3.1 INTRODUCTION

Chapter 3 describes the environment potentially affected by the Proposed Action and alternatives, and provides the basis for the impact assessment documented in Chapter 4. It begins with an overview of the Project area, and a discussion of how the river has been segmented for analysis purposes. Detailed discussions of the affected environment for each resource area listed below then follow:

- Geology and Geomorphology;
- Infrastructure;
- Navigation and Transportation;
- Water Resources;
- Aquatic Resources;
- Wetlands, Floodplains, and Terrestrial Ecology;
- Terrestrial Ecology;
- Federally Listed Species;
- Land Use and Recreation;
- Economics and Demographics;
- Noise;
- Visual and Aesthetic Resources;
- Cultural Resources; and
- Air Quality and Climate Change.

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3.2 OVERVIEW OF PROJECT AREA

3.2.1 Introduction

This section describes the geographic setting of the proposed Project and background information on the Missouri River, including the major uses of the river and the history of river channel modification and management. It also presents information on river bed degradation in the LOMR.

3.2.2 Geographic Setting

The Missouri River originates at the confluence of the Madison, Jefferson, and Gallatin Rivers near the City of Three Forks, Montana, and is the longest river in the United States. It flows southeast through or on the boundary of seven states, joining the Mississippi River north of St. Louis, Missouri. The river is approximately 2,540 miles long, with a drainage basin of 524,110-square-miles (one-sixth the size of the United States). Over 12 million people live in the Missouri River basin, which is shown in Figure 3.2-1. In modern times, the Missouri River is generally described in two segments: the Lower Missouri River and the Upper Missouri River.

3.2.2.1 Upper Missouri River Basin

The Upper Missouri River basin comprises that portion of the river from its headwaters in western Montana to the present-day Gavins Point Dam in Nebraska. The upper basin drains approximately one-half of the river's total drainage basin and overlaps the states of Montana, Wyoming, North Dakota, South Dakota, Colorado, and Nebraska. Most prominent in the upper basin are six dams and reservoirs that are located in Montana, North Dakota, South Dakota, and Nebraska. These dams control, store, and regulate water from the upper portion of the river to the LOMR.

3.2.2.2 Lower Missouri River Basin

The LOMR is that portion of the river from Gavins Point Dam in Nebraska to the river's confluence with the Mississippi River. The LOMR forms the boundary between Nebraska and Iowa, Nebraska and Missouri, and Missouri and Kansas. In Missouri, it traverses the width of the state in a west to east direction, from Kansas City to its confluence with the Mississippi River approximately 50 miles north of

St. Louis, Missouri. Throughout its length, the LOMR is joined by a number of major and minor tributaries.

Numerous towns and cities are located along the LOMR. They include Sioux City, Omaha, St. Joseph, Kansas City, Jefferson City, and St. Charles. St. Louis is the largest major city associated with the Missouri River. Uses along the LOMR include power plants, industrial and commercial businesses, rail yards, marinas, municipal utilities, sand and gravel excavation and processing plants, public parks, and floating casinos.

The floodplain of the LOMR extends well beyond the main channel banks in many locations and is predominantly used for agricultural production, especially row crops. Numerous levees have been built parallel to the river to partially contain the extent of flooding. Roadways and rail crossings cross the river sporadically along its length.

Between Sioux City, Iowa and the Mississippi River, there are no dams or other navigational impediments along the mainstem of the LOMR. Maximum flows vary depending on channel dimensional characteristics, slope, and the configuration of control structures such as revetments, dikes, and channel modifications installed to maintain the navigational channel.

The upper section of the LOMR, just below Gavins Point Dam, contains sand bars, islands, backwater marshes, and meandering channels. This section of the river has experienced some channel degradation due to capture of sediments in the reservoirs upstream of Gavins Point Dam. In addition, fixed boat docks occasionally encroach into channel areas. Deterioration of the channel and flood capacity occurs variably downstream of Omaha. Pumping for agricultural and industrial uses also occurs in the upper section of the LOMR. In some locations, channel degradation affects water withdrawal points during low winter river levels. In the upper section of the LOMR, as well as in some other portions of the river, periodic ice flows can cause flooding due to restrictions of channel capacity. USACE-operated water control facilities and reservoirs located on tributaries of the Missouri River also affect flows in the upper section of the LOMR.

Flooding occurs periodically in the upper section of the LOMR. Flood flows greater than the 25-year flood event can potentially interrupt navigation on the river. Installation of the dams and the levee systems in the upper Missouri River (upstream of Gavins Point Dam) have helped reduce flooding frequency, extent, and damage in the upper section of the LOMR.

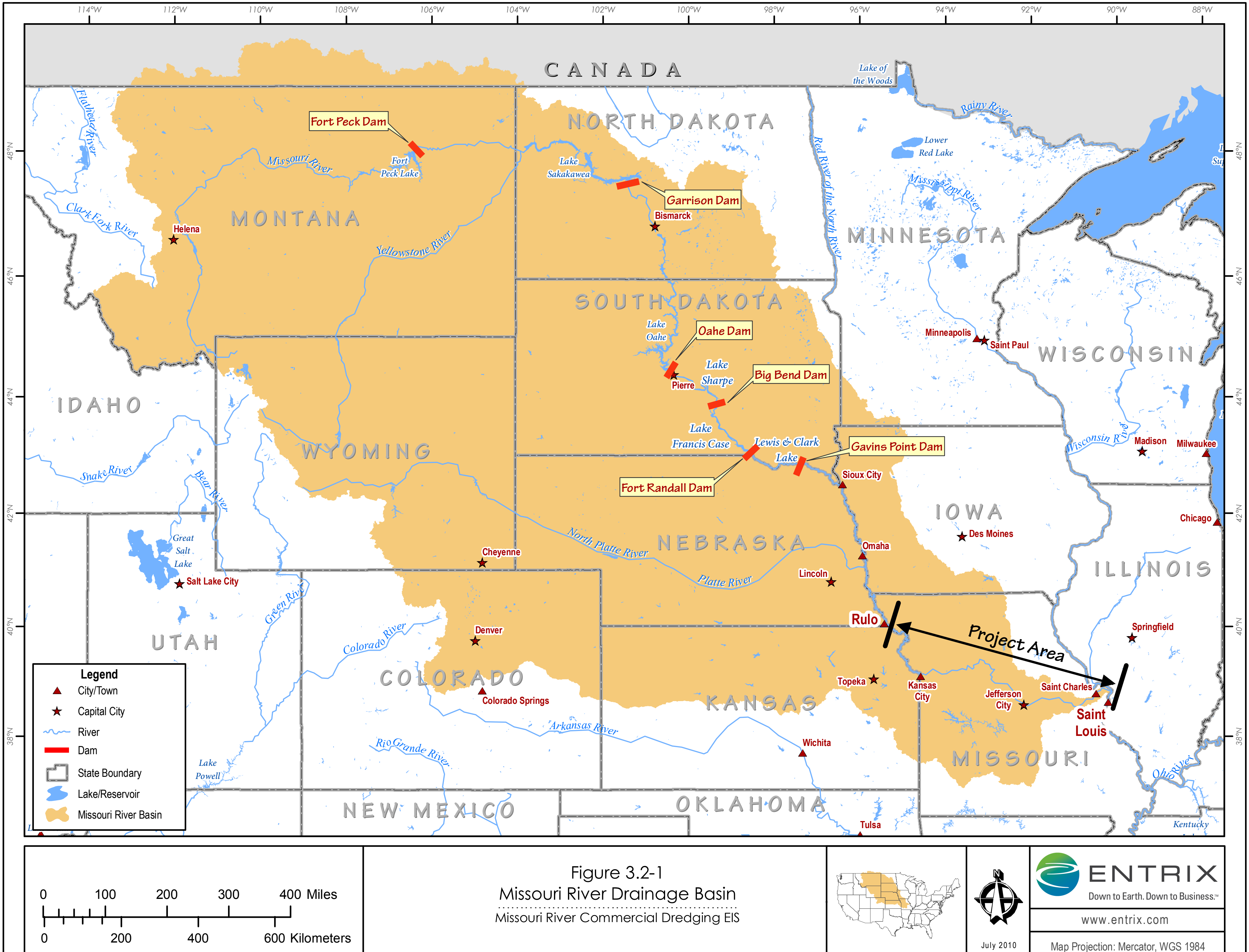

Figure 3.2-1
Missouri River Drainage Basin

Missouri River Commercial Dredging EIS

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The lower section of the LOMR contains the BSNP, an extensive series of river control structures installed to maintain a self-scouring navigation channel that minimizes dredging as a necessary part of navigation channel maintenance (see Sections 1.5.1 and 3.2.4.2).

3.2.2.3 Tributaries to the Lower Missouri River

Major tributaries and their point of confluence with the LOMR include:

- Big Nemaha River (RM 495);
- Nodaway River (RM 462) ;
- Platte River (of Missouri, RM 391);
- Kansas River (RM 368) ;
- Big Blue River (RM 357);
- Little Blue River (RM 340) ;
- Grand River (RM 250);
- Chariton River (RM 239);
- Little Chariton River (RM 227);
- Lamine River (RM 203);
- Osage River (RM 130); and
- Gasconade River (RM 104).

Many other minor streams, rivers, and drainage channels connect to the river. Details of the major tributaries are provided in Section 3.4.3.

3.2.3 Major Uses of the Lower Missouri River

The LOMR is a major source of drinking water, industrial and agricultural irrigation water, commercial and recreational fishing, boating and other recreation; fish and wildlife habitat; and commercial sand and gravel production. In addition, the LOMR has been a major transportation network for passengers and freight, and is greatly affected by hydroelectric power production in the Upper Missouri River basin and in LOMR tributaries. The USACE must weigh each of these factors and others, including flood control, when evaluating river management strategies or permit applications. The major uses of the LOMR include:

- Navigation, discussed in Section 3.6;
- Commercial sand and gravel production, discussed in Section 1.5.2;
- Recreation, discussed in Section 3.11; and
- Water supply, discussed in Sections 3.5 and 3.7.

3.2.4 Channel Modification

Since the 1930s, two major human-made modifications to the Missouri River have been constructed, resulting in significant change to the LOMR. These modifications include (1) construction of six dams on the upper river, which occurred between 1933 and 1963; and (2) construction of the BSNP, which occurred between 1945 and 1981.

3.2.4.1 Upper Missouri River Dam and Reservoir Development

Dams were built on the upper portion of the river at six separate locations primarily to minimize flooding frequency and intensity. They were built in stages between 1933 and 1963 at the locations shown in Figure 3.2-1. In addition to providing flood storage, the dams included hydroelectric plants and produced electricity. The reservoirs above the dams are used for a variety of water uses (drinking water, crop irrigation, and industrial and commercial uses) and recreational purposes. Collectively, these six dam and reservoir projects comprise the Missouri River Mainstem Reservoir System and provide 73 million acre-feet of storage capacity. The hydroelectric power generating facilities located at each dam are operated by the USACE through the Missouri River Mainstem Reservoir System Master Water Control Manual (Master Manual) and, more specifically, the Missouri River Mainstem Reservoir Current Water Control Plan (CWCP), which is incorporated into the Master Manual.

The most upstream of the six dams, Fort Peck Dam, was authorized by executive order of President Roosevelt in 1933 and was later approved through the RHA of 1935. Fort Peck Dam was built first, with construction starting in 1933 and the embankment closing off the river in 1937. The Fort Peck Dam created Fort Peck Lake and is the largest hydraulically filled earthen dam embankment in the United States. The remaining five facilities were authorized and funded via the congressionally approved Flood Control Act of 1944 and are listed below:

- Garrison Dam (Lake Sakakawea): initiated in 1947, closure of the river occurred in 1953.
- Oahe Dam (Lake Oahe): initiated in 1948, closure of the river occurred in 1958.
- Big Bend Dam (Lake Sharp): initiated in 1959, closure of the river occurred in 1963.
- Fort Randall Dam (Lake Francis Case): initiated in 1946, closure of the river occurred in 1952.
- Gavins Point Dam (Lewis and Clark Lake): initiated in 1952, closure of the river occurred in 1955.

As with most major reservoir systems constructed and operated by the USACE, the reservoir system was designed and built to serve three purposes: flood control, hydropower production, and recreation.

- Flood control – The flood control capacity provided by the reservoir system's dams and lakes reduces the flow variability downstream and, therefore, the potential for damages due to floods that have historically occurred along the river. Flood control is accomplished by storing peak flows of the plains snowmelt and rainfall season from March through April, and the mountain snowmelt and rainfall period from May through July. In addition to lake storage and release, flood control mechanisms on the Missouri River include an extensive levee system (USACE 2004). A discussion of the change in historical flows that has occurred can be found in Section 3.4.4.
- Hydropower production – The greatest hydropower energy generation period extends from June through September, with peak load periods occurring in the winter heating season (December to mid-February) and the summer air-conditioning season (mid-June to early September) (USACE 2004). The reservoir system's 2.6 million kilowatts of hydroelectric generating capacity typically generates 10 billion kilowatt hours of electricity a year, although recent generation has been lower.
- Recreation – Recreational uses in the reservoirs include pleasure boating, fishing, water fowl hunting, riverbank hiking, and bird watching.

Operation practices for the reservoir system have always needed to balance the needs for flood protection, navigational reliability, hydropower generation, and industrial and municipal water uses with environmental concerns and maintenance of wildlife habitat. However, the passage of various federal laws such as NEPA, the ESA, and the NHPA, and various court rulings related to these laws has added additional factors to be considered and needs to be met in operating the reservoir system. The CWCP in the Master Manual sets specific guidelines for operation of the reservoir system (USACE 2006) and is discussed in further detail in Section 3.2.5.

3.2.4.2 Missouri River Bank Stabilization and Navigation Project

In 1912, the USACE began to construct the BSNP—a system of dikes to train and re-direct the river to an alignment engineered for the appropriate gradient for navigation and to prevent future channel movement, revetments to stabilize the banks, and other structures to direct flows in the LOMR, creating a self-scouring navigation channel. The BSNP structures were designed to direct river flows in order to prevent sediment accumulation in the main channel. The main goal of the BSNP was to provide a continuous open-river navigation channel, 9 feet deep and 300 feet wide, from Sioux City, Iowa to the Mississippi River—a distance of approximately 730 miles. The BSNP included substantial initial dredging; construction of over 2,000 dikes, revetments, and other structures; and shortening the river by closing off side oxbows and side channels. Although the channel was essentially completed in 1981, dredging to maintain navigational depths is occasionally still necessary when shoals develop, but the dredged material is generally not removed from the river system.

Water and ice flows can affect the river banks and flow channel. The BSNP also provides for the repair and stabilization of eroded or damaged banks in order to protect upland uses, water intakes, and other bank-located structures.

River Cutoffs

A number of projects to shorten the navigation distance in the LOMR were associated with construction of the BSNP. The extensive channel improvements in the river for navigational purposes resulted in numerous locations where new channels could be constructed to isolate meandering segments of the river into human-made oxbows or cutoff lakes. Many of these oxbows and lakes are cut off from the normal river flows by dikes on each end. The current hydrology of these areas differs substantially from historical conditions (USACE 2009a).

Navigational improvements also have resulted in isolation of side channels or smaller tributaries from the river. These areas essentially have become lakes. The contributions of water, nutrients, and sediments that were once sent to the Missouri River no longer occur, except during flood conditions.

Part of the recently implemented Missouri River Recovery Program (MRRP), discussed in Section 3.2.6.1, assesses the locations of cutoff areas and the potential benefits of reconnecting such areas into the normal flow of the river. These habitat restoration goals could contribute to improved fish and wildlife habitat.

River Bed Degradation in the Lower Missouri River

Construction of the BSNP facilities for navigational improvements has resulted in a deeper river with a single predominant channel. Flow is generally faster due to removal of meandering waterways and shallows. River banks contain more vegetation, and floodplains are primarily used for row crops.

Sediment loads in the LOMR have been substantially reduced due to upstream dams and reservoirs and stabilized banks. Upstream water capture in reservoirs also has changed the period and amounts of seasonal flows (USACE 2009a).

Construction and maintenance of the BSNP for barge traffic and navigational use has resulted in straighter and faster flows that tend to prevent sediment accumulation in the channel bottom. In addition, the dams and reservoirs in the upstream portion of the river trap large amounts of sediments that previously moved downstream with normal water flow. Commercial dredging operations have also removed sediment. As a result of these and other actions, degradation (lowering) of the river bed has occurred in the LOMR. Associated with bed degradation, average low-flow water surface elevations have dropped as much as 12 feet in some locations in the last 50 years. Dropping water levels have resulted in river bank erosion, impacts to operation of water withdrawals, tributary degradation and head-cutting, potential loss of stability of levees and bridges, and exposed navigational hazards. Erosion of stream banks can result in (1) compromised use and value of adjacent riparian property; and (2) the need to rebuild sophisticated intake structures at the river's edge belonging to municipal, commercial, and industrial water users.

Channel degradation also can affect fish and wildlife habitats. Receding sediments reduce nesting habitats for piping plover and least tern, and habitats suitable for various life stages of pallid sturgeon spawning (USACE 2009b, 2009c).

The USACE has identified several specific portions of the river with significant degradation. They include RM 50, RM 150, and RM 375. The USACE is considering specific actions to address the areas of most concern. A complete discussion of river bed degradation is included in Section 3.4.

3.2.5 River Operations and Management

Active management of the river by the USACE is associated with construction of the upper river dams and reservoirs and the BSNP. This management includes plans for storage and release of water from the reservoirs and operation of flood control and BSNP structures to maintain navigation.

Prior to construction of the upstream dams and reservoirs, the typical annual flow regime would include a strong flood pulse beginning in March through April from rain and spring snowmelt from the Great Plains. A second pulse would normally occur from May through July from Rocky Mountain snowmelt and seasonal rainfall, which typically peaks in June. Flows then would decline through summer and fall. Lowest flows generally would occur in late December.

Active management of the river is guided by the CWCP. In enacting the 1944 Flood Control Act, Congress adopted the recommendations of the Pick-Sloan documents, which identified the purposes of the river management project (flood control, navigation, irrigation, hydropower, water supply, water quality, recreation, and fish and wildlife). To study the balance of these functions for optimizing development and utilization of the river's water resources, the USACE prepared the Missouri River Master Water Control Manual Review and Update Study (Master Manual Study). The result of the Master Manual Study was identification of the CWCP. Chapter 7 of the current Master Manual (USACE 2006) describes the CWCP, which guides control and operation of the series of six dams in the upper river.

The CWCP specifies four zone designations for each dam and reservoir system. They include the following:

- Permanent Pool Zones at each of the six reservoirs are intended to remain permanently filled with water and ensure the maintenance of minimum power heads, minimum irrigation diversion levels, and minimum reservoir elevations for water supply, recreation, and fish and wildlife purposes.
- Exclusive Flood Control Zones are reserved for regulating the largest floods and generally remain open and available for this purpose.
- Annual Flood Control and Multiple Use Zones are intermediate to the first two zones and provide (1) active storage for project purposes; (2) storage space for the control of moderate floods; and (3) when combined with the upper Exclusive Flood Control Zone, control of major floods.
- Carryover Multiple Use Zones are also intermediate to the first two zones and provide functions similar to those provided by the Annual Flood Control and Multiple Use Zones.

The CWCP attempts to mirror the pre-dam annual flow cycle, with higher releases from mid-March to November and lower rates of release from late-November to mid-March. The CWCP allows for adaptive management, meaning that the release rates can be varied during the water year. Each dam has specific release rates and an overall plan (USACE 2006).

The reservoir system's water releases directly affect the LOMR flow rates and durations. The upper segment of the LOMR is more directly affected by the dam operations. The tributaries and side channel connections to the main river that flow into this upper segment of the LOMR lessen the effects of the reservoir system's release program the farther downstream one moves.

3.2.6 Environmental Evaluation and Restoration Projects/Programs

A number of major evaluation and restoration projects and programs have been completed or are in progress for the Missouri River, as described in the following subsections.

3.2.6.1 Missouri River Recovery Program

The MRRP is the most recent of a series of mitigation and habitat restoration efforts that have been implemented since construction and operation of the BSNP and mitigation projects that arose from the biological opinion for the Master Manual and its 2003 update (USFWS 2003). The USACE works in partnership with the USFWS and tribal nations, states, and other agencies to develop and implement recovery actions and recovery goals of the MRRP (MRRP 2010). These agencies define where changes or improvements might result in benefits to the river or the environment.

Missouri River Recovery Program Goals

The primary goals of the MRRP include creation of habitat (shallow-water habitat and emergent sandbar habitat), fish hatchery support, flow modifications, public involvement, and scientific studies (MRRP 2010). More than 50 sites for creation of shallow-water habitat or emergent sandbar habitat are currently under consideration (MRRP 2010). Sand bars and shallow-water, slow-velocity habitat is necessary for successful nesting, egg laying, hatching, and foraging for terns and plovers; and as nursery and refugia habitat for successful larval development of pallid sturgeon and other native fish (USFWS 2000).

The goal for the shallow-water habitat initiative is to establish 20–30 acres of shallow-water habitat per river mile prior to 2020 in order to support threatened and endangered, listed and candidate species and other native species of concern (USFWS 2000). Shallow-water habitat is typically created by widening the river channel and restoring chutes and side channels. A portion of this work has already been completed, and habitat improvements have already shown positive biological results (USFWS 2000).

The goal for the emergent sandbar habitat initiative is to create 80 acres of sand bar per river mile by 2015. In January 2010, approximately 75 acres of sand bars per river mile had been constructed (MRRP 2010). Sand bars are generally not stable features but are formed, enlarged, moved, or eroded by the dynamic forces of the river. Stabilization of the Missouri River for navigation, hydropower, irrigation, and flood control has significantly increased stabilization in the river channel, resulting in stable sand bars that are unsuitable for nesting because of vegetation encroachment or are too low and subject to frequent inundation (USFWS 2000). Under the MRRP, sandbar habitat is typically created by mechanically building and maintaining sand bars and by clearing vegetation from existing sand bars.

Potential Sediment Contribution

The USGS has preliminarily estimated that, for a 700-mile stretch of river, approximately 37 million tons of sediment per year and 562 million tons of sediment over 15 years could be released through ongoing and reasonably foreseeable restoration projects (Jacobson et al. 2009). This estimate considers the different methods used to create the shallow-water habitat, the likelihood of projects to be carried out, and the goals set in the biological opinion for habitat restoration. In the short term, the amount of sediment that would be released into the river by restoration projects is likely to be minimal.

Missouri River Recovery Program Effects

Shallow-water habitat is created by mechanical excavation, which releases sediment into the river. Although sediment released into the river from restoration projects could potentially become available for dredging, the sediment contributed by such projects is unlikely to be predominately the size fraction that is desirable for dredging. Moreover, the addition of sediment to the river helps to create diverse aquatic habitats and to maintain sandbar and shallow-water habitat (USFWS 2000).

Whereas sediment load resulting from construction of restoration projects may also increase turbidity, increased turbidity could benefit the pallid sturgeon and other turbid water specialized species (USFWS 2000). Sediment releases into the Missouri River would likely benefit existing infrastructure, particularly in areas with high levels of degradation. Sediment aggradation enhances revetment protection and provides additional cover to near-exposed rock outcrops and buried pipelines.

The addition of large amounts of sediment into the Missouri River may negatively affect some biologic resources. Sediment aggradation in some areas may promote conversion of open-river habitat to undesirable lacustrine conditions and could eventually foster riparian forest growth if not maintained through continuing restoration efforts.

3.2.6.2 Biological Opinion

In 1989, the USACE initiated formal ESA Section 7 consultation with the USFWS on "Operations of the Missouri River Main Stem Reservoir System." In November 1990, USFWS issued a jeopardy biological opinion for the least tern (*Sterna antillarum*) and piping plover (*Charadrius melodus*) and a non-jeopardy opinion for the bald eagle (*Haliaeetus leucocephalus*). The pallid sturgeon (*Scaphirhynchus albus*), listed as endangered in late 1990, was not addressed by that biological opinion. In August 1994, the USFWS issued a draft biological opinion, which concluded jeopardy to the least tern, piping plover, and pallid sturgeon, and non-jeopardy to the bald eagle. Following the Flood of 1993, the USACE identified significant repair and maintenance work to flood-damaged training structures associated with the BSNP. Due to potential adverse effects on the pallid sturgeon in 1994, the USFWS requested that the USACE consult on the repair project. The USACE agreed to informal consultation on the project, including USFWS review and consultation on individual projects. In December 1998, the USACE provided the USFWS a biological assessment on the "Operations of the Missouri River Main Stem Reservoir System" and related "Operations of the Kansas River Tributary Reservoirs." In April 1999, the USACE also provided a biological assessment on "Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project." In a March 30, 2000 letter, the USACE requested that formal consultation on the three projects begin on April 3, 2000.

In 2002, the USFWS issued a biological opinion and amended it in 2003. The *USFWS 2003 Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Mainstem Reservoir System Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project and Operation of the Kansas River Reservoir System* (2003 Biological Opinion) states that flora and fauna living in or along a river are often highly dependent on certain patterns of streamflow and habitat to ensure their sustainability. The USFWS believes that past management and regulation of the Missouri River, as well as changing hydrological patterns, have significantly adversely impacted the piping plover, the interior least tern, and the pallid sturgeon, as discussed above. The 2003 Biological Opinion outlined specific measures the USACE needed to take to recover these three endangered species (CDR Associates 2006).

3.2.6.3 Missouri River Fish and Wildlife Mitigation Project

The Missouri River Fish and Wildlife Mitigation Project was designed to mitigate fish and wildlife habitat losses that resulted from past channelization efforts on the Missouri River. Construction of the BSNP facilities and subsequent adaptation of the channel to increased flow rates and sediment deposition have impacted fish and wildlife habitat in the river corridor. Fish and wildlife populations have decreased, as well as the recreational opportunities they provide. In the early 1980s, the USACE Kansas City District completed a study of the feasibility of this mitigation project. The study was conducted under the authorization of the 1958 Fish and Wildlife Coordination Act (Public Law [PL] 85-624) and determined that mitigating fish and wildlife resources lost to construction of the BSNP project and enhancing fish and wildlife resources was economically feasible. In 1986, Congress authorized construction of the Missouri River Fish and Wildlife Mitigation Project (USACE 2003). The Missouri River Fish and Wildlife Mitigation Project has implemented numerous segment-specific mitigation and habitat enhancement measures within and along the river between Sioux City, Iowa and St. Louis (USACE 2003).

3.2.6.4 Missouri River Master Water Control Manual EIS

In March 2004, the USACE published the Missouri River Master Water Control Manual EIS. In 1990, the USACE undertook revision of the Master Manual, due in part to the the ESA listing of the least tern, piping plover, and pallid sturgeon. The USACE objectives for the Master Manual have been to develop a CWCP that meets the contemporary needs of the basin; fulfills its responsibilities to Indian tribes; and complies with environmental laws, including the ESA. The Final EIS on the Master Manual stated that three features of the CWCP would be changed in the Master Manual to allow implementation of the Preferred Alternative identified in the Final EIS: drought conservation criteria, summer non-navigation service level, and reservoir system storage unbalancing (Kelly 2004).

3.2.6.5 Missouri River Recovery Implementation Committee

The USACE is exploring ways to encourage and support more collaborative approaches to water management challenges in the Missouri Basin. The USACE Record of Decision (ROD) on the Master Manual commits the USACE to initiate a comprehensive Missouri River Recovery Implementation Plan in order to restore the river’s ecosystem and protect and recover threatened and endangered species. To explore the feasibility of implementing such a plan, the ROD specified that recovery actions will be implemented through coordination with a Missouri River Recovery Implementation Committee, composed of a cross section of government entities and stakeholders, to ensure a comprehensive approach and broad-based support for recovery implementation (CDR Associates 2006).

3.2.6.6 Missouri River Ecosystem Restoration Plan and EIS

The USACE, in partnership with USFWS, is conducting a collaborative long-term study authorized by the Water Resources Development Act of 2007 (House of Representatives 2007). The study, known as the Missouri River Ecosystem Restoration Plan and EIS will identify the actions required to (1) mitigate losses of aquatic and terrestrial habitat; (2) recover federally listed species under the ESA; and (3) restore the ecosystem to prevent further declines among other native species. The intent of the study is to result in a plan that guides the USACE mitigation, restoration, and recovery efforts for the Missouri River for the next 30–50 years.

3.2.6.7 Federal Flood Risk Management Systems

The USACE established the Federal Flood Risk Management Program in 2006. Its purpose is to integrate USACE flood risk management programs and activities. The USACE coordinates with other agencies, such as the Federal Emergency Management Agency (FEMA); U.S. Department of Homeland Security; and other federal, state, and local agencies. The goal is to provide for comprehensive and sustainable national flood risk management, protect the public, and reduce flood damage.

As part of the program, the USACE performs several functions that relate to Missouri River floodplain management, including inventory and assessment of existing levees, assessment of potential public safety concerns related to deficient levee systems, assistance in flood mapping studies, participation in discussions relative to flood risk management, and development of policies (NFRMP 2010).

3.2.6.8 Missouri River Bed Degradation Study

The initial phase of the Missouri River Bed Degradation Study involved evaluation of the potential for federal interest in implementing solutions to water resources problems and opportunities related to river bed degradation in the lower 498 miles of the Missouri River. The necessary federal interest was demonstrated in the initial phase, allowing implementation of the reconnaissance phase.

The USACE Kansas City District prepared a Reconnaissance Report, which encompasses the geographic reach of the river from Rulo, Nebraska to the mouth of the river in St. Louis, Missouri. The purposes of the Reconnaissance Report were to examine existing data in order to determine the current condition and potential future condition of the river bed, and to look for opportunities to reduce river bed degradation and eliminate impacts. The USACE has determined through stream gage data and other physical data that the river bed has lowered. The river bed degradation has (1) affected public infrastructure, such as water intakes and pipeline crossings; (2) affected bank stability in certain areas; and (3) could potentially undermine dikes, revetments, and levees designed to support navigation and provide flood protection (USACE 2009a).

The Reconnaissance Report determined that there is a federal interest in implementing a feasibility study (USACE 2009a). Development of a project management plan and negotiating a feasibility cost-share agreement with non-federal partners for the next phase of study is currently ongoing.

3.2.6.9 Missouri River Authorized Purposes Study

Initiated in October 2009, the congressionally mandated Missouri River Authorized Purposes Study (MRAPS) co-led by the Omaha and Kansas City Districts of the USACE, will examine authorized purposes and current river infrastructure to identify options that may provide more multi-purpose benefits in terms of economic, ecosystem, socioeconomic and societal outputs. The study will analyze trade-offs and evaluate river management options within the context of current basin priorities. The result will be a comprehensive feasibility-type report and EIS for a USACE Chief's Report to Congress.

MRAPS also includes an extensive public involvement element. Involved stakeholders include the federal, state, and local agencies; tribal nations; businesses; interested stakeholder associations; farmers and landowners; environmental groups; recreation users; and others.

MRAPS will evaluate current interests and community values within the basin and identify opportunities for improvements to the Missouri River through research, analysis, and stakeholder input. MRAPS also will examine various alternatives and associated impacts on the following:

- Project infrastructure;
- Basin economics;
- Environmental quality;
- Public safety;
- Communities and social networks; and
- Other evaluation criteria that may be added during the study.

MRAPS will conclude with findings and recommendations, which will be provided to Congress (USACE 2009c).

3.2.6.10 Missouri River Recovery and Associated Sediment Management Study

The National Academy of Science has formed a Water Science and Technology Board and is overseeing an ad hoc committee to carry out the Missouri River Recovery and Associated Sediment Management Study. The committee members are scientific experts in water, ecology, chemistry, and soil who are not affiliated with the USACE and come from various universities, state agencies, federal agencies, and non-governmental organizations. The study is an independent, unbiased, and comprehensive study of sediment in and from the Missouri River basin. Issues associated with Missouri River basin sediment influence water management decisions throughout the greater Mississippi River watershed and extend as far as the Louisiana coast and the Gulf of Mexico. Effects also reach upstream to the river's headwaters in Montana and downstream to its mouth north of St. Louis. Specific questions to be addressed in this study include the following:

1. How and why is sediment a significant variable in the environmental restoration of a river system like the Missouri River?

2. What is the significance of the Missouri River sediments to the Gulf of Mexico hypoxia problem?

3. What is the significance of the Missouri River sediments to the restoration of Louisiana coastal wetlands?

4. What are the key environmental and economic considerations regarding nutrient loads and/or contaminants in Missouri River sediment? To what extent can such issues be addressed with management strategies?

5. Are there long-term consequences to the lack of sediment in the system to the human environment, either environmentally or economically?

6. Are there alternatives for reintroducing sediment into the system? What are they and what are the key constraints surrounding these alternatives?

7. Are current USACE management strategies, restoration tools (e.g. channel widening and creation of chutes and shallow-water habitat), and other activities adequate and sufficiently comprehensive

to address issues associated with sediment and nutrients in the system? If not, how might such strategies and activities be improved?

Although the USACE is sponsoring the study, which began in March 2008, they are not directing or controlling it. A report is expected in summer 2010.

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3.3 SEGMENTATION OF THE LOWER MISSOURI RIVER

Due to the length of the river being considered for dredging permits, a means of dividing the river into manageable units was needed. The LOMR from Rulo, Nebraska to St. Louis, Missouri includes diverse environmental conditions and considerable variations in land uses encompassing rural and urban areas. In addition, there is considerable variation in historical dredging operations and in supply from major tributaries. Finally, there were limited locations where sufficient hydrologic and sediment data have been collected to allow computation of sediment bed load estimates.

Of primary importance in evaluating the Proposed Action and alternatives is the potential for contributing to or exacerbating river bed degradation and how that degradation may affect various aspects of the natural and human environment. The two most important factors for segmenting the LOMR were (1) the limited number of locations where data are available to calculate sediment loads in the river; and (2) the number and location of major tributaries contributing additional sediment load to the river. Segment boundaries were established at major tributaries: Kansas River (RM 367.5), Grand River (RM 249.9), and Osage River (RM 129.9). Physical parameters such as bedrock geology, slope breaks, tributaries, width of the alluvial floodplain, and USGS gage locations were reviewed to refine the segment boundaries.

During the river segmentation process, it was recognized that the confluence of the Kansas and Missouri Rivers at Kansas City created a special circumstance. The Kansas River joins the LOMR in the heart of Kansas City, bisecting both the urbanized area and the area with the most observed channel degradation within the Project area. To better analyze issues specific to the Kansas City area, an additional segment was created by selecting tributaries upstream and downstream from the Kansas River, creating the Kansas City segment. The upstream tributary is the Platte River (Missouri) at RM 391.1, and the downstream tributary is the Big Blue River at RM 356.9.

The five segments were used to compute sediment bed loads in the river, to describe the existing environment in those segments when possible, and as a basis for the impact analysis. The segments are described in Table 3.3-1 and are shown in Figure 1.3-1. Analysis segments were named after a major urban area within the segment.

Table 3.3-1 Description of River Segments Used in the Analysis

Segment	Upstream Boundary (river mile)[a]	Downstream Boundary (river mile)[a]	Length (miles)
St. Joseph	Rulo, Nebraska (498)	Platte River (391.1)	106.9
Kansas City	Platte River (391.1)	Big Blue River (356.9)	34.2
Waverly	Big Blue River (356.9)	Grand River (249.9)	107
Jefferson City	Grand River (249.9)	Osage River (129.9)	120
St. Charles	Osage River (129.9)	Confluence with Mississippi River (0)	129.9

[a] River miles are from USACE spreadsheet MissouriR_RM_1890_1930_1960.xls.