4.7 WETLANDS, FLOODPLAINS, AND TERRESTRIAL RESOURCES

4.7.1 Introduction

The LOMR has been subjected to a long history of alterations in support of navigation and flood control, resulting in the loss of most of the riparian forests, wetlands and associated wetland functions, and terrestrial wildlife. The forested area of the Missouri River floodplain dropped from 76 percent to 13 percent between 1826 and 1972, and the cultivated area increased from 18 percent to 83 percent (Munger et al. 1974, Bragg and Tatschl 1977). Wetlands in the Missouri River floodplain declined 39 percent between 1890 and 1980; during that same period, sandbar habitat declined 97 percent, and open water habitat declined 45 percent (Hesse et al. 1988). Flow regulation has altered the hydrograph; the annual flood pulse is lower and shorter, and low-flow pulses are fewer and occur earlier in the year, which contributes to the overall alteration of floodplain wetland ecosystem function and health (Galat and Lipkin 2000).

The physical environment along the Missouri River has been shaped by the channel form and flow regime, both of which have been altered substantially and are managed for purposes other than ecological functions (Jacobson and Galat 2006). Hesse et al. (1988) estimated that net carbon production in floodplain wetlands decreased 65 percent, primarily as a result of vegetation changes. The wetland wildlife habitat function also has declined substantially, although there is little documentation (Hesse et al. 1988).

Flood control has the indirect effect of allowing agriculture in the floodplain, which has largely replaced natural habitats. Until recently, the management focus for some of the remaining wetlands along the LOMR has been to manage them for duck habitat (for hunting) (Galat et al. 1998; Bodie, Semlitsch, and Renken 2000). Levees and drainage ditches have removed much of the connectivity between wetlands along the LOMR and also have reduced the flood attenuation wetland function (Ward and Sanford 1995, Blevins 2004). Under the USDA programs described in Section 3.9.2, some wetlands converted to agricultural lands have been enrolled in programs to enhance, protect, and restore previous wetlands functions.

Dredging in the LOMR would not directly affect wetlands or terrestrial wildlife habitat because dredging activities would be limited to the areas within the channel of the LOMR. Commercial dredging is likely to have contributed to the loss of LOMR wetlands indirectly through river bed degradation. River bed degradation in the LOMR has occurred as a combined result of several factors, including commercial

dredging (see Section 3.4.6). River bed degradation lowers the river stage level, particularly during low-flow periods; surface water modeling (USACE 1994) and groundwater studies (Kelly 2001) indicate that decreasing river stage levels lowers the frequency and duration of surface water flows and lowers groundwater levels, resulting in decreased wetland acreage and changes in wetland types.

The primary wetland impact associated with continued commercial dredging in the LOMR, therefore, is the continued potential indirect effect of commercial dredging on wetlands that are dependent on the alluvial aquifer. Continued dredging would contribute to further river bed degradation, leading to lower river stages and lowered groundwater levels, which could cause both a decrease in wetland acreage and a change in wetland type in groundwater-dependent wetlands. The effects of lowered groundwater levels on wetlands would vary depending on site-specific wetland characteristics such as soil type, topography, proximity to the LOMR, reliance of groundwater input, and surface water connections. Because conditions and responses of wetlands to lowered alluvial aquifer levels would vary considerably, the following discussion identifies general potential impacts to wetlands associated with changes in groundwater levels.

Depending on the severity of alterations to groundwater inflow to wetlands, obligate wetland vegetation species (species that are almost always [99 percent of the time] associated with natural wetlands) in groundwater-supported wetlands may be replaced with facultative vegetation species (species that occur in wetlands 67–99 percent of the time) or upland vegetation species (species that occur in wetlands 0–67 percent of the time). Some riparian trees also could be sensitive to decreasing groundwater levels caused by river bed degradation during prolonged dry periods (Scott, Shafroth, and Auble 1999; Shafroth, Stromberg, and Patten 2000; Rood, Braante, and Hughes 2003). Temporary and seasonal wetlands occurring in agricultural areas with sandy loam or sandy-clay loam soils could be greatly affected by surface water elevations and durations of flow at different elevations. This effect would be most pronounced during summer and drought periods, when river stages are lowest, and when wetlands are most dependent on groundwater. Impacts on alluvial aquifer levels related to river bed degradation, and the associated groundwater-dependent wetlands, would be more pronounced in those areas nearest to the LOMR, which are more sensitive to changes in river stage, and could be manifested in changes to obligate and other wetland vegetation species that require certain hydrologic conditions for maintenance (see Section 4.5.3.3). The effects on wetland functions would be variable and could range from loss of all wetland functions to reduced or altered functions.

In addition to affecting existing wetlands, lowered groundwater levels could affect wetland restoration and preservation efforts being conducted under the Missouri River Recovery Program and various USDA wetland and habitat programs.

The following sections identify potential effects on wetlands and floodplain resources as a result of dredging operations or production of sand and gravel from alternate sources.

4.7.1 Assessment Methods

A semi-quantitative approach was used to assess potential indirect impacts on wetland and floodplain resources. Under this approach, wetlands that could be affected by the Proposed Action and alternatives were identified and quantified, but the extent and magnitude of the effects were not used because they could not be determined. The acreage of potentially affected wetlands served as a relative measure by which to compare impacts associated with alternatives.

Wetlands within the LOMR floodplain with the potential to be affected by the Proposed Action and the alternatives were identified by GIS analysis. Geospatial data for LOMR floodplain wetlands were obtained from the USFWS NWI website (USFWS 2010a). NWI data are developed through the use of remotely sensed data; therefore, the accuracy of the image interpretation depends on the quality of the imagery, the image analyst, and the amount of ground truth verification work (USFWS 2010b). Further, the NWI GIS coverage excludes some types of "farmed wetlands" as may be defined by the Food Security Act or that do not coincide with the Cowardin et al. (1979) definitions (USFWS 2010b). Although the accuracy of NWI data may vary depending on multiple factors, this data set was developed for use at a regional scale and is the most comprehensive data set available for the LOMR floodplain region.

A wetlands coverage was created that included all wetland polygons in the LOMR floodplain from RM 0 to RM 489. From this coverage, a subset of wetlands that would be most likely to be affected was selected, based on three assumptions: (1) that, in general, deep wetlands and water bodies are supported by groundwater and could be affected by changing river stage levels; (2) that, in general, shallow wetlands and water bodies are not directly supported by groundwater and would be unaffected by lowered river stage levels; and (3) that wetlands closer to the river would be more likely to be affected than wetlands farther from the river. Although these assumptions are generally supported by existing data (Kelly 2000, 2001; Chapman et al. 2003; Blevins 2004), not all deep wetlands are influenced by groundwater (Chapman et al. 2003). Some shallow wetlands have surface connections

to deeper wetlands supported by groundwater (Kelly 2001), and these wetlands could be affected if a decrease in the groundwater depth affected the water surface levels in the deep wetlands.

Wetland polygons within the 100-year floodplain were sorted by river segment, wetland classification, and wetland type. The few studies of river stage effects on groundwater levels have focused on wetlands within a few thousand feet of the river (Kelly 2000, 2001; Chapman et al. 2003; Blevins 2004). Although all groundwater-supported wetlands in the LOMR floodplain potentially could be affected, the groundwater response to river stage level decreases with increasing distance from the river (Kelly 2000, 2001). Wetlands with a wetland regime of semi-permanently flooded, intermittently exposed, and permanently flooded—which are most likely to be deeper wetlands supported by groundwater—were quantified in order to provide comparisons between alternatives and river segments.

As discussed above, a large quantity of converted wetlands have been and are being used for agricultural purposes. Some of these areas are held in easements managed by the USDA, while others are not. The USDA maintains wetland data in paper or electronic format for parcels enrolled in their easement programs, but the USDA does not contain a comprehensive record or data of prior converted wetlands in the states through which the LOMR flows (Dacey pers. comm.). Consequently, use of this information would not provide an accurate estimate of the quantity of converted wetlands along the LOMR.

This assessment assumes that other terrestrial land cover types along the LOMR floodplain are not supported by groundwater but are dependent on rainfall, surface runoff, or other surface waters. These terrestrial land cover types (e.g., grassland and deciduous forest) would not be directly or indirectly affected by Project dredging because they are not dependent on groundwater. Consequently, the analysis of vegetation and wildlife impacts within the LOMR floodplain was restricted to wetlands, as described above, and sand plant construction areas. University of Missouri 2005 land cover data were used in conjunction with NWI mapping and aerial photo interpretation to determine the vegetation types that would be impacted through the construction of the proposed sand plants. These land cover types and the associated vegetation communities were used to assess the potential Project-related impacts to wildlife resources.

4.7.1.1 Indirect Effects on Groundwater-Dependent Wetlands

Much of the wetlands along the LOMR floodplain are not supported by groundwater but are dependent on rainfall, surface runoff, or other surface waters, including irrigation. These wetlands would not be affected by dredging activities. Wetlands that could be indirectly affected by lowered groundwater

levels resulting from river bed degradation caused by dredging are summarized in Table 4.7-1. It is important to note that these numbers are likely underestimate the number of wetlands present in the Project area because of the large numbers of temporary, seasonal, and semi-permanent wetlands that have been converted to agricultural production in the LOMR floodplain. Approximately 1,310 acres of wetlands with a wetland regime of semi-permanently flooded, intermittently exposed, or permanently flooded are present in the LOMR floodplain in the Project area. Most of these wetlands (94 percent) are freshwater emergent wetlands, and only small amounts of freshwater forested wetlands (4 percent), and freshwater scrub-shrub wetlands (2 percent) are present. The majority of these wetlands are in the Waverly segment (61 percent) and St. Joseph segment (22 percent). The following sections discuss the potential impacts of the Proposed Action and alternatives on wetland resources by river segment.

Table 4.7-1 Estimated Acres of Groundwater-Supported Wetlands in the Lower Missouri River Floodplain[a]

	Wetland Class			
Segment	Forested (acres)	Scrub-Shrub (acres)	Emergent (acres)	Total Acres
St. Joseph	0.0	0.0	295.53	295.53
Kansas City	0.0	1.34	52.37	53.71
Waverly	46.43	18.27	738.81	803.51
Jefferson City	0.0	1.93	55.4	57.33
St. Charles	6.66	2.36	91.34	100.36
Total	53.09	23.9	1,233.45	1,310.44

[a] Potential impact wetland areas include those wetlands in the floodplain of the lower Missouri River with a semi-permanently flooded, intermittently exposed, and permanently flooded wetland classification.

4.7.1.2 Indirect Effects on Wetland-Dependent Species

Dredging in the LOMR occurs under existing conditions and may result in indirect effects on riparian and emergent wetlands within and adjacent to dredged areas because lower water surface levels affect groundwater-dependent wetlands. Indirect effects of dredging on terrestrial resources would be limited to alteration of vegetation resources in riparian and emergent wetland habitats, as discussed above, and potential conversion of these habitats to upland habitat types. This effect would result in loss or degradation of wetland habitat and consequently would affect wetland-dependent wildlife, including dabbling ducks, songbirds, mammals, reptiles, and amphibians.

As discussed in Section 4.2 (Geology and Geomorphology), river bed degradation could result in localized erosion of sand bar habitat features that may be located near the dredge sites. Sand bar habitats are important to shore birds, including the piping plover and interior least tern (see Section 4.8 [Federally Listed Species]). Erosion of these habitats would result in a decrease in available sand bar habitat for species that use sand bars for one or more of their life stages.

4.7.1.3 Potential Impacts from Construction of Sand Plants

Wetlands

Under the Proposed Action and Alternatives A, B, and C, sand plants would be constructed on property owned or controlled by The Master's Dredging Company and Edward N. Rau Contractor Company. The Master's Dredging Company plans to develop a sand plant at one of two sites near Waldron, Missouri (Master's [Waldron]). The only land cover type, as determined through inspection of aerial photos, NWI GIS coverage, and University of Missouri land cover GIS data, on either site is cropland (Table 4.7-2). Due to the historical conversion of wetlands to agricultural cropland, this area may retain some wetland characteristics if the land was a wetland prior to cultivation. Based on available desktop data, no direct or indirect effects on wetland resources would be likely as a result of sand plant construction on either Master's site. The wetland characteristics of these sites cannot be definitively determined until wetland delineations are conducted.

Aerial photography, NWI coverages, and University of Missouri land cover GIS data were inspected to approximate the land cover classes present at the Edward N. Rau Contractor Company property on the shore of the Missouri River at Washington, Missouri (Rau [Washington]). The wetland characteristics of this site cannot be definitively determined until a wetland delineation is conducted. For the purpose of this assessment, it was assumed that all existing wetland resources identified through desktop analysis would need to be cleared and filled to construct the new facility. Land cover data indicate that the parcel contains a mosaic of land cover types, including forested wetlands, herbaceous wetlands, open water, upland, and agricultural lands (Table 4.7-2). Depending on the configuration and size of the Rau (Washington) sand plant, wetland resources could be impacted by construction and operation.

Table 4.7-2 Land Cover Types on the Proposed Sand Plant Properties

	Land Cover Type (acres)							
Location	Cropland	Grassland	Woody-Dominated Wetlands	Herbaceous-Dominated Wetlands	Open Water	Low-Density Urban	Impervious Surface	Total
The Master's Dredging Company (Waldron)	20–60[a]	--	--	--	-	--	--	20–60[a]
Edward N. Rau Contractor Company (Washington)	0.28	0.66	15.37	4.24	2.82	1.60	0.18	25.15

Note: -- = Not applicable.

[a] Actual sand plant size would vary depending on the volume of dredging under each alternative.

Source: University of Missouri GIS database.

Wildlife and Vegetation

The primary impact on vegetative cover types from sand plant construction would be clearing and removal of vegetation on the sand plant parcels. The severity of impact would depend on the type of vegetation impacted and the size of the area cleared. The Master's site contains cropland (Table 4.7-2); and the Rau property contains a mosaic of land cover types, including forested wetlands, herbaceous wetlands, open water, upland, and agricultural lands (Table 4.7-2). Existing vegetation and habitats at the sand plant sites would be converted to industrial land cover after construction of the facilities. Activities that may result in habitat loss include, but are not limited to, vegetation removal to create new sand and gravel extraction and processing facilities; excavation and grading; and temporary stockpiling of soils, construction materials, or construction wastes.

Forested wetland habitats would be more dramatically altered by construction of sand plants than any other habitat. Because trees would be cleared from the sand plant area, species that depend on trees for food, refuge, or nesting would be displaced to nearby forested habitat. Some nesting species and tree-cavity nesting species would suffer mortality during clearing. For adult birds that are able to disperse from the construction area, nesting success may be denied or diminished for one annual breeding cycle. During construction and operation of the sand plants, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality.

4.7.2 Proposed Action

4.7.2.1 Indirect Effects on Wetlands and Wetland-Dependent Wildlife Species from Changes in Groundwater Levels

St. Joseph and St. Charles Segments

Under the Proposed Action, increased dredging in the St. Joseph and St. Charles segments would lead to moderate to substantial long-term decreases in low-flow water surface levels in this segment. This effect in turn could lead to localized indirect effects on floodplain wetland habitat as a result of changes in groundwater levels that support floodplain wetlands. Under the Proposed Action, up to 6.66 acres of forested wetlands, 2.36 acres of scrub-shrub wetlands, and 386.87 acres of emergent wetlands, as identified in NWI data, could be affected in these two segments through changes in groundwater levels. Note that these numbers are likely conservative due to the large quantity of wetlands that have been converted to agricultural lands in the LOMR floodplain that is not captured in the NWI data. These areas provide habitat for several state-listed species, migratory birds, and numerous common wildlife species. Loss or degradation of emergent wetland habitats would result in displacement of the wetland-dependent species but could provide additional upland habitat for other non-wetland-dependent species that are described in Section 3.10.

Kansas City and Jefferson City Segments

Under the Proposed Action, increased dredging in the Kansas City and Jefferson City segments would lead to a moderate short-term and a substantial long-term decrease in low-flow water surface levels. This effect in turn could lead to localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Under the Proposed Action, up to 3.27 acres of scrub-shrub wetlands and 107.77 acres of emergent wetlands, as identified by NWI data, could be affected by changes in groundwater levels. Note that these numbers are likely conservative due to the large quantity of wetlands that have been converted to agricultural lands in the LOMR floodplain that is not captured in the NWI data. These areas provide habitat for several state-listed species, migratory birds, and numerous common wildlife species. Loss or degradation of wetland habitats would result in displacement of wetland-dependent species but could provide additional upland habitat for other non-wetland-dependent species that are described in Section 3.10.

Waverly Segment

Under the Proposed Action, increased dredging in the Waverly segment would lead to slight degradation or aggradation of the river bed in the short term and the long term. Because low-flow water surface levels would change only slightly over the long term, it is not likely that changes in alluvial aquifer levels would affect wetland resources. Changes to wetland habitats and species composition in the Waverly segment also are not likely under the Proposed Action.

Alternate Sources

Under the Proposed Action, increased dredging would meet or exceed regional demands; therefore, no alternate sources of sand and gravel would be required. Potential indirect effects on wetland habitats associated with alternate sources of supply would not occur, such as wetland dredging or filling from upland and floodplain open-pit mines or alterations of groundwater levels and the associated floodplain wetland loss from dredging in the Mississippi or Kansas River. Further, direct or indirect mortality through clearing of upland and floodplain open-pit sites would not occur.

4.7.2.2 Potential Impacts on Wetland and Upland Vegetation and Habitats from Construction of Sand Plants

Kansas City Segment

Under the Proposed Action, The Master's Dredging Company plans to develop a sand plant at one of two sites near Waldron, Missouri in the Kansas City segment. According to land cover data and aerial photo interpretation, the only land cover type on either site is cropland (Table 4.7-2). Based on available desktop data, no direct or indirect effects on wetland resources would be likely as a result of sand plant construction on either Master's site. The wetland characteristics of these sites cannot be definitively determined until a wetland delineation of the site is conducted.

During construction and operation, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality. As described in Section 3.10, cropland is the most common land cover type in the LOMR floodplain; it is anticipated that species displaced by construction of the Master's sand plant would quickly find suitable alternative habitat.

St. Joseph, Waverly, and Jefferson City Segments

No new facilities would be constructed in the St. Joseph, Waverly, or Jefferson City segment under the Proposed Action; therefore, no direct or indirect effects on wetland, vegetation, or wildlife resources would result from construction of sand plants in these segments.

St. Charles Segment

Under the Proposed Action, construction of a new sand plant at the Edward N. Rau Contractor Company property in the St. Charles segment could result in direct effects on up to 15.37 acres of forested wetlands, 4.24 acres of herbaceous-dominated wetlands, and 2.82 acres of open water (Table 4.7-2). The wetland characteristics of this site cannot be definitively determined until a wetland delineation is conducted. For the purpose of this assessment, it was assumed that all existing wetland resources on the property would need to be cleared and filled to construct the new facility. Construction activities that involve dredge or fill of any delineated wetlands on the site would require that the facility operator obtain relevant CWA Section 404 and 401 certification and authorization, which would include required avoidance, minimization, and mitigation measures.

An additional 0.94 acre of cropland and grassland land covers could be directly affected by sand plant construction. Due to the historical conversion of wetlands to agricultural cropland, this area may retain some wetland characteristics if the land was a wetland prior to cultivation. Vegetative communities cannot be fully determined until a wetland delineation is conducted at the site. Vegetation and wildlife species would be displaced in both upland and wetland areas. Species that depend on wetland trees would be displaced to nearby forested habitat, and some nesting and tree-cavity nesting species could suffer mortality or a decrease in breeding success. Mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality.

4.7.3 No Action Alternative

4.7.3.1 Indirect Effects on Wetlands and Wetland-Dependent Wildlife Species from Changes in Groundwater Levels

All Segments

Under the No Action Alternative, dredging would result in slight aggradation or degradation of the river bed in the short term and slight aggradation of the river bed in the long term. River bed aggradation would result in slight increases in low-flow water surface levels in the short term and long term. This

effect in turn would lead to stabilized or improved groundwater levels that support floodplain wetlands. Floodplain wetlands would not be adversely affected from changes in groundwater levels under this alternative. No change to wetland habitats or species composition in any segment would be likely under the No Action Alternative.

Alternate Sources

Under the No Action Alternative, in-channel dredging on the Kansas River or Mississippi River would not result in direct effects on wetland habitat because dredging activities would be limited to the area within the river channels. The potential indirect effects of dredging alternate sources have not been quantified because the location of these actions is not known at this time. It was assumed, however, that any river bed degradation associated with alternate sources of dredging would lead to localized indirect effects on floodplain wetland habitats as a result of changes in surface water and groundwater surface levels on the Kansas and Mississippi Rivers. Potential indirect effects to wetland-dependent species, such as displacement and loss of habitat, would be similar to those described for the LOMR.

Any expansion of existing or new land-based mining that would directly impact wetland resources would be required to obtain a CWA Section 404 and 401 permit and certification. Appropriate wetland permitting of alternate sources would require the implementation of avoidance, minimization, and mitigation measures.

New or expansion of open-pit and floodplain mining under the No Action Alternative could result in conversion of wildlife habitat and vegetative land cover to industrial land covers. The degree of impacts to wildlife species, such as species displacement and habitat modification, would depend on the location of the alternate source, land covers, and the level of extraction.

4.7.3.2 Potential Impacts on Wetlands and Upland Vegetation and Habitats from Construction of Sand Plants

All Segments

No new facilities would be constructed in any segment under the No Action Alternative; therefore, no direct or indirect effects on wetland, vegetation, or terrestrial resources would result from construction of sand plants in any segment.

4.7.4 Alternative A

4.7.4.1 Indirect Effects on Wetlands and Wetland-Dependent Wildlife Species from Changes in Groundwater Levels

All Segments

Dredging in the LOMR would not result in direct effects on wetlands because dredging activities would be limited to the areas within the channel of the LOMR. The effects of dredging on river bed degradation, the indirect effects of declining groundwater surface levels during prolonged drought periods on wetlands, and the associated potential change in vegetation and wildlife habitat, would halt.

Under Alternative A, river bed degradation would lead to only a slight decrease or increase in low-flow water surface levels, which would lead to stabilized groundwater levels that support floodplain wetlands. Correspondingly, no changes to wetland habitats or species composition would be expected under Alternative A.

Alternate Sources

The wetland impacts from dredging in the Mississippi and Kansas Rivers and at open-pit mine sites under Alternative A would be similar to those described for the No Action Alternative, but of less magnitude. Under Alternative A, any river bed degradation associated with dredging of alternate sources could lead to localized indirect effects on floodplain wetlands as a result of changes in surface water and groundwater surface levels on the Kansas and Mississippi Rivers.

Further, any expanded or new open-pit mines could result in wetland impacts and would be subject to relevant wetland permitting. New or expansion of open-pit and floodplain mining could also result of the conversion of wildlife habitat and vegetative land cover to industrial land covers. Impacts to wildlife species, such as species displacement and habitat modification, would be similar to those described for the No Action Alternative but would occur in fewer locations.

4.7.4.2 Potential Impacts on Wetlands and Upland Vegetation and Habitats from Construction of Sand Plants

Kansas City Segment

Under Alternative A, The Master's Dredging Company plans to develop a sand plant at one of two sites near Waldron, Missouri in the Kansas City segment. According to land cover data and aerial photo

interpretation, the only land cover type on either site is cropland (Table 4.7-2). Based on available desktop data, no direct or indirect effects on wetland resources would be likely as a result of sand plant construction on either Master's site. The wetland characteristics of these sites cannot be definitively determined until a wetland delineation of the site is conducted.

During construction and operation, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality. As described in Section 3.10, cropland is the most common land cover type in the LOMR floodplain; it is anticipated that species displaced by the construction of this sand plant would quickly find suitable alternative habitat.

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; therefore, no direct or indirect effects on wetland, vegetation, or wildlife resources would result from construction of sand plants in these segments.

St. Charles Segment

Under Alternative A, construction of a new sand plant at the Edward N. Rau Contractor Company property in the St. Charles segment could result in direct effects on up to 15.37 acres of forested wetlands, 4.24 acres of herbaceous-dominated wetlands, and 2.82 acres of open water (Table 4.7-2). The wetland characteristics of this site cannot be definitively determined until a wetland delineation is conducted. For the purpose of this assessment, it was assumed that all existing wetland resources on the property would need to be cleared and filled to construct the new facility. These activities would require that the facility operator obtain relevant CWA Section 404 and 401 certification and authorization, which would include required avoidance, minimization, and mitigation measures.

An additional 0.94 acre of cropland and grassland land covers could be directly affected by sand plant construction. Due to the historical conversion of wetlands to agricultural cropland, this area may retain some wetland characteristics if the land was a wetland prior to cultivation. Vegetative communities cannot be fully determined until a wetland delineation is conducted. Vegetation and wildlife species would be displaced in both upland and wetland areas. Species that depend on wetland trees would be displaced to nearby forested habitat, and some nesting and tree-cavity nesting species could suffer mortality or a decrease in breeding success. Mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality.

4.7.5 Alternative B

4.7.5.1 Indirect Effects on Wetlands and Wetland-Dependent Wildlife Species from Changes in Groundwater Levels

Dredging in the LOMR would not result in direct effects on wetland habitats because dredging activities would be limited to the areas within the channel of the LOMR. Dredging under Alternative B could affect alluvial aquifer levels and those wetlands that are groundwater dependent. Effects to wetlands associated with low-flow surface water elevations would be manifested during prolonged drought and dry periods.

Under Alternative B, the need for alternate sources of sand and gravel would be substantially less than under the No Action Alternative and Alternative A; therefore, fewer wetland-related impacts would be associated with alternate sources.

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

Under Alternative B, river bed degradation would lead to slight to moderate long-term decreases in low-flow water surface levels. This effect in turn could lead to localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Under Alternative B, up to 6.66 acres of forested wetlands, 3.70 acres of scrub-shrub wetlands, and 439.24 acres of emergent wetlands, as identified in NWI data, could be affected by changes in groundwater levels. Note that these numbers are likely conservative due to the large quantity of wetlands that have been converted to agricultural lands in the LOMR floodplain that is not captured in the NWI data. Those wetlands closest to the LOMR would be most dramatically affected, particularly during prolonged dry periods. Emergent, scrub-shrub, and forested wetlands provide habitat for several state-listed species, migratory birds, and numerous common wildlife species. Loss or degradation of wetland habitats would result in displacement of the wetland-dependent species, but could provide additional upland habitat for other non-wetland-dependent species that are described in Section 3.10.

Waverly and Jefferson City Segments

Under Alternative B, dredging in the Waverly and Jefferson City segments would lead to slight long-term decreases in low-flow water surface levels. This effect in turn could lead to slight potential localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Because only a slight long-term decrease in low-flow water surface levels

is anticipated under this alternative, substantial impacts to groundwater resources and associated wetlands are not anticipated. Effects to groundwater-fed wetlands that are located nearest to the LOMR could occur during periods of prolonged drought. No changes to wetland habitats or species composition would be expected under Alternative B.

Alternate Sources

The wetland impacts from dredging in the Mississippi and Kansas Rivers and at open-pit mine sites under Alternative B would be similar to those described for alternate sources under the No Action Alternative and Alternative A, but of less magnitude. Under Alternative B, any river bed degradation associated with dredging alternate sources could lead to localized indirect effects on floodplain wetlands as a result of changes in surface water and groundwater surface levels on the Kansas and Mississippi Rivers.

Further, any expanded or new open-pit mines could result in wetland impacts and would be subject to relevant wetland permitting. New or expansion of open-pit and floodplain mining could result in conversion of wildlife habitat and vegetative land cover to industrial land covers. Impacts to wildlife species, such as species displacement and habitat modification, would be similar to those described for Alternative A but would occur in fewer locations.

4.7.5.2 Potential Impacts on Wetlands and Upland Vegetation and Habitats from Construction of Sand Plants

Kansas City Segment

Under Alternative B, The Master's Dredging Company plans to develop a sand plant at one of two sites near Waldron, Missouri in the Kansas City segment. The only land cover type on either site is cropland (Table 4.7-2). According to land cover data and aerial photo interpretation, the only land cover type on either site is cropland (Table 4.7-2). Based on available desktop data, no direct or indirect effects on wetland resources would be likely as a result of sand plant construction on either Master's site. The wetland characteristics of these sites cannot be definitively determined until a wetland delineation of the site is conducted.

During construction and operation, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality. As described in Section 3.10, cropland is the most common land cover type in the LOMR floodplain; it is anticipated that species displaced by construction of this sand plant would quickly find suitable alternative habitat.

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; therefore, no direct or indirect effects on wetland, vegetation, or wildlife resources would result from construction of sand plants in these segments.

St. Charles Segment

Under Alternative B, construction of a new sand plant at the Edward N. Rau Contractor Company property in the St. Charles segment could result in direct effects on up to 15.37 acres of forested wetlands, 4.24 acres of herbaceous-dominated wetlands, and 2.82 acres of open water (Table 4.7-2). The wetland characteristics of this site cannot be definitively determined until a wetland delineation is conducted. For the purpose of this assessment, it was assumed that all existing wetland resources on the property would need to be cleared and filled to construct the new facility. These activities would require that the facility operator obtain relevant CWA Section 404 and 401 certification and authorization, which would include required avoidance, minimization, and mitigation measures.

An additional 0.94 acre of cropland and grassland land covers could be directly affected by sand plant construction. Due to the historical conversion of wetlands to agricultural cropland, this area may retain some wetland characteristics if the land was a wetland prior to cultivation. Vegetative communities cannot be fully determined until a wetland delineation is conducted. Vegetation and wildlife species would be displaced in both upland and wetland areas. Species that depend on wetland trees would be displaced to nearby forested habitat, and some nesting and tree-cavity nesting species could suffer mortality or a decrease in breeding success. Mobile species present in all habitats would disperse to adjacent habitats, while small non-mobile species could suffer mortality.

4.7.6 Alternative C

4.7.6.1 Indirect Effects on Wetlands and Wetland-Dependent Wildlife Species from Changes in Groundwater Levels

Dredging in the LOMR would not result in direct effects on wetland habitats because dredging activities would be limited to the areas within the channel of the LOMR. The volume of dredged sediment collected in all of the LOMR segments would be the same as current volumes; therefore, no new alternate sources would be required.

St. Joseph and Waverly Segments

Under Alternative C, the continued level of dredging effects on river bed degradation and the low-flow water surface levels would lead to a slight long-term reduction or no change in low-flow surface water elevations. This effect in turn could lead to slight, if any, potential localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Because only a slight long-term decrease in low-flow water surface levels is anticipated under this alternative, substantial changes in groundwater levels and associated wetlands are not anticipated. Effects to groundwater-fed wetlands that are located nearest to the LOMR could occur during periods of prolonged droughts. No changes to wetland habitats or species composition would be expected under Alternative C.

Kansas City, Jefferson City, and St. Charles Segments

Under Alternative C, river bed degradation could result in a moderate to substantial decreases in low-flow water surface levels, which could result in a long-term lowering of alluvial aquifer levels. Indirect effects on floodplain wetlands could occur under this alternative as a result of changes in groundwater levels that support floodplain wetlands. Under Alternative C, up to 6.66 acres of forested wetlands, 5.63 acres of scrub-shrub wetlands, and 199.11 acres of emergent wetlands, as identified in NWI data, could be affected by changes in groundwater levels. Note that these numbers are likely conservative due to the large quantity of wetlands that have been converted to agricultural lands in the LOMR floodplain. These wetlands provide habitat for several state-listed species, migratory birds, and numerous common wildlife species. Loss or degradation of wetland habitats would result in displacement of the wetland-dependent species but could provide additional upland habitat for other non-wetland-dependent species that are described in Section 3.10.

Alternate Sources

Dredging under Alternative C would remain at current levels; therefore, no alternate sources of sand and gravel would be required. Under Alternative C, the potential indirect effects on wetland habitats would not occur, such as wetland dredging or filling from upland and floodplain open-pit mines or alterations of groundwater levels and the associated floodplain wetland loss from dredging in the Mississippi or Kansas River. Further, direct or indirect mortality through the clearing of upland and floodplain open-pit sites would not occur.

4.7.6.2 Potential Impacts on Wetlands and Upland Vegetation and Habitats from Construction of Sand Plants

Kansas City Segment

The Master's Dredging Company plans to develop a sand plant at one of two sites near Waldron, Missouri in the Kansas City segment under Alternative C. According to land cover data and aerial photo interpretation, the only land cover type on either site is cropland (Table 4.7-2). Based on available desktop data, no direct or indirect effects on wetland resources would be likely as a result of sand plant construction on either Master's site. The wetland characteristics of these sites cannot be definitively determined until a wetland delineation of the site is conducted.

During construction and operation, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality. As described in Section 3.10, cropland is the most common land cover type in the LOMR floodplain, and it is anticipated that species displaced by the construction of this sand plant would quickly find suitable alternative habitat.

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; therefore, no direct or indirect effects on wetland, vegetation, or wildlife resources would result from construction of sand plants in these segments.

St. Charles Segment

Under Alternative C, construction of a new sand plant at the Edward N. Rau Contractor Company property in the St. Charles segment could result in direct effects on up to 15.37 acres of forested wetlands, 4.24 acres of herbaceous-dominated wetlands, and 2.82 acres of open water (Table 4.7-2). The wetland characteristics of this site cannot be definitively determined until a wetland delineation is conducted. For the purpose of this assessment, it was assumed that all existing wetland resources on the property would need to be cleared and filled to construct the new facility. These activities would require that the facility operator obtain relevant CWA Section 404 and 401 certification and authorization, which would include required avoidance, minimization, and mitigation measures.

An additional 0.94 acre of cropland and grassland land covers could be directly affected by sand plant construction. Due to the historical conversion of wetlands to agricultural cropland, this area may retain some wetland characteristics if the land was a wetland prior to cultivation. Vegetative communities

cannot be fully determined until a wetland delineation is conducted. Vegetation and wildlife species would be displaced in both upland and wetland areas. Species that depend on wetland trees would be displaced to nearby forested habitat, and some nesting and tree-cavity nesting species could suffer mortality or a decrease in breeding success. Mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality.

4.7.7 Summary of Impacts

Table 4.7-3 presents a summary of potential impacts on wetlands, floodplains, and terrestrial resources associated with the Proposed Action and the alternatives.

4.7.8 References

4.7.8.1 Printed Literature

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Table 4.7-3 Summary of Potential Impacts on Wetlands, Floodplains, and Terrestrial Resources

Category of Impact	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Indirect effects on wetlands and wetland-dependent wildlife species from changes in groundwater levels	• Short-term and long term loss of wetland acreage, altered composition of vegetation, and altered wetland habitat functions during periods of low flow in those segments most affected by river bed degradation.	• Increase in or stabilization of LOMR wetland habitats during low-flow periods in all segments. • Potential decrease in groundwater input into wetlands due to potential bed degradation in the Kansas and Mississippi Rivers.	• Increase in or stabilization of LOMR wetland habitats during low-flow periods in most segments. • Potential decrease in groundwater input into wetlands due to potential bed degradation in the Kansas and Mississippi Rivers.	• Short-term and long term loss of wetland acreage, altered composition of vegetation, and altered wetland habitat functions during periods of low flow in those segments most affected by river bed degradation. • Potential decrease in groundwater input into wetlands due to potential bed degradation in the Kansas and Mississippi Rivers.	• Short-term and long-term loss of wetland acreage, altered composition of vegetation, and altered wetland habitat functions during periods of low flow in those segments most affected by river bed degradation.
Potential impacts on wildlife and vegetation from construction of sand plants	• Displacement of mobile species and loss of non-mobile wildlife and vegetation species from clearing.	• Conversion of wildlife habitat and vegetative land cover to industrial land covers at alternate source sites.	• Displacement of mobile species and loss of non-mobile wildlife and vegetation species from clearing. • Conversion of wildlife habitat and vegetative land cover to industrial land covers at alternate source sites.	• Displacement of mobile species and loss of non-mobile wildlife and vegetation species from clearing. • Conversion of wildlife habitat and vegetative land cover to industrial land covers at alternate source sites.	• Displacement of mobile species and loss of non-mobile wildlife and vegetation species from clearing.

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4.7.8.2 Personal Communication

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