative A, increased amounts of material dredged from the Mississippi River would result in an increase in barge traffic on the Mississippi River. The Kansas River is dredged with pipeline dredges, and barges are not used. More barge traffic would result in a greater potential for conflicts with recreational boaters on the Mississippi River. To the extent that alternate areas for boating are available on the river and restrictions on dredging near boat ramps and other recreational facilities would be enforced (similar to those on the LOMR), potential conflicts with recreational boaters would be reduced.

4.9.5.3 Changes in Access to Boat Ramps

St. Joseph Segment

Under Alternative A, slight river bed degradation or aggradation likely would occur in the short term in the St. Joseph segment, with a potential for slight river bed degradation in the long term. Low-flow water surface elevations likely would be slightly reduced in the long term. These slight changes in low-flow water surface elevations would not likely result in substantial changes in the potential for scour to damage boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Kansas City Segment

Under Alternative A, slight river bed degradation or aggradation likely would occur in the short term in the Kansas City segment, and slight aggradation likely would occur in the long term. Low-flow water surface elevations could increase or decrease slightly in the short term and likely would increase slightly in the long term. Slight changes would not likely result in substantial changes in the potential for scour to damage boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Waverly Segment

Slight river bed degradation or aggradation likely would occur under Alternative A in the short term and the long term in the Waverly segment. Water surface elevations would remain similar to existing conditions. Slight changes in river bed or water surface elevations would not substantially change the potential for scour to damage boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Jefferson City Segment

Slight river bed degradation or aggradation would like occur in the short term in the Jefferson City Segment under Alternative A, and slight river bed degradation likely would occur in the long term. A slight reduction or increase in low-flow water surface elevations would occur in the short term, and a slight decrease would occur in the long term. Slight changes in river bed or water surface elevations are not likely to substantially change the potential for scour to damage boat ramps.

St. Charles Segment

Slight river bed degradation or aggradation likely would occur in the short term and the long term in the St. Charles segment under Alternative A. Slight decreases or increases in low-flow water surface elevations likely would occur in the short term and the long term. Slight changes would not likely result in substantial changes in the potential for scour to damage boat ramps.

Alternate Sources

Under Alternative A, increased reliance on alternate sources of sand and gravel likely would increase dredging activities on the Kansas and Mississippi Rivers, which could result in some river bed degradation on these rivers. If dredging increases on the Kansas River, accelerated degradation is

likely to occur in the reaches where dredging increases occur. Dredging may be halted when degradation reaches a certain threshold, dictated by dredging regulations on the Kansas River. Impacts on boat ramps would vary depending on the location of boat ramps, the location of dredging activities, the extent and proximity of dredging, and associated changes in water surface elevation and river bed degradation rates. Any increase in river bed degradation could potentially increase scour at boat ramps on the Kansas and Mississippi Rivers, potentially resulting in more frequent ramp closures and decreased recreational access. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

4.9.5.4 Changes in Wetlands-Related Recreational Opportunities

All Segments

Under Alternative A, changes in groundwater levels that could result in conversion or alteration of wetlands would not take place or would be slight. Therefore, wetlands-related recreational opportunities are not expected to change in any of the segments because of changes in groundwater.

If open-pit mines are developed in the Missouri River floodplain in the long term, wetlands could be lost or converted to other habitat types, such as upland habitat, which could affect wetlands-related recreational opportunities.

Alternate Sources

The potential indirect effects on wetlands-related recreational opportunities related to increased reliance on alternate sources for production of sand and gravel have not been quantified because the locations of the alternative sources are not known at this time. However, river bed degradation associated with dredging at alternate sources could result in localized indirect effects on floodplain wetlands caused by changes in surface water and groundwater surface levels on the Kansas and Mississippi Rivers. This loss of wetlands could result in loss of suitable habitat for several state-listed species, migratory birds, and numerous common wildlife species. The loss of habitat would potentially reduce recreational opportunities related to wetlands, particularly in designated recreation areas.

4.9.5.5 Changes in Access to Portions of Land-Based Recreation Trails

St. Joseph and Kansas City Segments

No land-based recreation trails of statewide or national importance are located in the St. Joseph or Kansas City segment. Recreation trail access in these segments would not change under Alternative A.

Waverly and St. Charles Segments

Under Alternative A, high-flow water surface elevations would not change, nor would the frequency or severity of washouts along the Katy Trail or the paved portions of the Historic Trail. Recreation trail access would not be affected in these segments under Alternative A.

Jefferson City Segment

The potential long-term increase in high-flow water surface elevations in the Jefferson City segment that would occur under Alternative A could increase the frequency and extent of washouts along the Katy Trail and the paved portion of the Historic Trail. Limits to trail access related to washouts would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR.

Alternate Sources

It is not currently known how much dredging would increase along the Kansas and Mississippi Rivers because of reliance on alternate sources of sand and gravel under Alternative A; however, river bed degradation likely would occur in areas of increased dredging. If high-flow water surface elevations decreased because of river bed degradation, washouts could be less likely along recreation trails in the floodplain of either river, which would increase access and recreational opportunities.

4.9.5.6 Changes in Recreational Fishing Opportunities

St. Joseph Segment

Under Alternative A, entrainment, noise, and suspended sediment effects on individual aquatic species would be similar to those occurring under existing conditions. No change to recreational fishing would occur in the St. Joseph segment.

Kansas City and St. Charles Segments

Sand plant construction would require land-clearing activities that could result in overland runoff or erosion from uncontained storm water. This would increase the chances of discharge of pollutants (e.g., gasoline, oil, and grease) into water bodies and aquatic habitats that could affect fishes and other aquatic life through toxic or sub-lethal effects on reproduction, growth, and recruitment. To the extent that fish populations decline, recreational fishing opportunities would decrease.

Waverly and Jefferson City Segments

A decrease in the number of fish eggs, larvae, and macroinvertebrates that would be entrained would occur in the Waverly and Jefferson City segments under Alternative A. Because less noise would be produced under Alternative A, the short-term localized avoidance behaviors in noise-sensitive fish species would decrease. Given that dredging impacts on suspended sediment levels are localized and natural background sediment concentrations are relatively high in the LOMR, Alternative A would result in a minor, short-term improvement in water quality in these segments that would alleviate potential elevated suspended sediment effects on fish and macroinvertebrate communities. To the extent that these effects do not change fish populations, recreational fishing opportunities would not change.

Alternate Sources

Dredging in the Mississippi and Kansas Rivers would result in similar impacts on aquatic species related to entrainment, noise, and turbidity as described for the LOMR. Development or expansion of upland, floodplain, or instream open-pit mines would not directly affect aquatic resources but could result in the removal of riparian habitat and introduction of contaminants via storm water (Section 4.5). These changes in water quality could result in behavioral changes, toxicity, and decreased reproductive success in fish. To the extent that these changes result in declining fish populations, recreational fishing opportunities would decrease.

4.9.6 Alternative B

4.9.6.1 Changes in Existing or Planned Land Uses

St. Joseph, Waverly, and Jefferson City Segments

No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segment under Alternative B. Existing facilities in these segments would experience an increase (St. Joseph and Waverly segments) or decrease (Jefferson City segment) in processing quantities, which would not

affect adjacent agricultural or industrial land use. Therefore, no change in land use or adverse impact to adjacent land use would occur in these segments under Alternative B.

Kansas City Segment

Under Alternative B, The Master's Dredging Company would construct a new 20- to 60-acre onshore facility in the Kansas City segment near RM 388 on land designated by Platte County for agricultural use. The proposed facility would be constructed on land with a soil designation of prime farmland and a zoning designation of agricultural. Whether the land is in current agricultural production is unknown. The proposed sand plant would convert up to 60 acres from an agricultural designation in Platte County, which would conflict with the designated land use. Industrial use is not allowed under the current agricultural zoning designation. Platte County would require a zoning change and a special use permit. The maximum 60 acres that would be converted represents 0.06 percent of the 93,138.7 acres of prime farmland in Platte County. The adverse impact to prime farmland would therefore be minimal.

The land adjacent to the proposed sand plant is designated by Platte County as agricultural; however, the proposed industrial facilities would not conflict with adjacent land uses because the sand plant would not prevent or hinder agricultural use. All other Dredgers in the Kansas City segment would use existing facilities that are in compliance with local land use designations. Existing facilities in the Kansas City segment would continue to operate as they do now, except that processing amounts would decrease under Alternative B compared to existing conditions.

St. Charles Segment

Under Alternative B, the Edward N. Rau Contractor Company would construct a new onshore facility (Rau–Washington) in the St. Charles segment near RM 67. The facility would be built on land designated by the City of Washington for heavy industrial use and therefore would not conflict with the zoning designation. The land appears undeveloped and is partially vegetated. The area adjacent to the proposed facility site is also zoned for heavy industrial use; therefore, the facility would not conflict with the adjacent land use. Existing facilities in the St. Charles segment would continue to operate as they do now, except that processing quantities would be lower under Alternative B compared to existing conditions, which would not disrupt adjacent land use.

Alternate Sources

Under Alternative B, reliance on alternate sources of sand and gravel would increase. This analysis assumes that increased demand for sand and gravel would be met through supplies from currently

permitted sources in the short term. An increase in production at the alternate source facilities could potentially conflict with adjacent land uses. However, whether a land use conflict would occur cannot be determined without knowing the increase in production quantities, changes in operations, and specific facilities that would be used. In the long term, construction of new alternate source facilities has the potential to result in land use conflicts, depending on the location of the planned facility.

4.9.6.2 Changes in Recreational Boating

St. Joseph and Waverly Segments

Increases in barge traffic would accompany increased dredging in the St. Joseph and Waverly segments under Alternative B. Barge trips would increase by 163 percent in the St. Joseph reach and 68 percent in the Waverly reach. Interference with recreational boating because of additional barges would be reduced to the extent that (1) alternative boating areas are available in the LOMR; (2) barges are not concentrated in one area; and (3) Condition C of the dredging restrictions is enforced. In addition, many recreational boating trips likely would occur outside of the main channel, where the dredges and barges would operate. The number of dredges on the river would not change.

Kansas City, Jefferson City, and St. Charles Segments

Under Alternative B, less dredging (38–54 percent) would occur in the Kansas City, Jefferson City, and St. Charles segments compared to existing conditions. Less dredging would result in a reduction of barge traffic and less interference with recreational boaters.

Alternate Sources

Under Alternative B, increased amounts of material dredged from the Mississippi River would result in an increase in barge traffic on the Mississippi River. The Kansas River is dredged with pipeline dredges, and barges are not used. More barge traffic would result in a greater potential for conflicts with recreational boaters on the Mississippi River. To the extent that alternate areas for boating are available on the river and restrictions to dredging near boat ramps and other recreational facilities would be enforced (similar to those on the LOMR), conflicts with recreational boaters would be reduced.

4.9.6.3 Changes in Access to Boat Ramps

St. Joseph Segment

Under Alternative B, slight river bed degradation would occur in the short term in the St. Joseph segment, and slight to moderate river bed degradation would occur in the long term. Low-flow water surface elevations would decrease slightly in the short term and would decrease slightly to moderately in the long term. Potentially moderate levels of river-bed degradation and decreases in low-flow water surface elevations in the long term would increase the likelihood of scour problems and damage to boat ramps, also in the long term. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Kansas City Segment

Under Alternative B, river bed degradation and decreases in low-flow water surface elevations in the Kansas City segment would be slight in the short term. Moderate river bed degradation and slight to moderate decreases in low-flow water surface elevations, in the long term, could increase the likelihood of scour problems and damage to boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Waverly Segment

Under Alternative B, changes in river bed elevation and low-flow water surface elevations in the Waverly segment would be slight in the short term. Slight river bed degradation and decreases in low-flow water surface elevations that would occur in the long term would not likely result in substantial changes in the potential for scour to damage boat ramps.

Jefferson City Segment

Under Alternative B, slight river bed degradation would occur in the short term in the Jefferson City segment, and slight decreases in low-flow water surface elevations would occur in the long term. Slight to moderate river bed degradation that would occur in the long term could increase the likelihood of scour problems and damage to boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

St. Charles Segment

Under Alternative B, slight river bed degradation would occur in the short term in the St. Charles segment. Slight to moderate river bed degradation and decreases in low-flow water surface elevations that would occur in the long term could increase the likelihood of scour problems and damage to boat ramps. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Alternate Sources

Under Alternative B, dredging activities likely would increase on the Kansas and Mississippi Rivers. Although the amount of dredging that would occur is currently unknown, some river bed degradation on these rivers could occur. If dredging increases on the Kansas River, accelerated degradation is likely to occur in the reaches where increased dredging occurs. Dredging may be halted when degradation reaches a certain threshold, dictated by dredging regulations on the Kansas River. Impacts on boat ramps would vary depending on the location of boat ramps, the location of the dredging activities, the extent and proximity of dredging, and associated changes in water surface elevation and river bed degradation rates. Any increase in river bed degradation could increase scour at boat ramps on the Kansas and Mississippi Rivers and could result in closure of boat ramps and disrupted recreational access. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

4.9.6.4 Changes in Wetlands-Related Recreational Opportunities

St. Joseph, Kansas City, and St. Charles Segments

Under Alternative B, changes in groundwater levels could result in conversion of forested wetlands, scrub-shrub wetlands, and emergent wetlands suitable for several wetland-dependent state-listed species, migratory birds, and common wildlife species to upland forests, scrublands, and grasslands or seasonal wetlands more suitable to upland-dependent species. Also, this conversion of wetlands to uplands could remove these areas from federal regulation under Section 404 of the CWA and allow them to be cleared, filled, and used for agriculture or residential or commercial development. Conversion of wetland habitat to upland habitat could reduce recreational opportunities specifically related to wetlands, such as watching, hunting, trapping, and fishing wetland fish and wildlife species, particularly if the reduced opportunities occurred within designated recreation areas. However, within designated recreation areas, recreational opportunities such as hiking and camping, and watching, hunting, and trapping upland wildlife would increase if wetlands were converted to uplands. The same

impacts could occur on private lands unless the landowner chooses to clear or develop those new uplands that were previously regulated as wetlands. Table 4.9-2 shows the acreage of wetland loss for these segments by type of wetland habitat, as an indication of the potential disruptions to wetlands-related recreational opportunities.

Table 4.9-2 Potentially Converted Wetlands under Alternative B (acres)

Segment	Forested Wetlands	Scrub-Shrub Wetlands	Emergent Wetlands
St. Joseph	0	0	295.53
Kansas City	0	1.34	52.37
Waverly	0	0	0
Jefferson City	0	0	0
St. Charles	6.66	2.36	91.34

If open-pit mines are developed in the Missouri River floodplain in the long term, wetlands could be lost or converted to other habitat types, such as upland habitat. A loss in wetlands-related recreational opportunities would accompany the loss or conversion of wetlands.

Waverly and Jefferson City Segments

Under Alternative B, changes in groundwater levels potentially resulting in conversion or alteration of wetlands would not occur or would be slight in the Waverly and Jefferson City segments. Therefore, wetlands-related recreational opportunities are not expected to change in these segments because of changes in groundwater.

Alternate Sources

River bed degradation associated with dredging alternate sources under Alternative B could cause localized indirect effects on floodplain wetlands because of changes in surface water and groundwater surface levels on the Kansas and Mississippi Rivers. This loss of wetlands could result in loss of suitable habitat for several state-listed species, migratory birds, and numerous common wildlife species. The loss of habitat could reduce recreational opportunities related to wetlands, particularly if the loss occurred in designated recreation areas.

4.9.6.5 Changes in Access to Portions of Land-Based Recreation Trails

St. Joseph and Kansas City Segments

No land-based recreation trails of statewide or national importance are located in the St. Joseph or Kansas City segments; consequently, recreation trail access would not change under Alternative B in these segments.

Waverly Segment

Under Alternative B, high-flow water surface elevations would not change in the Waverly segment. The frequency or severity of washouts along the Katy Trail or the paved portion of the Historic Trail would not change.

Jefferson City and St. Charles Segments

Under Alternative B, the potential long-term increase in high-flow water surface elevations that would occur could increase the frequency or extent of washouts along the Katy Trail and the paved portion of the Historic Trail in the Jefferson City and St. Charles segments. Limits to trail access related to washouts would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR.

Alternate Sources

Under Alternative B, river bed degradation likely would occur in areas of increased dredging of alternate sources. If high-flow water surface elevations decreased because of river bed degradation, washouts could be less likely along recreation trails in the floodplain of either the Kansas or Mississippi River, which would increase access and recreational opportunities.

4.9.6.6 Changes in Recreational Fishing Opportunities

St. Joseph Segment

Under Alternative B, the potential for entrainment, elevated noise, and elevated turbidity would increase. Increased dredging would result in temporary localized increases in injury or mortality to fish eggs, larvae, and macroinvertebrates by entrainment. Temporary localized noise avoidance behaviors in noise-sensitive fish species would also be expected related to an increase in dredging. Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to

increased levels of suspended sediment (such as non-natives). To the extent fish populations decline, recreational fishing opportunities would decrease.

Kansas City Segment

Under Alternative B, the number of fish eggs, larvae, and macroinvertebrates that would be entrained would decrease. This alternative would decrease the short-term localized avoidance behaviors in noise-sensitive fish species. The minor short-term improvement in water quality in these segments would alleviate potential effects of elevated suspended sediment on fish and macro-invertebrate communities. Sand plant construction under Alternative B would require land-clearing activities during construction that could result in overland runoff or erosion from uncontained storm water. These changes in water quality could result in acute or chronic toxicity and sub-lethal effects that could affect reproduction, growth, and recruitment in individuals downstream of the new sand plant facilities. Recreational fishing opportunities would decline to the extent that fish populations decline.

Waverly Segment

The potential for entrainment, elevated noise, and elevated turbidity would increase. Increased dredging would result in temporary localized increases in injury or mortality to fish eggs, larvae, and macroinvertebrates by entrainment. Temporary localized noise avoidance behaviors in noise-sensitive fish species also would be expected. Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-natives). Recreational fishing opportunities would decline to the extent that fish populations decline.

Jefferson City Segment

Under Alternative B, the number of fish eggs, larvae, and macroinvertebrates that would be entrained would decrease. This alternative would decrease the short-term localized avoidance behaviors in noise-sensitive fish species. The minor short-term improvement in water quality in these segments would alleviate potential effects of elevated suspended sediment on fish and macroinvertebrate communities. Recreational fishing opportunities would decline to the extent that fish populations decline.

St. Charles Segment

The number of fish eggs, larvae, and macroinvertebrates that would be entrained would decrease. This alternative would decrease the short-term localized avoidance behaviors in noise-sensitive fish species. The minor short-term improvement in water quality in these segments would alleviate potential elevated suspended sediment effects on fish and macroinvertebrate communities. Sand plant construction under Alternative B would require land-clearing activities during construction that could result in overland runoff or erosion from uncontained storm water. This would increase the chances of discharge of pollutants (e.g., gasoline, oil, grease) into water bodies and aquatic habitats that could affect fishes and other aquatic life through toxic or sub-lethal effects on reproduction, growth, and recruitment. Recreational fishing opportunities would decline to the extent that fish populations decline.

Alternate Sources

Dredging in the Mississippi and Kansas Rivers would result in similar impacts on aquatic species related to entrainment, noise, and turbidity as described for the LOMR. Development or expansion of upland, floodplain, or instream open-pit mines would not directly affect aquatic resources but could result in the removal of riparian habitat and introduction of contaminants via storm water (Section 4.5). These changes in water quality could result in behavioral changes, toxicity, and decreased reproductive success in fish. To the extent that these changes result in declining fish populations, recreational fishing opportunities would decrease in alternate source locations.

4.9.7 Alternative C

4.9.7.1 Changes in Existing or Planned Land Uses

St. Joseph, Waverly, and Jefferson City Segments

No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segment under Alternative C. Existing facilities in these segments would experience an increase (St. Joseph and Waverly segments) or decrease (Jefferson City segment) in processing quantities, which would not affect adjacent agricultural or industrial land use. Therefore, no change in land use or adverse impact to adjacent land use would occur in these segments under Alternative C.

Kansas City Segment

Under Alternative C, The Master's Dredging Company would construct a new 20- to 60-acre onshore facility in the Kansas City segment near RM 388 on land designated by Platte County for agricultural

use. The proposed facility would be constructed on land with a soil designation of prime farmland and a zoning designation of agricultural. Whether the land is in current agricultural production is unknown. The proposed sand plant would convert up to 60 acres from an agricultural designation in Platte County, which would conflict with the designated land use. Industrial use is not allowed under the current agricultural zoning designation. Platte County would require a zoning change and a special use permit. The maximum 60 acres that would be converted represents 0.06 percent of the 93,138.7 acres of prime farmland in Platte County. The adverse impact to prime farmland therefore would be minimal.

The land adjacent to the proposed sand plant is designated by Platte County as agricultural; however, the proposed industrial facilities would not conflict with adjacent land uses because the sand plant would not prevent or hinder agricultural use. All other Dredgers in the Kansas City segment would use existing facilities that are in compliance with local land use designations. Existing facilities in the Kansas City segment would continue to operate as they do now, except that processing amounts would decrease under Alternative C compared to existing conditions.

St. Charles Segment

Under Alternative C, the Edward N. Rau Contractor Company would construct a new onshore facility (Rau–Washington) in the St. Charles segment near RM 67. The facility would be built on land designated by the City of Washington for heavy industrial use and therefore would not conflict with the zoning designation. The land appears undeveloped and is partially vegetated. The area adjacent to the proposed facility site is also zoned for heavy industrial use; therefore, the facility would not conflict with the adjacent land use. Existing facilities in the St. Charles segment would continue to operate as they do now, except that processing quantities would be lower under Alternative C, which would not disrupt adjacent land use.

Alternate Sources

Under Alternative C, no new alternate sources of sand and gravel would be required. Therefore, no new construction would occur either in the short term or the long term for the purposes of providing alternate sources of sand and gravel.

4.9.7.2 Changes in Recreational Boating

All Segments

Under Alternative C, dredging would be similar to existing conditions. No additional barge traffic would be present under Alternative C. Therefore, increased interference with recreational boaters would not occur.

Alternate Sources

No new alternate sources would be required under Alternative C. Therefore, no new dredging would occur on the Kansas or Mississippi River, and no changes to recreational boating would occur on those rivers.

4.9.7.3 Changes in Access to Boat Ramps

St. Joseph Segment

Under Alternative C, slight river bed aggradation or degradation in the short term, and slight river bed degradation in the long term would occur in the St. Joseph segment. Low-flow surface water elevations would slightly decrease in the long term. Slight changes are not likely to result in substantial changes in the potential for scour to damage boat ramps.

Kansas City Segment

Under Alternative C, slight to moderate river bed degradation and decreases in low-flow water surface elevations would occur in the short term. Substantial river bed degradation and moderate to substantial decreases in low-flow surface water elevations would occur in the long term. If multiple boat ramps are damaged and forced to close, boat ramps would become less accessible. If only one ramp in a specific reach was forced to close, another boat ramp would remain available. The likelihood of disruptions to boat ramp access would increase in the long term. Proper maintenance of boat ramps would reduce the likelihood of scour problems and damage from fluctuations in water surface elevations, and the resulting disruptions to recreational uses.

Waverly Segment

Under Alternative C, slight river bed aggradation or degradation would occur in the short term and the long term in the Waverly segment. Low-flow surface water elevations would not change. Slight changes are not likely to result in substantial changes in the potential for scour to damage boat ramps.

Jefferson City Segment

Under Alternative C, slight river bed degradation would occur in the short term, and moderate to substantial river bed degradation would occur in the long term in the Jefferson City segment. Low-flow surface water elevations would decrease slightly in the short term, and would experience moderate to substantial decreases in the long term. If the boat ramp in the Capital Sand—Jefferson City reach (Noren boat ramp) and the boat ramp in the Capital Sand—Boonville reach (Franklin Island boat ramp) were damaged by scour and required closure during low-flow periods, no other public access points would be available near the reach. Although this instance would disrupt boat ramp access, proper maintenance of the ramps to address scour issues would reduce the likelihood of needing to close the boat ramps. The likelihood of boat ramp access disruptions would increase in the long term.

St. Charles Segment

Under Alternative C, slight river bed degradation in the St. Charles segment would occur in the short term; moderate to substantial river bed degradation likely would occur in the long term. Low-flow water surface elevations would decrease slightly in the short term and decrease slightly to moderately in the long term. If proper maintenance to address scour issues was not completed on a ramp on which a reach is solely dependent, and river bed degradation or low-flows damaged that ramp, boat ramp access would be disrupted and related recreational opportunities would decrease. The likelihood of boat ramp access disruptions would increase in the long term in the St. Charles segment under Alternative C.

4.9.7.4 Changes in Wetlands-Related Recreational Opportunities

Kansas City, Jefferson, and St. Charles Segments

Under Alternative C, changes in groundwater levels in the Kansas City, Jefferson City, and St. Charles segments could result in conversion of forested wetlands, scrub-shrub wetlands, and emergent wetlands suitable for several wetland-dependent state-listed species, migratory birds, and common wildlife species to upland forests, scrublands, and grasslands or seasonal wetlands more suitable to upland-dependent species. Also, this conversion of wetlands to uplands could remove these areas from federal regulation under Section 404 of the CWA and allow them to be cleared, filled, and used for agriculture or residential or commercial development. Conversion of wetland habitat to upland habitat could reduce recreational opportunities specifically related to wetlands, such as watching, hunting, trapping, and fishing wetland fish and wildlife species, particularly if the reduced opportunities occurred within designated recreation areas. However, within designated recreation areas, recreational

opportunities such as hiking and camping, and watching, hunting, and trapping upland wildlife would increase if wetlands were converted to uplands. The same impacts could occur on private lands unless the landowner chooses to clear or develop those new uplands that were previously regulated as wetlands. Table 4.9-3 shows the acreage of wetland loss by type of wetland habitat, as an indication of the potential disruptions to wetlands-related recreational opportunities.

Table 4.9-3 Potentially Converted Wetlands under Alternative C (acres)

Segment	Forested Wetlands	Scrub-Shrub Wetlands	Emergent Wetlands
St. Joseph	0	0	0
Kansas City	0	1.34	52.37
Waverly	0	0	0
Jefferson City	0	1.93	55.4
St. Charles	6.66	2.36	91.34

St. Joseph and Waverly Segments

Under Alternative C, changes in groundwater levels potentially resulting in conversion or alteration of wetlands would not occur or would be slight in the Waverly and Jefferson City segments. Therefore, wetlands-related recreational opportunities are not expected to change because of changes in groundwater in these segments.

Alternate Sources

Under Alternative C, dredging at alternate locations would not be required to meet regional demand. Therefore, floodplains and wetlands would not change, and no changes to wetlands-related recreational activities would occur.

4.9.7.5 Changes in Access to Portions of Land-Based Recreation Trails

St. Joseph and Kansas City Segments

No land-based recreation trails of statewide or national importance are located in the St. Joseph or Kansas City segment; therefore, no impacts on recreation trail access would occur under Alternative C.

Waverly Segment

Under Alternative C, high-flow surface water elevations in the Waverly segment would not change, with no associated potential increase in the occurrence or severity of washouts along the Katy Trail and the Historic Trail.

Jefferson City and St. Charles Segments

Under Alternative C, high-flow water surface elevations would increase in the long term in the Jefferson City and St. Charles segments, which could prolong or make more frequent access limitations during flood events. Limits to trail access related to washouts would be reduced to the extent that the trails are regularly maintained and repaired, as needed, by the MDNR. The access limitations would be temporary and likely would occur during periods of low use (i.e., during or immediately following storms).

Alternate Sources

No additional dredging would occur at alternate sources that could change high-flow water surface elevations. Therefore, no disruptions to trail access would occur under Alternative C related to using alternate sources for sand and gravel.

4.9.7.6 Changes in Recreational Fishing Opportunities

St. Joseph, Waverly, and Jefferson City Segments

Under Alternative C, the rate of entrainment and noise production would not change substantially. Recreational fishing opportunities therefore would not change.

Kansas City and St. Charles Segments

Sand plant construction under Alternative C would require land-clearing activities in the St. Charles segment during construction that could result in overland runoff or erosion from uncontained storm water. These changes in water quality could impact reproduction, growth, and recruitment or result in the mortality of individual aquatic species downstream of the new sand plant facilities. Recreational fishing opportunities would decrease to the extent that fish populations decline.

Alternate Sources

No alternate sources of supply would be required under Alternative C; therefore, no changes in fish population or related changes in recreational fishing opportunities would occur.

4.9.8 Summary of Impacts

Table 4.9-4 presents a summary of potential impacts on land use and recreation for the Proposed Action and the alternatives.

4.9.9 References

City of Washington. 2007. City of Washington Zoning Map. Website (http://washingtonmo.govoffice2.com/ vertical/Sites/%7B16AC081B-8831-40B4-BC22-1AAFE46CD04B%7D/uploads/%7B9F28CEB9-BB0F-472B-B059-3FAF10A4039A%7D.PDF) accessed on December 21, 2009.

MDC (Missouri Department of Conservation). 2010. Missouri Department of Conservation. Website (http://mdc4.mdc.mo.gov/Applications/MOATLAS/AreaSummaryPage.aspx?txtAreaID=911) accessed on December 16, 2010.

MDNR (Missouri Department of Natural Resources). 2010. Missouri Department of Natural Resources. Website (http://www.dnr.mo.gov/) accessed on March 26, 2010.

MDNR (Missouri Department of Natural Resources). 2008. Statewide Comprehensive Outdoor Recreation Plan. Website (http://www.mostateparks.com/scorp08-12.pdf) accessed on March 22, 2010.

NPS (National Park Service). 2010. The National Trails System Act, (Public Law 90-543, as amended through Public Law 111-11, March 30, 2009). Website (http://www.nps.gov/nts/legislation.html) accessed on April 6, 2010.

Platte County. 2010. Land Use Plan, Platte County, Missouri. Website (http://www.co.platte.mo.us/docs/planning_zoning/2010/100301_landuseplan.pdf) accessed on March 29, 2010.

Table 4.9-4 Summary of Potential Impacts on Land Use and Recreation

Category of Impact	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Changes in existing or planned land uses	• Permanent minimal reduction in prime farmland in St. Joseph segment; zoning conflict requiring zoning change and special use permit in St. Joseph segment; no disruptions to adjacent land uses resulting from new facilities in St. Joseph or St. Charles segment.	• No changes in existing or planned land uses. • Potential land use conflicts at alternate sources.	• Permanent minimal reduction in prime farmland in St. Joseph segment; zoning conflict requiring zoning change and special use permit in St. Joseph segment; no disruptions to adjacent land uses resulting from new facilities in St. Joseph or St. Charles segment. • Potential land use conflicts at alternate sources.	• Permanent minimal reduction in prime farmland in St. Joseph segment; zoning conflict requiring zoning change and special use permit in St. Joseph segment; no disruptions to adjacent land uses resulting from new facilities in St. Joseph or St. Charles segment. • Potential land use conflicts at alternate sources.	• Permanent minimal reduction in prime farmland in St. Joseph segment; zoning conflict requiring zoning change and special use permit in St. Joseph segment; no disruptions to adjacent land uses resulting from new facilities in St. Joseph or St. Charles segment.
Changes in recreational boating	• Potential interference with boaters and change in recreational experience because of additional barges and tugs in all segments in the short term and the long term.	• Increase in recreational access and opportunities because of reduction in number of barges and dredges in all segments; less interference from barges and dredges. • Potential interference with boaters due to additional barges/tugs on Mississippi River.	• Potential increased interference with boaters because of additional barges and tugs in St. Joseph segment in the short term and the long term; less interference with boaters because of fewer barges and tugs in Kansas City, Waverly, Jefferson City, and St. Charles segments in the short term and the long term. • Potential interference with boaters due to additional barges/tugs on Mississippi River.	• Potential increased interference with boaters because of additional barges and tugs in St. Joseph and Waverly segments in the short term and the long term; less interference with boaters because of fewer barges and tugs in Kansas City, Jefferson City, and St. Charles segments in the short term and the long term. • Potential interference with boaters due to additional barges/tugs on Mississippi River.	• No change in recreational access or opportunities because of no change in number of barges and dredges on river.

Table 4.9-4 Summary of Potential Impacts on Land Use and Recreation

Category of Impact	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Changes in access to boat ramps	• Increase in scour problems and resulting access disruptions in St. Joseph, Kansas City, Jefferson City, and St. Charles segments in the long term.	• Reduced potential for scour at boat ramps and increased recreation access in all segments in the long term; highest increase in access likely in Kansas City segment. • Potential decreased boat ramp access on the Mississippi River.	• No likely increases in scour; no expected change in access to boat ramps. • Potential decreased boat ramp access on the Mississippi River.	• Increase in scour problems and resulting access disruptions in St. Joseph, Kansas City, Jefferson City, and St. Charles segments in the long term. • Potential decreased boat ramp access on the Mississippi River.	• Increase in scour problems and resulting access disruptions in Kansas City, Jefferson City, and St. Charles segments in the long term.
Changes in wetlands-related recreational opportunities	• Loss of forested wetlands, scrub-shrub wetlands, and emergent wetlands from lowered groundwater levels, resulting in removal of suitable habitat and reduction in wetlands-related recreational opportunities in all segments except Waverly segment in the short term and the long term.	• Potential long-term loss of wetlands and related recreational opportunities because of development of open-pit mines in the Missouri River floodplain. • Potential loss of wetland-related recreational uses on the Kansas or Mississippi Rivers.	• Potential long-term loss of wetlands and related recreational opportunities because of development of open-pit mines in the Missouri River floodplain. • Potential loss of wetland-related recreational uses on the Kansas or Mississippi Rivers.	• Loss of forested wetlands, scrub-shrub wetlands, and emergent wetlands resulting in removal of suitable habitat and reduction in wetlands-related recreational opportunities in St. Joseph, Kansas City, and St. Charles segments in the short term and the long term. • Potential long-term loss of wetlands and related recreational opportunities because of development of open-pit mines in the Missouri River floodplain. • Potential loss of wetland-related recreational uses on the Kansas or Mississippi Rivers.	• Loss of forested wetlands, scrub-shrub wetlands, and emergent wetlands resulting in removal of suitable habitat and reduction in wetlands-related recreational opportunities in St. Joseph, Kansas City, Jefferson City, and St. Charles segments in the short term and the long term.

Table 4.9-4 Summary of Potential Impacts on Land Use and Recreation

Category of Impact	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Changes in access to portions of land-based recreation trails	• Long-term increases in high-flow water surface elevations in Jefferson City and St. Charles segments could prolong or make more frequent access limitations during flood events.	• Long-term increases in high-flow water surface elevations in Jefferson City and St. Charles segments could prolong or make more frequent access limitations during flood events. • Potential trail access improvement near Mississippi or Kansas Rivers.	• Long-term increases in high-flow water surface elevations in Jefferson City segment could prolong or make more frequent access limitations during flood events. • Potential trail access improvement near Mississippi or Kansas Rivers.	• Long-term increases in high-flow water surface elevations in Jefferson City and St. Charles segments could prolong or make more frequent access limitations during flood events. • Potential trail access improvement near Mississippi or Kansas Rivers.	• Long-term increases in high-flow water surface elevations in Jefferson City and St. Charles segments could prolong or make more frequent access limitations during flood events.
Changes in recreational fishing opportunities	• Potential decrease in recreational fishing opportunities because of increased dredging (all segments) and construction of sand plants.	• No change or potential increase in recreational fishing opportunities because of termination of dredging activity. • Potential decrease in recreational fishing opportunities at alternate sources.	• Potential slight decrease in recreational fishing opportunities because of decreased dredging in all segments except St. Joseph and construction of sand plants in Kansas City and St. Charles segments. • Potential decrease in recreational fishing opportunities at alternate sources.	• Potential decrease in recreational fishing opportunities because of increased dredging in St. Joseph and Waverly segments and construction of sand plants in Kansas City and St. Charles segments. • Potential decrease in recreational fishing opportunities at alternate sources.	• Potential slight decrease in recreational fishing opportunities because of construction of sand plants in Kansas City and St. Charles segments.