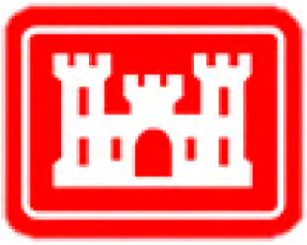
Draft

After-Action Environmental Assessment for the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal

Arkansas River Basin
Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, and Le Flore Counties, Oklahoma

August 2021



Tulsa District
U.S. Army Corps of Engineers

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1 Introduction

This Environmental Assessment (EA) has been prepared by the U.S. Army Corps of Engineers (USACE) Tulsa District (SWT) to evaluate the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal. This EA is an assessment of potential impacts that have resulted from the implementation of the Emergency Action Alternative in comparison with the No Action Alternative. It has been prepared in accordance with 33 Code of Federal Regulations (CFR) Part (§) 230 and the 1978 Council on Environmental Quality (CEQ) regulations 40 CFR § 1500-1508, as amended in 1986 and 2005, as reflected in the USACE Engineering Regulation (ER) 200-2-2. In fulfillment of these and all other legal, regulatory, and policy requirements, this EA describes the purpose and need for the action, the range of alternatives considered, and discloses the environmental impacts of the alternatives.

1.1 Purpose and Need

Record rainfall in May and June 2019 in southern and southeastern Kansas and in northeastern Oklahoma caused approximately 15 USACE reservoirs in the Upper Arkansas River Basin, Verdigris River Basin, and Grand (Neosho) River Basin (all within Tulsa District), to fill to or exceed the top floodpool elevation. While Tulsa District worked diligently to lessen the effects of flooding downstream, significant and in some cases catastrophic flooding was unavoidable.

River flows, measured in cubic feet per second (cfs), were overwhelming within large portions of the river system. Below Keystone Dam, west of Tulsa, Oklahoma, the rate of river flow approached 300,000 cfs at its maximum volume. Approximately 50 miles southeast of Tulsa, Oklahoma on the Arkansas River below Muskogee, Oklahoma - downstream from the Arkansas River confluence with the Verdigris River and the Grand (Neosho) River at the location known locally as "Three Forks” - the flow eclipsed 600,000 cfs in volume.

The Arkansas River within the Webbers Falls Pool, at a sustained volume of well over 600,000 cfs over a duration of more than a week, was carrying an enormous volume of sediment which was eroded from the three upstream feeder river basins and was passed through upstream dams and into the Navigation System, where much of it was subsequently deposited.

On May 23, 2019 two fully loaded barges moored in Muskogee, Oklahoma tore loose and were carried downstream, where they collided with Webbers Falls Pool Lock and Dam 16 and sunk. After sinking, the barges were forced against three of the structure's gates which had been fully open for the high river flow; because the two barges impeded the operation of the gates, those gates could not be closed. The inability to control the gates impacted by the barges led to an uncontrolled pool drawdown in the Webbers Falls Pool upstream of the Webbers Falls Lock and Dam 16. The SWT USACE emptied the pool more rapidly so barge removal and gate repair could begin. The amount of cfs leaking at the open gates put an increased amount of pressure on the barges and the salvage crew was unable to physically remove them, by emptying the pool; it allowed the salvage equipment to remove the barges.

Removal of the barges/operation of the Webbers Falls gates was dependent on the emergency dredging action, specifically the dredging within the Robert S. Kerr Pool. A tow barge was required to perform the extraction of the barges at Webbers Falls Pool Lock and Dam 16, and the tow barge had to travel the channel upstream from Arkansas through the Robert S. Kerr Pool. The inability for vessels to safely navigate also delayed the removal of the barges. The barges were removed in 2019, but the impacts of the water drawdown resulting from their impact on the dam structure were significant. In addition, the cfs leaking at the two open gates put too much pressure on the barges to allow for removal, which required USACE to empty the pool more rapidly. This reduced the pressure off of the barges and allowed salvage equipment to begin removing the barges. It is the opinion of USACE, that the unavoidable pool drawdown caused by the two barges, and the subsequent impacts of a rapid drawdown were not a result of the Federal emergency actions. Therefore, any impacts resulting from the pool drawdown are not considered as an effect of the Emergency Action and will not be evaluated within this EA.

The sediment prohibited the safe passage of barge and similar size draft vessels between Robert S. Kerr Pool Lock and Dam and Webbers Falls Pool Lock and Dam 16. The purpose of the Emergency Action was to remove the sediment impounded because of the May and June 2019 floods; facilitate the passage of equipment to complete the removal of the two sunken barges; and reopen the channel to navigation.

1.2 Project Authority

The development of the Arkansas River for navigation, flood control, hydroelectric power generation, and other purposes was authorized by the Rivers and Harbors Act (RHA) of July 24, 1946. Construction of the system began in 1949 with the construction of emergency bank stabilization and the system was declared open to commercial traffic on December 2, 1970. Public Law 91-649, passed by Congress in 1971, designated it as the McClellan–Kerr Arkansas River Navigation System (MKARNS). Subsequent acts authorized water supply, fish and wildlife, and agricultural water supply. Construction of the project began in 1957 and the current 9-foot navigation channel was opened to navigation in 1971 at a total cost of $1.3 billion.

The emergency dredging and disposal, known hereafter as the Emergency Action, was conducted under the Council of Environmental Quality (CEQ) regulation 40 Code of Federal Regulations § 1506.12, which provides guidance for alternative arrangements for National Environmental Policy Act (NEPA) compliance in regard to emergency declarations. Immediate action by USACE was necessary to secure lives and safety of citizens and to protect valuable resources. This EA has been prepared to evaluate the potential adverse effects of the Emergency Action in accordance with 40 CFR § 1500-1508.

The EA focuses on three core actions, dredging of the MKARNS, the subsequent disposal, and the mitigation associated with the disposal methods. The MKARNS required dredging to remove the barges from the Webbers Falls Pool Lock and Dam 16 gates and to restore two-way navigation for commerce within the channel. Disposal was necessary to continue dredging the channel. Related disposal sites were chosen based on proximity to the dredge locations and coordination with resource agencies. The

subsequent impacts require compensatory mitigation, which will require the conversion of terrestrial areas into appropriate habitats. This document will evaluate the impacts associated with the No Action Alternative, the Emergency Action dredging, and subsequent disposal and determine the necessary mitigation associated with restoring the quantity and quality of essential ecosystems. In compliance with the Anti-deficiency Act, 31 U.S.C. § 1341, the implementation of any additional action identified in the Emergency Action alternative is subject to the availability of funding, and no funds will be obligated prior to appropriation or apportionment.

1.3 Location

For the purposes of this EA, the discussion of “study area” will refer to the USACE fee-owned boundary around the MKARNS within Oklahoma state limits. The study area will be used to discuss existing conditions to give the reader an overview of the MKARNS. The study area geographically encompasses the MKARNS from the Port of Catoosa near Tulsa, Oklahoma to near the Arkansas state-boundary near Fort Smith (Figure 1).

The “project area” has been refined and is limited to discussions regarding sediment dredging and disposal sites and areas proposed for mitigation work within USACE fee-owned property. Discussion of the project areas are used to evaluate on-site impacts from implementation of the Emergency Action. Individual project areas are displayed in Appendix E – Project and Mitigation Area Maps.

Adverse Emergency Action impacts are in Webbers Falls Pool and the Robert S. Kerr Pool. The adverse habitat impacts described in Section 1.5.2 are located in areas that were not approved or addressed in the *Arkansas River Navigation Study Feasibility Report and Environmental Impact Statement (EIS) August 2005,* otherwise known in this document as the 2005 Arkansas River Navigation Study (USACE, 2005).

Figure 1. MKARNS Study Area

1.4 Relevant Projects and Studies

The authority for the 2005 Arkansas River Navigation Study came from a Resolution by the Committee on Public Works and Transportations of the United States House of Representatives, dated 11 March 1982, and referred to as the Arkansas River Basin Authority.

Additional authority for the 2005 study came from Section 216, 1970 FCA (P.L. 91-611) and Sections 103, 105, and 905 of WRDA 1986 (P.L. 99-662). Funds were appropriated in the Energy and Water Development Appropriations Act of 1999 to initiate and complete a reconnaissance study of flooding in unprotected areas outside the existing flood control levees at Fort Smith, Arkansas. As a result of the reconnaissance study, a Section 905(b) (WRDA 86) Analysis, dated September 1999, was prepared and approved in January 2000. The analysis identified the current MKARNS operating plan as the cause of some of the flooding problems. Concurrently, the navigation industry asked that the operating plan be re-evaluated to try to reduce the navigation losses due to high flows. The navigation industry also requested an investigation of increasing the channel depth from nine feet to 12 feet. Based on an initial assessment of possible benefits, the reconnaissance study recommended a feasibility study to improve navigation conditions while incidentally improving flood control, hydropower, recreation, and fish and wildlife. Additional language was included in Section 136 of the Energy and Water Development Appropriations Act of 2004, which authorized a project depth of 12 feet.

1.5 Description of Alternatives

The alternative evaluation is split between the No Action Alternative and the Emergency Action Alternative. The objective of the after-action EA is to evaluate the alternatives and manage the environmental impacts resulting from the dredging and disposal.

1.5.1 No Action Alternative

The No Action Alternative or No Action, while it does not meet the purpose of or need for the Emergency Action, serves as a benchmark of existing conditions against which Federal actions can be evaluated, and, therefore, is included in this EA pursuant to CEQ regulations 40 CFR § 1502.14(d).

Under the No Action Alternative, the USACE would not have dredged or disposed the sediment associated with the 2019 flooding. The USACE would have allowed the sediment impoundment to prohibit the safe passage of barge and similar size draft vessels between Robert S. Kerr Lock and Dam and Webbers Falls Pool Lock and Dam 16 along the MKARNS ship channel. The No Action Alternative would have led to the continued delay of the removal of the two barges at Webbers Falls Pool Lock and Dam 16 and the dam flood gates would have remained open. This would have led to operational issues and a continued pool drain, creating significant adverse impacts to the human and natural resources.

1.5.2 Emergency Action Alternative

The Emergency Action incorporates the dredging and disposal of sediment impounded because of the May and June 2019 floods, which permitted the passage of equipment to complete the removal of the two sunken barges; repairing the gates; and reopening the channel to navigation.

The Emergency Action Alternative or Emergency Action included extensive dredging in the locations noted in Table 1 for an approximate total of 1.6 million cubic yards (cy). The dredged material was placed in locations within 1,500 feet of dredging operations, with some variation depending on local conditions in the MKARNS and pools. See Appendix E – Project and Mitigation Area Maps for detailed dredging and disposal project areas. The dredge and disposal areas are all located within USACE fee-owned property. The disposal areas have varying levels of environmental impact because they were placed in existing disposal sites, bottomland hardwood forest, emergent wetland, forested wetland, and open water habitats. The areas that were previously bottomland hardwood forest, emergent wetland, forested wetland, and open water habitat were not approved in any existing NEPA document for SWT; therefore, the disposals within these habitat types are the focus of evaluation. Some of the open water disposal sites in Webbers Falls Pool and Robert S. Kerr Pool extend above the water, increasing the area and volume of sediment above the normal pool elevation.

Selection of dredging equipment and method used to perform the dredging, as described in Engineering Manual (EM) 1110-2-5025 “Engineering and Design – Dredging and Dredged Material Management”, depends on the following factors:

- Physical characteristics of material to be dredged,
- Quantities of material to be dredged,
- Dredging depth,
- Distance to disposal area,
- Physical environment of the dredging and disposal areas,
- Contamination level of sediments,
- Method of disposal,
- Production required,
- Type of dredges available, and
- Cost.

The project used hydraulic dredging to remove loosely compacted sediment materials from the navigation channel. Hydraulic dredges remove and transport sediment in liquid slurry form. They are usually barge mounted and carry diesel or electric-powered centrifugal pumps with discharge pipes ranging from six to 48 inches in diameter. The pump produces a vacuum on its intake side, and atmospheric pressure forces water and sediments through the suction pipe. The slurry was transported by pipeline to a disposal area (see Figure 2). Pipeline dredges are commonly used for open water disposal adjacent to channels. Material from this dredging operation consists of a slurry with solids concentration ranging from a few grams per liter to several hundred grams per liter (USACE, 2018).

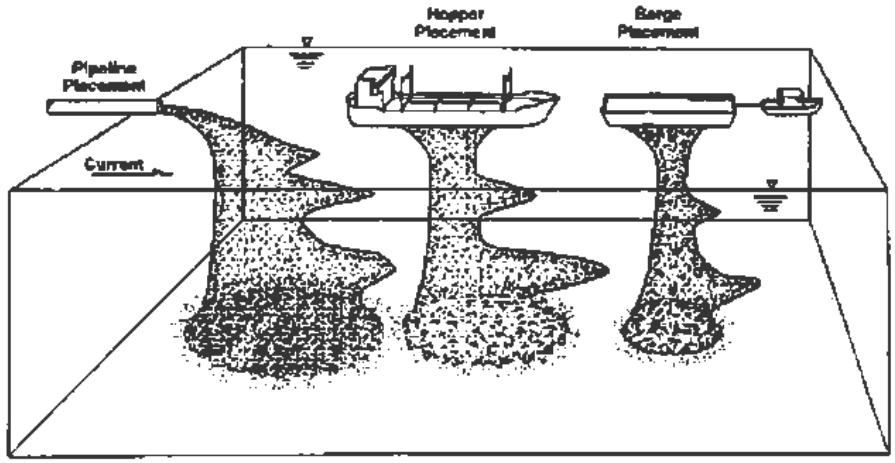

Figure 2. Plume Shape by Dredge Type

Table 1. Sediment Dredge and Disposal Locations

Location	River Mile	Cubic Yards Dredged	Disposal Location	Acres Impacted by Disposal	NEPA Approved Disposal Location
Sandtown Bottom	346-349	778,330	Open Water	97.7	No
			Emergent Wetland	16.4	No
Below Lock 16	366	70,322	Bottomland Hardwood Forest	10	No
Spaniard Creek	375	110,635	Open Water	146	No
Salt Creek	380	259,322	Open Water	1.3	No
			Emergent Wetland	7.4	No
			Forested Wetland	2.4	No
Stoney Point	355	76,444	Open Water	4.9	No
			Emergent Wetland	7.6	No
San Bois Creek	6.5 - 8	161,639	Open Water	30	No
Kerr Lake (RM 343)	343	55,586	Open Water	8.3	No
Three Forks	394.5 – 395	23,578	Disposal Site 16B	14.6	Yes
RM 400	400	13,875	Disposal Site 16A-1	14	Yes
Below Lock 18	421	35,688	Disposal Site 17A	30.3	Yes
Above Lock 18	422 – 422.5	37,367	Disposal Site 18C	11.6	Yes
Catoosa	445	14,525	Disposal Site 18B	11.5	Yes
Below Lock 14	319	21,578	Disposal Site 13A	1.5	Yes

In total, there were 10 acres of bottomland hardwood forest, 2.4 acres of forested wetland, 31.4 acres of emergent wetland, and 288.2 acres of open water habitat impacted by the Emergency Action. Because this action was used to address the sedimentation of the MKARNS, many adverse impacts were unavoidable.

Due to the disposal of sediment within emergent wetlands, forested wetlands, and bottomland hardwoods forest; compensatory mitigation will be required and enacted in accordance with Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act. The mitigation standard for this project falls under 33 CFR § 332.

In coordination with SWT Regulatory Office (RO), Table 2 displays the ratios required to compensate the adverse impacts as well as the resulting acres required to mitigate the action.

Table 2. Habitat Type, Acres Impacted, Ratio, and Required Mitigation Acreage Associated with the Emergency Action Alternative

Habitat Type	Impacted Acres	Mitigation Ratio	Required Mitigation Acres	Mitigation Method
Bottomland Hardwood	10	1.5:1	15	Creation
Forested Wetland	2.4	4.5:1	10.8	Creation
Emergent Wetland	31.4	2.5:1	78.5	Creation
Open Water	288.2	1:1	288.2	Self-Mitigating

The objective of the bottomland hardwood and wetland mitigation is to create a minimum of 15 acres of bottomland hardwood, 10.8 acres of forested wetland, and 78.5 acres of emergent wetland habitat in areas that would not be adversely impacted by creation of habitat and would be self-sustaining upon completion of mandatory monitoring and adaptive management guidelines. The mitigation sites included as part of this project are owned in fee by USACE and are currently used for agricultural practices such as haying and grazing, leaving them devoid of significant vegetation. However, the sites show appropriate characteristics for emergent wetland, forested wetland, and bottomland hardwood forest habitat based on their topography and soils.

The objectives of SWT Operations Division to compensate the loss of bottomland hardwood forest and wetland habitat are listed below.

- Establishment of native plant communities for wildlife.
- Bottomland hardwood - Planting of herbaceous vegetation, shrubs, and trees
- Forested Wetland - Planting of emergent wetland vegetation along with shrubs and trees
- Emergent wetland - Planting of emergent wetland vegetation
- Develop and maintain hydrologic characteristics for created habitats

Some of the open water disposal sites in Webbers Falls Pool and Robert S. Kerr Pool extend above the water, increasing the area and volume of sediment above the normal pool elevation. It is assumed by USACE that the open water impacts as described above are self-mitigating because USACE simply moved the sediment from one open

water site in the MKARNS to a nearby adjacent site. The sediment would have eventually been washed downstream, but there was a need to remove from the navigation channel immediately. Therefore, mitigation of open water will not occur as part of this project.

It was determined by USACE that the Emergency Action was the most practicable alternative compared to No Action, because it met the overall purpose and need of the project. It is understood there are still major adverse impacts to wetlands and Waters of the U.S. resulting from the Emergency Action, which instigated the need for habitat mitigation as described above.

2 Affected Environment and Environmental Consequences

This section of the EA describes the natural and human environments that exist at the project area and the potential impacts of the No Action Alternative and the Emergency Action Alternative, outlined in Section 1.5 of this document. The No Action Alternative can also be described as the Future Without-Project Condition. Only those issues that have the potential to be affected by any of the alternatives are described, per CEQ guidance (40 CFR § 1501.7 [3]). Some topics are limited in scope due to the lack of direct effect from the Emergency Action on the resource or because that resource is not located within the project area. For example, no body of water in the project area is designated as a Federally Wild or Scenic River, so this resource will not be discussed.

A significant discussion of the MKARNS affected environment was presented in the 2005 Arkansas River Navigation Study; additional information regarding the existing conditions of the MKARNS can be found in the project's Environmental Impact Statement (EIS). Disposal of sediment at Salt Creek, Stoney Point, and Sandtown Bottom directly impacted wetlands and open water habitats while Spaniard Creek, Kerr Lake River Mile 343, and San Bois Creek are restricted to open water habitats impacts. Below Lock 16 is the only site that required vegetation clearing within existing bottomland hardwood forest habitat adjacent to a previously approved disposal site. Due to the regular maintenance of the MKARNS, it is assumed any disposal locations that were previously approved in the 2005 Arkansas River Navigation Study EIS and are regularly utilized would result in a "negligible" determination. Therefore, those locations will not be discussed in this section because they have been mentioned in previous documents and have already been impacted by prior work.

- Three Forks
- RM 400
- Below Lock 18
- Above Lock 18
- Catoosa
- Below Lock 14

Impacts (consequence or effect) can be either beneficial or adverse. As discussed in this section, the alternatives could create temporary (less than 1 year), short-term (up to 3 years), long-term (3 to 10 years), or permanent effects.

Whether an impact is significant depends on the potentially affected environment in which the impact occurs and the degree of the impact (40 CFR § 1508.27). The context refers to the setting in which the impact occurs and may include society, the affected region, the affected interests, and the locality. Impacts on each resource can vary in degree or magnitude from a slightly noticeable change to a total change in the environment. For this analysis, the degree of impact is classified as negligible, minor, moderate, or major. The degree thresholds are defined as follows:

- Negligible: A resource would not be affected, or the effects would be at or below the level of detection, and changes would not be of any measurable or perceptible consequence.
- Minor: Effects on a resource would be detectable, although the effects would be localized, small, and of little consequence to the sustainability of the resource. Mitigation measures, if needed to offset adverse effects, would be simple and achievable.
- Moderate: Effects on a resource would be readily detectable, long-term, localized, and measurable. Mitigation measures, if needed to offset adverse effects, would be extensive and likely achievable.
- Major: Effects on a resource would be obvious and long-term and would have substantial consequences on a regional scale. Mitigation measures to offset the adverse effects would be required and extensive, and success of the mitigation measures would not be guaranteed.

2.1 Navigation

The beginning of the MKARNS is located at the confluence of the White River and the Mississippi River. The Arkansas River comprises most of the MKARNS and is entered via the White River to the Arkansas Post Canal, then up the Arkansas River to Muskogee to the Port of Catoosa via the Verdigris near Tulsa. The total length of the MKARNS is 445 miles, of which 375 miles is the lower Arkansas River (river miles 394 to 19). Other MKARNS components include approximately 50 miles of the Verdigris River (river miles 445 to 394), the Arkansas Post Canal, a nine-mile canal connecting the Arkansas River to the lower portion of the White River (river miles 19 to 10), and the lower 10 miles of the White River (river miles 10 to 0).

In 1946 Congress authorized USACE to begin constructing a planned series of locks and dams on the Arkansas River from the mouth of the river well into Oklahoma (The MKARNS continues for 50 miles up the Verdigris River in Oklahoma to the Port of Catoosa in Tulsa). Two U.S. Senators, John L. McClellan of Arkansas and Robert S. Kerr of Oklahoma, worked to get Congress to appropriate the necessary billions of dollars needed for the huge project. The system was finished in 1970. The USACE constructed the locks and dams and continues to maintain them.

The MKARNS has also been channelized and stabilized with dikes and revetments to improve navigation on the system. This channelization has reduced the historic breadth of the floodplain in these areas. The placement of levees along the system to retain floodwaters and control normal flood events has also impacted the systems' historic floodplain.

2.1.1 Locks and Dams

The development of the waterways of the MKARNS involved many in-stream modifications that produce stability and consistency to a naturally dynamic system. Navigation on the MKARNS is controlled by a series of 18 locks and dams. Dams were created along the length of the system to maintain a navigation pool, typically along the old river channel, that provided a constant minimum navigation depth to the channel. This series of navigation pools from dam to dam creates a stair step profile to the waterway from pool to pool, this allows the system traffic to "ascend" the system's 420-foot elevation change with a consistent navigable channel.

Passage through a dam is achieved through a "lock" chamber system that lowers downstream traffic by reducing the water level in the chamber to that of the downstream navigation pool and raising the chamber elevation for upstream traffic.

The lock and dam structures along the MKARNS vary in design and include 14 “low-head” and four “high-head” locks and dams. The four high-head USACE-operated locks and dams are used for hydroelectric power production as well as navigation control. Hydroelectric power production occurs at additional locks and dams along the MKARNS; however, these are not USACE-operated facilities. Passage through MKARNS lock chambers was configured for eight barges but can accommodate 15 barge tows using double lockage.

There are two lock and dam systems within the study area that should be specifically addressed within this EA: Webbers Falls Lock and Dam (No. 16) and Robert S. Kerr Lock and Dam (No. 15).

Webbers Falls Lock and Dam (No. 16) located at river mile 368.9 is approximately five miles northwest of Webbers Falls, Oklahoma. The lock and dam were constructed for both navigation and hydroelectric power. Authorization to build the lock and dam came from the RHA of 1946. Construction of No. 16 began in 1965; it was completed and operational in 1970.

The Webbers Falls Lock and Dam Project is 4,370 feet long, including the spillway, powerhouse intake, and navigation lock. The dam is constructed of rolled earth material and stands 84 feet above the streambed. The elevations from the upper and lower pools are 490 and 460 feet above mean sea level (msl), respectively. The spillway is a gated, concrete, ogee weir. The lock, an Ohio River-type with a normal lift of 30 feet, has a culvert and port filling system and side outlet discharge. The chamber is 110 feet wide by 600 feet long.

The Robert S. Kerr Lock and Dam (No. 15) was authorized as part of the MKARNS by the RHA of 1946. The lock and dam are located at river mile 336.2, about eight miles south of Sallisaw in Le Flore County, Oklahoma. Construction was started in 1964 with the objectives of navigation, hydroelectric power, and recreation. Closure of the dam and navigable operation occurred in 1970.

The total length of Robert S. Kerr Lock and Dam (No. 15) is 7,230 feet, including the spillway, powerhouse intake, and navigation lock. The dam, constructed of rolled earthfill material, is 75 feet above the streambed. The gated, concrete, ogee weir-type spillway extends partly across the existing river channel and a portion of the right bank

between the power improvements and the navigation lock. It is 900 feet long. The single-lift, Ohio River-type lock is located to the left of the spillway and has a culvert and port filling system. The chamber is 110 feet wide by 600 feet long and provides a normal lift of 48 feet.

2.1.2 Navigation

The 445-mile MKARNS links Oklahoma and Arkansas with ports on the nation's 12,000-mile inland waterway system, and foreign and domestic ports beyond by way of New Orleans and the Gulf Intracoastal Waterway. In addition, being near the geographic center of the United States makes these ports accessible to the rest of the country via the nation's interstate highway system and railroads.

Essentially a series of navigation pools connected by locks, the waterway enables vessels to overcome a 420-foot difference in elevation from the Mississippi River to the head of navigation at Catoosa, Oklahoma. The navigation system was designed for ease of navigation by multi-barge tows, with ample channel and lock dimensions and bridge clearances. Necessary maintenance dredging is done promptly, and the nine-foot deep channel is open year-round. The locks and dams are operated 24 hours a day by USACE, and the Coast Guard maintains the channel markers and other navigation aids.

The waterway has five major publicly developed ports and numerous privately developed facilities that adjoin the system. A considerable amount of land suitable for development is available at the ports and in other areas.

The five publicly developed ports along the MKARNS include: the Port of Catoosa, OK; Port of Muskogee, OK; Port of Fort Smith, AR; Port of Little Rock, AR; and Port of Pine Bluff, AR.

Although the MKARNS has been authorized to a depth of 12 feet [Section 136 of the Energy and Water Development Appropriations Act of 2004 (PL 108-137)], the actual maintained channel depth throughout the MKARNS is nine feet minimum. Due to ongoing maintenance dredging of the existing navigation channel and natural stream scour, approximately 80-90% of the MKARNS is already 12 feet deep over a portion of the channel width. A barge draft is defined as the depth a vessel sinks in water, particularly when loaded. Thus, a nine-foot deep channel can only accommodate barges with less than a nine-foot draft (approximately 8.5-foot draft with a 0.5-foot clearance).

2.1.3 Dredging Operations and Disposal

During periods of high river flows, water velocities are reached that cause river sediments in the form of silt and sand to be carried in suspension. As river flow decreases and velocities slow, the heavier suspended materials are dropped, and shoals develop in eddies and slower moving water. These shoals, when they occur in the navigation channel, are removed via hydraulic dredges to maintain the MKARNS navigation channel to authorized depths and dimensions. Dredged materials are disposed of in designated disposal areas on shore adjacent to the river or behind bank stabilization and channel alignment structures. On the Verdigris River, the dredged sediment is suitable for tilling and planting with grasses. The material dredged from the

Arkansas River is sand and is not suitable for planting. Dredged material is most likely to be free of contaminants if the material is composed primarily of sand, gravel, or similar materials and is found in areas of high current or wave action. Maintenance dredged material from the Arkansas River is primarily composed of sand and relatively free of pollutants (USACE, 2003).

The original SWT Dredge Material Management Plan (DMMP) (2003) was included as a federal action analyzed as part of the 2005 Arkansas River Navigation Study. The Record of Decision (ROD) was signed on 27 September 2005. A long-term plan was prepared in 2018 to address current and potential needs up to 2038. There were no substantial changes to the 2018 DMMP in environmental conditions or proposed dredge material disposal locations or methods not addressed in previous NEPA documents. The plan was updated to reflect dredging quantities, remaining capacities of selected disposal sites, and minor corrections and additions to the plan (USACE, 2018).

The dredging and disposal sites presented in the 2018 DMMP were analyzed using technical guidance presented in the EPA and *USACE Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual* commonly referred to as the Inland Testing Manual, and EPA regulation 40 CFR Part 230, (*Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredge or Fill Material*), and the USACE operation and maintenance regulations 33 CFR § 335-338. The Inland Testing Manual contains technical guidance for determining the potential for contaminant-related impacts associated with the discharge of dredge material in waters regulated under Section 404 of the CWA through chemical, physical, and biological evaluations. The manual uses a tiered process for analysis of dredge sites. At some sites, sediment sampling and analysis for chemical contaminants has been performed where the guidance indicated the need for such sampling. Regular maintenance dredging is conducted on the MKARNS to maintain the current navigation channel depth for commercial navigation purposes.

Maintenance dredging is being performed on the MKARNS under the following planning constraints:

- Maintain all existing project purposes;
- Allow all existing locks to remain in operation;
- Allow no in-stream disposal in Oklahoma;
- Minimize/mitigate impacts to the entire aquatic ecosystem, i.e., fisheries, wetlands, etc;
- Minimize/mitigate flood damages; and
- Minimize stream bank erosion.

Dredged material disposal has taken place in designated disposal areas such as on shore unconfined disposal areas; or behind bank stabilization and channel alignment structures; or in confined upland disposal areas. Currently, dredged material disposal areas along the Oklahoma portion of the MKARNS are scarce. The 2018 DMMP identifies twenty-nine maintenance dredged material disposal sites that occur or are planned for the SWT portion of the MKARNS (Pools 13 to 18).

2.1.4 No Action Alternative

Under the No Action Alternative, there would be significant long-term adverse impacts to infrastructure and the navigation channel. The concentration of flow on the remaining gates at Webbers Falls Pool Lock and Dam 16 could potentially have long-term or permanent consequences on the structure. Extreme damage on the gates through unforetold precipitation events, increased pressure, and permanently open gates would have immediate and likely permanent impacts on navigation within the MKARNS. Increased maintenance on the structure because of the potential damages would be costly and adversely affect any other USACE project within the study area. In addition, the unavoidable drawdown of the Webbers Falls Pool for an extended period would have significant adverse impacts on navigation throughout the channel, removing an important link within the waterway; resulting in greater cost and impact to infrastructure in the MKARNS.

2.1.5 Emergency Action Alternative

Under the Emergency Action, the navigation channel would be sustained using existing disposal sites and new unapproved disposal sites. River flow management and navigation channel depth would be modified to reflect historical conditions.

An increase in navigation efficiency occurred to the benefit of the navigation industry through the Emergency Action by allowing continued use of the channel throughout the system.

Although most of the impacts resulting from the Emergency Action are presumably beneficial, it can be expected that the open water disposal could eventually impact the navigation channel. Arkansas River flows will continue to move sediment, regardless of whether the flows are average or extreme. Average flows will slowly dislocate sediment disposed within 1,500 feet of the dredge sites and will either move downstream into the riverbanks or directly into the main navigation channel.

There would be negligible impacts from the use of existing disposal sites. Those located on upland properties would be used, regardless of the Emergency Action but would have been filled at a reduced rate of speed allowing for use in the future.

2.2 Land Use

Land use in the study area includes timber production, agriculture, public, industrial, and residential lands. Public lands and some private lands are managed for wildlife and recreation. Housing and industrial complexes are primarily centered on the communities of Tulsa, Muskogee, Gore, and Brent, Oklahoma. The area is best described as primarily rural with scattered homes between the major communities, which is also reflected by road density. Private lands that are mostly flat and not prone to flooding are typically used for farming, while more hilly lands are used for ranching and timber production.

2.2.1 No Action Alternative

Under the No Action Alternative, there would have been major impacts to land use within the study area. The barges stuck within the Webbers Falls Pool Lock and Dam 16 gates would not have been removed in a timely manner without the emergency declaration. There would have been major adverse impacts resulting from future precipitation events which could adversely impact land use if the gates were still out of action, by flooding downstream public and private lands used for the various purposes listed above.

2.2.2 Emergency Action Alternative

There were 10 acres of bottomland hardwood forest habitat impacted because of the Emergency Action, 2.4 acres of forested wetlands, and 31.4 acres of emergent wetland habitat due to the disposal of sediment in the Webbers Falls Pool and Robert S. Kerr Pool. Although these habitats were adversely impacted, this will cause minor adverse impacts to land use for recreational hunting and wildlife viewing. The Emergency Action would cause negligible impacts on approved upland sites due to their historic and existing use as disposal locations. Sediment disposal sites on islands and the shore of the Arkansas River would have minor temporary adverse effects on land use in areas that are specifically managed for wildlife; however, the creation of additional interior least tern (ILT) (*Sterna antillarum athalassos*) habitat did create beneficial opportunities for the species. It is assumed that the adverse effects of disposal on land use would decrease over time through precipitation events that will regularly wash away sediments.

Mitigation associated with the Emergency Action would cause permanent minor adverse impacts to land use through the conversion of prime farmlands to emergent wetland, forested wetland, and bottomland hardwood forest habitat. However, mitigation is necessary to counteract the adverse impacts of wetland disposal and vegetation clearing resulting from the Emergency Action.

2.3 Geology, Topography, and Soils

Geology

The rocks that underlie the Ouachita Province is Paleozoic (Cambrian to Pennsylvanian) in age. The Ouachita Province bedrock is fractured, faulted, and folded shale, sandstone, limestone and cherty-novaculite rocks.

The Ouachita Province rock is mostly a thick sequence of shale and sandstone, deposited during the Cambrian to early Pennsylvanian time, within an elongating subsiding Ouachita trough. The trough was formed by rifting along a late Precambrian-early Paleozoic continental margin. The Ouachita trough contains depositional deep-water sediments. The trough was closed during the late Pennsylvanian time by compressional tectonic forces. These forces created an intensely folded structure with north and south directed thrust faults. The thrust faults occur in folded structures and result in the rocks above the fracture depositing over the rocks below. Normal faults are common in the areas north of the Arkansas River, and thrust faults are present south of the river in the Ouachita Mountains.

Topography

The Ouachita Province is divided into the Ouachita Mountains Section in the southern portion of the province and the Arkansas Valley Section in the northern portion. The Ouachita Mountains Section is distinguished by ridge and valley topography rising in some areas to more than 2,000 feet above sea level. The Arkansas Valley Section includes lower elevation plains (300-600 feet above sea level) with smaller east-west ridges generally no more than 1,000 feet above sea level. Normal MKARNS navigation pool elevation in the Arkansas Valley Section varies from over 500 feet above sea level in eastern Oklahoma to approximately 250 feet above sea level near Little Rock, Arkansas.

The Ozark Plateau Province is north of the Ouachita Province and is separated into the Boston Mountains Section to the south of the Province and the Salem and Springfield Plateaus to the north. The Boston Mountains Section occurs along the northern portion of the Arkansas River Valley in northwestern Arkansas and northeastern Oklahoma. This 35-mile wide section is a deeply dissected plateau region characterized by flat-crested ridges that generally ranges from 1,900 to 2,500 feet above sea level. The valleys are generally V-shaped and are cut 300 to 1,000 feet below the ridges.

Soil

Within the MKARNS, deposition and down-cutting by major rivers and streams were extensive from the end of the Tertiary period to the Quaternary period. This on-going pattern of erosion and deposition left a series of alluvial depositions as the streams progressively lowered their beds. The more recent alluvial terraces may only be a few feet above the current floodplain. The alluvium is the most recent depositional material within the confines of the current floodplain.

In Oklahoma, the alluvium and alluvial terraces of the main stem of the Arkansas River average more than 5 miles in width and 45 feet in depth between the confluence with the Cimarron River and where the Arkansas passes Tulsa. The deposits are predominantly sand and gravel. The water table is generally less than 20 feet below the soils.

2.3.1 No Action Alternative

It is expected the No Action Alternative would have yielded adverse effects to soils within the study area. A permanent drawdown of Webbers Falls Pool could have potentially caused increased erosion within the pool, loss of soil through increased sedimentation, and drying of soils that are normally kept under wet conditions.

There would be negligible effects to geology and topography as a result of the No Action Alternative.

2.3.2 Emergency Action Alternative

Under the Emergency Action approximately 1.6 million cubic yards (cys) of dredged material was removed from the MKARNS. This resulted in minor short-term adverse impacts to soils from sediment suspension, movement, and resettlement caused by dredging. In addition, the open water disposal would also have short-term adverse impacts to soils as disposed material settles.

It is anticipated that there were minor adverse impacts to soil and topography from the disposal of dredged sediments on upland sites. Increased levels of erosion and compaction could occur from the material disposal activities. The addition of this dredged material would also raise the elevation of any disposal sites.

The mitigation plan will require some excavation, grading, and contouring to increase the extent and/or depth of areas to create wetland habitats. Implementing mitigation would result in the excavation of six inches to six feet of material to create the target wetlands. Any changes to topography resulting from the Emergency Action mitigation would result in increased habitat quality within the proposed mitigation areas due to the improvement with vegetative diversity because of the topographical changes. No measurable impacts would occur due to mitigation.

Sedimentation and erosion Best Management Practices (BMPs) will be incorporated to habitat construction to avoid erosion and sedimentation to adjacent waterbodies and wetlands. Prime farmland soils occur at the mitigation sites and a Farmland Conversion Impact Rating has been prepared and is included in Appendix D – Public, Agency, and Tribal Coordination in accordance with Section 1541(b) of the Farmland Protection Policy Act (FPPA) of 1980 and 1995, 7 United States Code (U.S.C.) 4202(b).

2.4 Climate, Climate Change, and Greenhouse Gases

Kansas, Oklahoma, and Texas fall within the Southern Great Plains. This region experiences diverse and extreme weather. The climate of the study area is “humid subtropical” characterized by long summers, relatively mild winters, and a wide range in temperatures. Generally, there is a significant amount of precipitation in every month and temperatures tend to be mild compared with the northern part of the country.

The average annual temperature is 60 degrees (°) (Fahrenheit), with an average annual high temperature of 71°F and average annual low temperature of 49°F.

Each year the area receives about 47 inches of rain, with January typically being the driest month. Late spring and late fall to early winter are typically the wettest periods.

Summer precipitation primarily occurs during rainstorms, where locally high rainfall amounts occur over a short period. During the fall, winter, and early spring, precipitation events are usually less intense and of longer duration. Most precipitation falls as rain and, on rare occasion, snow. Although the area receives precipitation throughout the year, droughts of short duration are frequent and are accentuated by high evaporation rates during the growing season (Weatherbase, 2020).

Severe weather is relatively frequent in Oklahoma, especially during the spring. Severe weather often takes the form of ice storms, severe thunderstorms, high winds, hail, lightning, heavy rainfall, and tornadoes. In Oklahoma City, Oklahoma the tornados generally track from the southwest to northeast (NOAA, 2020A). From 1950 through 2018, 3,866 (more than 16 per year) tornadoes have occurred statewide (National Oceanic Atmospheric Administration [NOAA], 2020B).

2.4.1 No Action Alternative

The U.S. Global Change Research Program (USGCRP) looks at potential impacts of climate change globally, nationally, regionally, and by resource (e.g., water resources, ecosystems, human health). Following drought over the last 50 years, there have been significant flooding and rainfall events in the Southern Great Plains region. This contrasts with the early 1900's. There has been an increase in the magnitude of flooding following an extreme drought. Populations, as they grow, will become subject to these extreme rainfall events. However, the Southern Great Plains flood frequency has decreased over the last 30 years while specific record-breaking flood events have increased. USGCRP predicts relatively small changes regarding average annual precipitation within the Southern Great Plains with slightly wetter winters within the northernmost section of the region, and drier summers. Increases in frequency and intensity of heavy precipitation events are expected (Kloesel et at., 2018).

Extreme heat events are expected to increase in frequency, duration, and intensity as well as an overall increase in average temperatures. Extreme cold events are expected to reduce over time due to climate change. The Southern Great Plains' annual average temperatures are projected to increase by 3.6°-5.1° and 4.4°-8.4°F in the mid to late 21st century due to probable increased greenhouse gas emissions. Similarly, to the summer of 2011, if no changes to emissions occur, the Southern Great Plains will most likely experience an additional 30-60 days per year above 100°F than what occurs at this point in time (Kloesel et al., 2018).

The No Action Alternative would not address Climate and Climate Change; however, it is expected that temperatures will rise and conditions will become wetter into the future.

2.4.2 Emergency Action Alternative

There would be short-term adverse impacts from emissions due to the use of heavy machinery used for dredging and sediment disposal. However, any impacts from the use of heavy machinery would have occurred regardless of the Emergency Action. The MKARNS is maintained on a regular basis with this type of equipment. It is expected that the implementation of the action produced negligible effects on climate and climate change.

The impacts to wetlands and bottomland hardwood forest habitat because of the Emergency Action would have had minor adverse impacts to climate change. However, the creation of emergent wetland (78.5 to 86.2 acres), forested wetland (10.8 to 20.7 acres) and bottomland hardwood forest (15 to 49.9 acres) habitat through mitigation would contribute to the collective sequestration of carbon. In particular, wetland habitats sequester significantly more carbon than the associated upland habitats. The Emergency Action and mitigation will not have a significant impact on climate and climate change

2.5 Air Quality

The U.S. Environmental Protection Agency (EPA) is primarily responsible for regulating air quality nationwide. The Clean Air Act (CAA) (42 U.S.C. 7401 *et seq*.), as amended, requires EPA to set National Ambient Air Quality Standards (NAAQS) for wide-spread pollutants from numerous and diverse sources considered harmful to public health and

the environment. The CAA established two types of national air quality standards classified as either “primary” or “secondary.” Primary standards set limits to protect public health, including the health of at-risk populations such as people with preexisting heart or lung diseases (such as asthma), children, and older adults. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings.

EPA has set NAAQS for six principal pollutants known as “criteria” pollutants. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2) and lead (Pb). If the concentration of one or more criteria pollutant in a geographic area is found to exceed the regulated “threshold” level for one or more of the NAAQS, the area may be classified as a non-attainment area. Areas with concentrations of criteria pollutants that are below the levels established by the NAAQS are considered either attainment or unclassifiable areas. Oklahoma is currently in attainment for all six criteria pollutants (Oklahoma Department of Environmental Quality [ODEQ], 2021a).

2.5.1 No Action Alternative

There would have been negligible beneficial impacts to air quality due to implementation of the No Action Alternative. Through the No Action Alternative, the Webbers Falls Pool water level would have decreased to unnavigable water levels preventing the barge dependent repair process for the gates. This would have decreased the capacity of towboats within the channel. The limitation of two-way traffic within the Arkansas River would also contribute to reduced traffic and emissions.

2.5.2 Emergency Action Alternative

The Emergency Action caused temporary and localized adverse impacts on air quality during dredging and disposal through heavy machinery and their associated emissions. Emissions associated with other forms of transportation would not measurably change as a result of emergency work completion. The project would return to status-quo and any short-term affects from the dredging and disposal would be temporary and negligible. Consequently, because Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, and Le Flore Counties, Oklahoma are in an attainment area for air quality, a conformity determination is not required for any work resulting from the Emergency Action.

The operation of heavy equipment, support vehicles, and other motorized machinery for mitigation construction would result in combustion of fossil fuels and the release of volatile organic compounds (VOCs), nitrogen oxides (NOx), CO, O_3, SO_2, and particulates (PM_{10} and $PM_{2.5}$). Additionally, fugitive dust emitted to the atmosphere by heavy equipment and support vehicles moving across unpaved, non-vegetated roadways or staging areas, wind blowing dust from disturbed areas and storage piles into the atmosphere could create a haze over the mitigation areas and increase ambient concentrations of particulate matter. Fugitive dust emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area

of land being worked and the level of construction activity. Emissions would be temporary in nature. The use of BMPs during mitigation construction would minimize these emissions, including the use of cleaner burning fuels and energy efficient equipment.

Air quality impacts from implementation of the mitigation plan would be similar in scope but varying in scale and duration. In general, each area would have minor and temporary direct impacts to ambient air quality from construction activities. Air emissions would be mobile in nature, temporary, and localized to the mitigation unit(s) being worked at that time. Implementation of the following BMPs would further reduce air quality impacts and should be incorporated when developing contract specifications:

Mobile Source Controls:

- The use of heavy machinery should be fitted with approved muffling devices that reduce emissions
- Plan construction scheduling to minimize vehicle trips
- Limit idling of heavy equipment
- Maintain and tune engines per manufacture's specifications to perform at EPA certification levels, prevent tampering, and conduct inspections to ensure these measures are followed; and
- Consider alternative fuel and energy sources (e.g. natural gas, electricity, etc.) when and where appropriate.

Fugitive Dust Source Controls:

- Stabilize open storage piles and disturbed areas by covering and / or applying water or chemical/organic dust palliative where appropriate at active and inactive sites; and
- Install wind fencing and phase grading operations where appropriate and operate water trucks for stabilization of surfaces under windy conditions.

2.6 Noise

The study area is relatively rural due to its location on the Arkansas River. Access to the river is limited to watercraft and any lands included are fee-owned by USACE. Existing noise sources within the study area can be attributed to large and small watercraft and adjacent roadways.

2.6.1 No Action Alternative

Under the No Action Alternative, there would be periodic noise attributed to scheduled dredging and disposal. Noise from growing residential areas is expected to increase over a 50-year period. This will be due to an increased population size, leading to additional vehicular noise from adjacent roadways.

2.6.2 Emergency Action Alternative

The Emergency Action required heavy equipment to implement dredging and disposal efforts, which caused short-term localized increases in noise levels. These short-term increases were not expected to substantially affect adjacent noise sensitive receptors or wildlife areas.

Noise levels created by mitigation construction equipment will vary greatly depending on factors such as the type of equipment, the specific model, the operation being performed, and the condition of the equipment. The equivalent sound level of the activity also depends on the fraction of time that equipment is operated over the period of the construction. Construction will occur during daylight hours, thus reducing the day-night average sound levels and the chances of causing annoyances. Construction will also be in accordance with migratory bird nesting periods, due to their proximity to the mitigation areas. Because the construction activities will occur within the existing USACE property, adjacent properties would be partially buffered from construction noises. The use of BMPs such as keeping equipment in good operating condition, proper training, and providing appropriate health and safety equipment would minimize the potential noise impacts associated with the Emergency Action mitigation.

2.7 Socioeconomics and Environmental Justice

The socioeconomics of the communities surrounding the MKARNS study area are summarized in this section. The study area is located in sections of Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, Le Flore Counties, Oklahoma. Although most adverse impacts to physical resources are concentrated in Muskogee, Haskell, and Sequoyah County, Oklahoma. The seven counties will be referred to as the “area of interest” in this section of the report. Demographic information for the state of Oklahoma is provided for comparison. The parameters used to describe the demographics and socioeconomic environment include population trends, private sector employment, and wage earnings. Other social characteristics such as race composition, age distribution, and poverty will be examined to recognize any potential environmental justice issues that the Emergency Action Alternative induced.

Population

Population estimates for the state of Oklahoma and the area of interest are displayed in Table 3 below. Between 2018 and 2050 Haskell county is expected to experience 18.7-percent (%) growth, Cherokee County a 46.3% increase, Le Flore County a 36.6% increase, Muskogee County a 18.5% increase, Rogers County a 51.7% increase, Wagoner County a 45.9% increase, and Sequoyah County expects a 46.8% population growth. Oklahoma is expected to grow up to 24% in population between 2018 and 2050.

Table 3: Population Estimates between 2000-2050

Geographical Area	2000 Population Estimate	2010 Population Estimate	2018 Population Estimate	2050 Population Projection
Oklahoma	3,450,654	3,761,702	3,918,137	4,860,554
Cherokee	42,521	46,987	48,607	71,103
Haskell	11,792	12,769	12,636	15,083
Le Flore	48,109	50,384	50,093	68,174
Muskogee	69,451	70,990	69,324	81,882
Rogers	70,641	86,905	91,801	139,281
Sequoyah	38,972	42,391	41,585	60,704
Wagoner	57,491	73,085	80,123	116,876

Source: U.S. Census Bureau, ACS Demographic and Housing Estimates. 2010: ACS 1-Year Estimates.
U.S. Census Bureau, Population Division (2000, 2010, 2018 Estimates); U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates (2018 Estimate)
U.S Census. 2002. Oklahoma 2000 Profile.
Barker, S. 2012. 2012 Demographic State of The State Report Oklahoma State And County Population Projections Through 2075.
U.S. Census Bureau. 2019. Annual Estimates of the Resident Population for Counties: April 1, 2010 to July 1, 2019.

Employment by Industry

The labor force by industry for the state and the area of interest is characterized in Table 4. Most of the area of interest is employed in the Educational services, health care and social assistance sector. Haskell County has high rates of employment in Agriculture, forestry, fishing and hunting, and mining followed by Construction. Le Flore, Muskogee, Rogers, Wagoner, and Sequoyah Counties have high rates of employment in Manufacturing. Cherokee, Muskogee, Rogers, Wagoner, Le Flore and Sequoyah Counties also have relatively high employment in the Retail trade. Sequoyah County also has high employment in Arts, entertainment, recreation, accommodation food services sector.

Table 4: Area of Interest Employment by Industry

Industry	Oklahoma	Cherokee	Haskell	Le Flore	Muskogee	Rogers	Sequoyah	Wagoner
Agriculture, forestry, fishing and hunting, and mining	4.6	3.5	14.3	7.6	1.7	2.3	3.2	1.6
Construction	7.1	6.5	10.4	7.0	6.2	7.7	8.4	8.6
Manufacturing	9.5	7.6	6.3	12.0	12.8	14.4	11.9	13.1
Wholesale trade	2.5	2.3	1.7	2.1	2.9	3.1	1.9	3.7
Retail trade	11.6	11.8	9.1	11.7	10.9	10.0	10.8	10.8
Transportation and Warehousing, and utilities	5.4	4.4	6.8	7.2	6.4	9.1	6.5	6.6
Information	1.6	0.7	0.8	0.9	1.2	1.9	0.6	1.6
Finance and insurance, and real estate and rental and leasing:	5.5	4.5	2.7	4.2	3.7	5.7	3.9	6.0
Professional, scientific, and management, and administrative, and waste	8.6	7.2	4.4	5.9	5.9	7.5	5.4	9.0

Industry	Oklahoma	Cherokee	Haskell	Le Flore	Muskogee	Rogers	Sequoyah	Wagoner
management services								
Educational services, and health care and social assistance	22.4	28.6	26.3	23.1	27.2	21.1	25.7	20.7
Arts, entertainment, and recreation, and accommodation and food services	9.8	9.8	4.2	8.3	8.8	8.6	13.1	8.7
Other services, except public administration	5.2	4.9	6.0	4.4	4.7	4.4	3.5	5.2
Public administration	6.2	8.2	6.8	5.6	7.4	4.1	5.1	4.5

Source: U.S. Census Bureau, Comparative Economic Characteristics. 2019: ACS 5-Year Estimates Comparison Profiles.

Income and Poverty

Median household and per capita incomes for the selected geographies are displayed in Table 5. The median household incomes are lower in each of the areas of interest when compared to the state of Oklahoma, except for Rogers and Wagoner Counties. The largest discrepancy within the categories of median household income and percent of people with incomes below poverty level.

Also displayed in Table 5 is the percentage of individuals and families whose incomes were below the poverty level in 2019. The percent of people with incomes below poverty level in the AOI is higher than the state of Oklahoma, except for Rogers and Wagoner County.

Table 5: Income and Poverty within the Area of Interest

Geographical Area	Median Household Income ($)	% of Families with Incomes Below Poverty Level (2019)	Per Capita Income ($)	% of People with Incomes Below Poverty Level (2019)
Oklahoma	52,919	11.3	28,422	15.7
Cherokee	42,774	14.3	22,161	22.1
Haskell	42,348	14.2	22,074	19.1
Le Flore	40,677	16.6	20,902	20.7
Muskogee	43,078	16.3	23,826	21.1
Rogers	65,434	7.4	32,148	9.9
Sequoyah	40,351	17.0	20,384	21.5
Wagoner	62,795	7.4	29,415	10.4

Source: U.S. Census Bureau, Comparative Economic Characteristics. 2019: ACS 5-Year Estimates Comparison Profiles.

Labor Force and Unemployment

Details on the labor force and unemployment rates for Oklahoma and the AOI are displayed in Table 6 below. The 2019 annual average unemployment rate in Oklahoma was 5.1%. The unemployment rates in Haskell and Sequoyah Counties were much higher at 8.6% and 7.2%, respectively. Le Flore, Muskogee, Rogers, and Wagoner Counties were comparable to Oklahoma at 5.6%, 6.3%, 4.5%, and 5.9%, respectively.

Table 6: Unemployment Rates in the Area of Interest

Geographic Area	Civilian Labor Force	Number Employed	Number Unemployed	Unemployment Rate (%)
Oklahoma	1,866,957	1,771,742	95,215	5.1
Cherokee	21,290	19,672	1,618	7.6
Haskell	5,094	4,656	438	8.6
Le Flore	20,300	19,163	1,137	5.6
Muskogee	28,290	26,508	1,782	6.3
Rogers	46,146	44,069	2,077	4.5
Sequoyah	17,147	15,912	1,235	7.2
Wagoner	39,243	36,928	2,315	5.9

Source: U.S. Census Bureau, Comparative Economic Characteristics. 2019: ACS 5-Year Estimates Comparison Profiles.

Race and Ethnicity

Table 7 displays race and ethnicity for the comparative geographies. Within each of the areas of interest, the American Indian and Alaska Native alone population is significantly higher when compared to the state of Oklahoma and comprises most of the population.

Table 7: Race and Ethnicity in the Area of Interest

Area	White	Black	Hispanic or Latino	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races
Oklahoma	72.3	7.3	10.6	13.4	2.9	0.3	3.1	6.9
Cherokee	50.9	1.4	7.2	43.7	1.3	0.4	2.4	10.1
Haskell	72.3	0.9	4.4	23.9	1.1	0.2	1.9	14.5
Le Flore	75.5	1.9	7.00	18.8	1.00	0.0	2.3	8.00
Muskogee	57.8	10.6	6.2	26.1	1.00	0.0	3.7	8.9
Rogers	74.6	1.00	4.8	20.7	1.8	0.1	1.3	8.5

Area	White	Black	Hispanic or Latino	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races
Sequoyah	64.2	1.9	4.2	30.6	1.1	0.2	1.6	10.9
Wagoner	75.3	3.5	6.2	16.3	2.1	0.2	2.0	8.5

Source: U.S. Census Bureau. 2019. 2015-2019 American Community Survey 5-Year Estimates (2019 Estimate) ACS Demographic and Housing Estimate

Age

The distribution of population by age group is displayed in Table 8. The age distribution is similar between the AOI and the state of Oklahoma. In terms of percentage of total population, the AOI have a slightly larger population of ages 55 to 59 when compared to Oklahoma, except for Cherokee County.

Table 8: Population by Age Group

Area	Age Group (%)												
	<5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 34	35 to 44	45 to 54	55 to 59	60 to 64	65 to 74	75 to 84	85 and over
Oklahoma	6.6	6.8	6.9	6.7	7.1	13.8	12.4	11.9	6.4	6	8.9	4.7	1.8
Cherokee	5.9	6.2	6.4	7.7	11.2	12.1	11.3	11	6.1	5.8	9.7	5.2	1.4
Haskell	6.4	6.1	7.3	6.6	5.3	11.2	11.8	12.1	6.7	6.7	11.5	6.2	2.1
Le Flore	6.4	6.7	7.1	6.6	5.7	12.0	12.3	12.5	7.0	6.3	10.4	5.4	1.7
Muskogee	6.7	7.0	6.8	6.8	6.4	12.8	12.2	11.9	6.6	6.5	9.4	4.9	2.1
Rogers	5.8	6.3	7.1	6.9	6.4	12.3	12.2	13.5	6.8	6.8	9.4	4.9	1.7
Sequoyah	6.4	6.0	7.1	6.6	5.9	11.8	11.5	13.6	7.5	5.7	10.7	5.7	1.6
Wagoner	6.0	6.9	7.2	6.6	5.3	12.6	13.2	13	6.7	6.3	9.9	5.0	1.2

Source: U.S. Census Bureau. 2019. 2015-2019 American Community Survey 5-Year Estimates (2019 Estimate) ACS Demographic and Housing Estimate

Commerce

Commercial activity on the MKARNS waterway includes up-bound barges of bauxite, grain, chemicals, fertilizer, steel, pipe, asphalt, soda ash, petroleum products, clay, sand, gravel and miscellaneous commodities. Down-bound barges ship soybeans, wheat, lumber, steel, coal, gypsum, scrap iron, rock, refined petroleum products and manufactured equipment.

The 445-mile MKARNS links Oklahoma and Arkansas with ports on the nation's 12,000-mile inland waterway system, and foreign and domestic ports beyond by way of New Orleans and the Gulf Intracoastal Waterway. In addition, being near the geographic center of the United States makes these ports accessible to the rest of the country via the nation's interstate highway system and railroads.

The waterway has five major publicly developed ports and numerous privately developed facilities that adjoin the system. However, only the Port of Catoosa and Port of Muskogee will be described in detail in this report. The other ports within the MKARNS include: Port of Fort Smith, AR; Port of Little Rock, AR; and the Port of Pine Bluff, AR. Additional information about each port can be found in the 2005 Arkansas River Navigation Study.

- Port of Catoosa, OK **-** Situated only five miles from Tulsa, Oklahoma, the Port of Catoosa lies at the head of navigation for the MKARNS and only five miles from Interstate 44. A 2000-acre industrial park located at the port gives businesses direct access to the waterway.

  The Tulsa Port of Catoosa has five major terminal areas: a low water (roll/on-roll/off) wharf, liquid bulk, dry bulk, grain, and general dry cargo. Between them they can transfer from raw steel to fabricated equipment and from powder-dry materials to thick liquids.

  For high-volume overland shipping, the Tulsa Port of Catoosa provides its businesses with easy access to major rail carriers. The port is served directly by the Burlington Northern/Sante Fe, and indirectly by the Union Pacific/Southern Pacific via the South Kansas and Oklahoma shortline. While the rail cars are on port property, the port's two switch engines can efficiently deliver them to and from port businesses over the 13 miles of internal railroad track.

- Port of Muskogee, OK - The Port of Muskogee is located at River Mile 393.8 within the incorporated limits of the City of Muskogee, Oklahoma. The Port of Muskogee is a full-service facility that offers easy access to rail, truck, and barge transportation.

  The 400-acre Port Industrial Park offers businesses access to the waterway via truck and rail. All-weather paved industrial roads extend throughout the port. Industrial roads connect to the Muskogee Turnpike and Highway 165 at the port entrance. The Port of Muskogee has a rail marshalling yard and an internal track system that is within the Muskogee switching limits of the Union Pacific Railroad. The port has 20 mooring dolphins, or marine structures designed to anchor boats. These structures are located along river channel frontage and barge terminal and dock facilities that provide access to the MKARNS.

2.7.1 No Action Alternative

Under the No Action Alternative, the emergency dredging would not have occurred on the federal navigation channel. As a result of deferred dredging, material would remain within the channels, the sunken barges would hold open the dam flood gates and continue to interfere with safe vessel passage. Commercial barges and recreational vessels would not able to use the channels, causing major adverse impacts to the local, regional, and national economy. The lasting impact of the No Action Alternative would have been significantly detrimental to local, regional, and national commerce, as barges could not ascend or descend the system.

2.7.2 Emergency Action Alternative

There are major permanent beneficial impacts on socioeconomics and negligible impacts to environmental justice from the Emergency Action. Although the MKARNS undergoes standard operations and maintenance that would normally keep the channel clear, the 2019 flooding created conditions within the Arkansas River that interfered with that standard. Dredging the channel and removing the sunken barges from the Webbers Falls Pool Lock and Dam 16 provided a direct link to improve conditions for businesses and individuals that may utilize the channel for local, regional, and national commerce. Adverse impacts to habitat resulting from the Emergency Action are not expected to have any effect on environmental justice because they are located on USACE fee-owned property.

2.8 Recreation and Visual Aesthetics

Fishing, hiking, hunting, kayaking, bicycling, boating, bird watching, camping, and off roading opportunities are in abundance throughout the study area. Forested lands in and surrounding the study area are very popular with the public. Public lands are heavily used by hunters during the fall and winter. Private lands in the area have large, and well-known hunting clubs, and are very popular for waterfowl hunting. Although, hunting levels vary year to year, it is consistent and an important source of revenue for landowners and local businesses.

The area's many oxbow lakes are popular spring and summertime destinations for anglers, especially during periods following overbank flooding. These floods provide hydrologic connections from the rivers, as well as inundate thousands of acres of bottomland forests – providing excellent spawning habitat for fishes. The most sought-after species in these rich lakes include crappie (*Pomoxis spp*.), largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), bluegill (*Lepomis macrochir*us), red-eared sunfish (*Lepomis microlophus*), and catfish (*Siluriformes spp*.). Boat ramps have been installed on many of the larger lakes and at selected sites along the rivers to increase access for waterborne recreation and fishing.

2.8.1 No Action Alternative

There would be long-term major adverse impacts to recreation and aesthetics due to the No Action Alternative. The impacts would be limited to the areas affected by the unavoidable drawdown of the Webbers Falls Pool. The prevalence of water provides a significant aspect to recreation activities like hunting, fishing, and kayaking within the study area. In general, individuals are attracted to water bodies due to their aesthetic

value. The adverse impacts to Webbers Falls Pool would be detrimental to the aesthetics of the study area due to a lack of water and exposure of soil, navigation channels, and other exposed materials (abandoned vehicles, boats, etc.).

In areas that were not affected by the drawdown of Webbers Falls Pool, potential impacts to recreation and aesthetic values would be negligible. During periods of maintenance dredging some recreational resources would not be accessible. However, these short-term minor adverse impacts would not change from current levels.

2.8.2 Emergency Action Alternative

The Emergency Action would incur minor adverse impacts to aesthetics along the MKARNS. The sustained maintenance of the existing channel normally produces short-term impacts to recreation and aesthetic values; however, the sediment disposal within wetlands and bottomland hardwood forests are expected to be unappealing and permanent if not removed.

Unlike large commercial vessels, recreational watercraft could still operate on the river without dredging and disposal occurring, except in the case of Webbers Falls Pool if the gates were still held open. Dredging activities have the potential to temporarily close boat ramps and boat basins and affect public recreation areas (swimming beaches) on a short-term basis during emergency dredging.

Permanent adverse impacts would be associated with dredged material disposal on areas used for hunting, fishing, or other recreational activities. However, given the number of recreational opportunities in the area, this would be a minor adverse impact. Once at capacity, open water dredge disposal has the potential to create wildlife habitat, which would have indirect beneficial effects on recreation if they enhanced hunting, fishing, or wildlife viewing opportunities.

Short-term impacts may occur where construction-related equipment, activities, and dust could be visible to observers on proposed mitigation areas. Impacts would be anticipated in years in which construction is implemented. These areas would realize only temporary aesthetic degradation until the disturbed areas blend in with the surrounding environment. It would be anticipated that the aesthetic value of the area would be improved over the existing condition.

2.9 Cultural, Historical, and Archaeological Resources

Archaeological sites representative of the Paleo-Indian, Archaic, Woodland, Caddoan/Mississippian, Protohistoric (Contact), and Historic Periods are known in the larger vicinity of the Arkansas River Valley in northeastern Oklahoma. This culture-historical sequence falls generally within the overall sequence that has been established for eastern Oklahoma. Many archaeological sites in this area have undisturbed, deeply-buried deposits; many are comprised of multi-component prehistoric and/or historic occupations. Several cultural resources investigations, including archaeological survey and excavation, were conducted incident to and post-construction of the MKARNS. In the larger region there are hundreds of archaeological sites and historic standing structures on record with the Oklahoma State Historic Preservation Office (SHPO) and Oklahoma Archeological Survey (OAS). Ultimately, as a mainstem river in a major

drainage basin of the central and southern Plains, the entire Arkansas River Valley can be classified as an area of high sensitivity for the location of cultural resources.

Cultural History Sequence

The following general regional chronology is widely found in the archaeological literature, with some variation depending on source.

- Paleo-Indian Period: 12,000 to 8500 Before Present (BP)
- Archaic Period: 8500 to 2000 BP
- Woodland Period: 2000 to 1200 BP (Anno Domini [AD] 1 to 800)
- Plains Village/Caddoan/Mississippian Period: AD 800 to 1500
- Protohistoric (Contact) Period: AD 1500 to 1825
- Historic Period: AD 1825 to present

To aid in comparing divergent cultures and sequences in eastern Oklahoma, the following general adaptation types are used to characterize prehistoric cultural traditions.

- Paleo-Indian - Specialized, large-game hunting by small bands of hunter-gatherers was the adaptation type associated with this ancient period. Signature stone tools are unnotched projectile points of fluted or lanceolate type, often found in contexts where mammoth or bison remains also occur. Structural remains are poorly understood, the probable result of a mobile lifestyle and the use of perishable construction materials. Three main complexes identified within this period are Clovis, Folsom, and Late Paleo-Indian (e.g., Dalton). The extent of the Paleo-Indian period was approximately 12,000 BP to 8500 BP.
- Archaic - Plant foraging and small-game hunting was an important subsistence strategy of hunter gatherer groups in this period and was associated with increased seasonal variability of resources during the mid-Holocene geological period. Repeated occupation of sites and features such as rock-lined hearths and roasting pits, and grinding tools reflect intensive plant processing and the cyclical exploitation of resources. Bison were hunted on a smaller scale than previously, with greater reliance on small mammals, mussels and fish. Stone tools were often thermally cured and included distinctive stemmed and notched projectile points. The Archaic period is traditionally divided into Early, Middle, and Late periods, the overall extent of which was approximately 8500 BP to 2000 BP.

- Woodland - Archaeologists in Oklahoma associate the use of ceramics in describing Woodland cultural components. Incipient horticulture was the adaptation type associated with this period, marked by the introduction of cultigens in eastern Oklahoma. Evidence for semi-permanent villages, increased reliance on wild and domestic plants, widespread use of ceramics and elaborate burials reflect the more sedentary lifestyle of Woodland cultures. Small game remained essential in subsistence. Tool assemblages are distinguished by small, corner-notched projectile points, which suggest invention of the bow and arrow. Woodland sites, not well known in Oklahoma, are generally described within the AD1-800 date range.
- Plains Village/Caddoan/Mississippian - Agriculture, supplemented by hunting and gathering, was the adaptation type associated with village societies. Agricultural tools were recognized in artifact assemblages, along with triangular arrowpoints for hunting and pottery types that in eastern Oklahoma serve to denote this period as the Plains Village/Caddoan/Mississippian. Village cultures are often identified in lowland terraces of waterways where agriculture was viable. Some archaeological sites from this time period have mounds associated, suggesting that those sites have some larger ceremonial or social function. Some mounds contain primary or secondary burials, but a few represent mounds on which a structure was located. Mounds such as these likely had a very specific role in the ceremonial lives of the region's inhabitants. This village farming period is generally described within the AD 800-AD 1500 date range.
- Protohistoric (Contact) - This period is defined by transitory contacts of European explorers in the eastern woodlands and central plains, substantiated by little or no historical documentation. Lifeways were subsumed under the Plains Village adaptation type, which is the Plains adaptation largely contemporaneous with Caddoan/Mississippian villages. Protohistoric sites in Oklahoma appear to be directly related to an earlier manifestation of similar village sites located further north in Kansas, including the Great Bend aspect with sites in south-central Kansas. Great Bend manifestations likely represent the proto-Wichita villages encountered by Francisco Coronado in 1541. Slightly later Proto-Wichita sites from the early 1700's have been identified on the mainstem Arkansas River in Kay County, north-central Oklahoma, and on the mainstem Arkansas River in southern Tulsa County, Oklahoma. These early 1700's Proto-Wichita sites are evidence of French influence on the southern Plains, as artifact assemblages from these sites contain metal musket parts from French firearms, glass trade beads (French), and European gunflints. The sites are also physically reflective of a significant trade economy with the French, where bison hides were processed in significant numbers and probably traded for firearms, beads, and gunflints.

- Historic - The Reservation Period (1825-1900) was marked by the displacement and resettling of Native American tribes throughout the greater Oklahoma region. The Cherokee Nation was created in northeastern Oklahoma in 1828, soon thereafter incorporating the Quapaw and Seneca tribes. After the Civil War, the area was further divided into reserves for the Peoria, Ottawa, Wyandotte and others. From 1838 to 1871 the Neosho Agency held jurisdiction over all tribes but the Cherokee. Between the 1830s and 1850s Anglo-Americans legally occupied tribal lands to operate mission schools, trading posts, ferries, mills, and blacksmith shops. The period 1850-1900 was marked by increasing Anglo-American land speculation and enhanced military supply lines through the study region that connected Fort Gibson, Fort Scott and Fort Leavenworth during the Civil War. Pioneer settlement of homesteads and towns began in earnest in southeastern Kansas during the 1860s following the removal of Native American tribes to Oklahoma. This trend was somewhat delayed in northeastern Oklahoma where the Cherokee Nation maintained a loose hold on sovereignty. By the 1890s, however, towns such as Miami and Ottawa in northeastern Oklahoma were firmly rooted.

Archaeological Inventories

The largest single archaeological assessment of archaeological resources on the MKARNS is A.F. Miller's 1977 "A Survey and Assessment of the Cultural Resources of the McClellan-Kerr Arkansas River Navigation System in Oklahoma, 1976." This investigation looked at the entire MKARNS system in Oklahoma, including the mainstem Arkansas River and the Verdigris River portions, identifying and visiting previously recorded archaeological sites, nearly 80 in total.

While some archaeological site test and major excavations and some limited archaeological surveys were accomplished in the Arkansas River valley, primarily from the 1960s through the early 2000s, the latest work in the region is a series of projects completed in 2015 by AmaTerra Environmental, Inc., on contract with the USACE, SWT. AmaTerra's work is detailed in two reports, including "Assessment of 32 Archaeological Sites at Webbers Falls Reservoir in Muskogee County, Oklahoma," and "Assessment of 58 Archaeological Sites at Robert S. Kerr Reservoir in Muskogee, Haskell, and Sequoyah Counties, Oklahoma." Final versions of both reports were authored by Mindy L. Bonine in August 2015.

The AmaTerra investigations at Webbers Falls and Robert S. Kerr Reservoirs were conducted between 2010-2015 and consisted of a series of re-visits to archaeological sites that had been recorded previously, in decades past, some last visited as part of A.F. Miller's 1977 work. The AmaTerra investigations focused on re-identifying sites in the field; determining if the sites were physically present and correctly mapped or required re-mapping; determining if the horizontal or vertical extent of the sites required modification; assessing and describing the sites; and making current National Register eligibility recommendations, if possible.

Geomorphological Investigations

Two recent geomorphological investigations of locations on the mainstem Arkansas River on MKARNS have been conducted, one in 2008 by Geo-Marine Inc. and the other in 2012 by URS Group. Both investigations were on contract with the USACE, SWT and focused on limited geomorphological investigations of previously identified, potential locations proposed for future confined disposal facilities, which could be constructed and utilized for disposal of dredge material. These investigations and associated results are discussed in further detail in the following section on Section 106 compliance, as the reports are directly relevant to determinations of effect for the actions presented in this document.

2.9.1 No Action Alternative

As inflows to the Webbers Falls Reservoir pool eventually abated and the water level dropped, concerns related to looting, vandalism, and collecting of archaeological sites and human burials increased. Specifically, these concerns relate to federal responsibilities under the Archaeological Resources Protection Act (ARPA) of 1979 and the Native American Graves Protection and Repatriation Act (NAGPRA), both of which establish criminal penalties for looting and/or trafficking of archaeological materials and human remains and associated funerary objects.

As Webbers Falls Pool began to drop in water elevation, SWT notified the Oklahoma SHPO, Oklahoma Archeological Survey, and several Tribal Nations. Multiple District personnel began undertaking regular patrols of prioritized areas to ensure protection of the archaeological resources. In addition to this internal response, SWT coordinated with law enforcement officers with Oklahoma Department of Wildlife Conservation (ODWC) and with resource personnel at Camp Gruber to conduct patrols of specific areas as well. Archaeological monitoring activities of this nature were conducted by SWT for the full extent of the pool drawdown, with only minor collecting activities observed at Webbers Falls, and no major looting damage during this event. If these conditions continued into the future, looting and vandalism of archaeological resources would have likely increased.

2.9.2 Emergency Action Alternative

Sediment Dredge and Disposal Component

The dredging sites are located entirely within the active channel zone of the Arkansas River where the historic lateral stream movement has been significant, and with accompanying significant deposition of recent alluvium and subsequent erosion and re-deposition of that alluvium as the active river has migrated over time. The potential for archaeological resources to be discovered in undisturbed context is exceedingly low, and without potential for undisturbed context the possibility of identifying historic properties (archaeological resources with information potential, and thus significance) is lower. Existing geomorphological investigations in the Webbers Falls Pool area have demonstrated that alluvium dates to the recent Holocene Period, and that in most areas no potential for cultural horizons pre-dating the Historic Period exists in soil horizons above two meters in depth.

Based on a thorough analysis of existing geomorphological and archaeological information, USACE has determined that the sediment dredge and disposal component of the Emergency Action does not have the potential to affect historic properties. Therefore, an archaeological investigation or damage assessment is not necessary pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended).

Additionally, the Emergency Action dredging and disposal did not involve ground preparation; dredge material was excavated and placed directly on the ground surface. Thus, there is a further reduction in any perceived potential to affect historic properties. When analyzed in full, these considerations – both concerning the project specifications and the river geomorphology as it relates to archaeological site potential – lead to a firm determination that the dredge and disposal does not have the potential to affect historic properties and that no further work, regarding dredge and disposal, is necessary under Section 106.

Mitigation Component of the Action

The compensatory mitigation required to reduce the significance of adverse impacts to natural resources is currently in the planning phase. Activities associated with the planned mitigation include maximizing the hydrologic footprint of existing wet soils (see Appendix A). There would be direct and indirect impacts from the excavation for wetland habitat creation. Additionally, the specific types of construction activities planned within the proposed mitigation areas would increase the potential to adversely affect historic properties in these locations. The areas proposed have not been previously surveyed to identify historic properties, pursuant to 36 CFR 800.4, but significant historic properties are known to be present in settings similar to those being considered. Accordingly, the mitigation component of the action – in contrast to the dredging and dredge disposal component of the action – comprises a distinct “potential to affect” historic properties under Section 106.

As plans and designs are formalized, cultural resources will be taken into account in accordance with Section 106 and implementing regulations. During this planning phase, intensive cultural resources surveys will be conducted in all areas proposed for mitigation activities. The surveys will be performed and reported in accordance with USACE SWT Standards, in coordination with the Oklahoma State Historic Preservation Office and appropriate Tribal nations. Archaeological investigations will include deep testing as appropriate, consistent with design features. Cultural resources that are identified as a part of these investigations will be fully delineated to determine their horizontal extent on the landscape. All cultural resources will then be completely avoided (to include buffer zones) and construction activities will be monitored to ensure compliance.

2.10 Hazardous, Toxic, and Radioactive Waste

The potential impacts from hazardous, toxic, and radioactive waste (HTRW) related to dredging activities was considered in accordance with USACE ER 1165-2-132, “*Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects*”, dated June 26, 1992. Per the ER, Section 4.a.(1), “Dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within

the boundaries of a site designated by the EPA or a state for a response action (either a removal action or a remedial action) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or if they are a part of a National Priority List (NPL) site under CERCLA." The ER does not require a specific method for performing this HTRW surveys but does require that HTRW concerns be assessed and impacts and their costs reported and/or approximated, as necessary for each Civil Works project.

The programmatic definition, HTRW, is used throughout the USACE to assess impacts, list and approximate costs associated with environmental pollutants released to the environment on USACE property and USACE Civil Works projects. For this report, HTRW impact costs were not approximated. The full American Society for Testing and Materials (ASTM) Phase I environmental site assessment or All Appropriate Inquiry (AAI) procedure was not followed and Recognized Environmental Conditions (RECS) were not identified for any HTRW concerns/impacts while preparing this report. Therefore, none of the following was performed: site specific reconnaissance/property visit; Sanborn Maps; historical aerial photos and topographic maps; personal property owner interviews; search of a commercial CERCLA/Resource Conservation and Recovery Act (RCRA)/other local/state pollutants environmental database; City Directory.

In addition, two barges impacted Webber Falls Lock and Dam 16 causing them to overturn and deposit approximately 3,800 tons of phosphate fertilizer in the river on May 23, 2019. Because of the high solubility of the fertilizer, biodegradability of its contents, and high river flow rate from flood conditions, there is little to no concern for HTRW impact from the barge contents on the dredged materials.

There may be unknown HTRW or pollutant impacts to the study area which were not fully disclosed and listed. These types of unknown HTRW impacts could also consist of newly discovered HTRW or buried historical type HTRW that is not observed on the land surface or not found from CERCLA databases. Newly discovered HTRW can sometimes be derived from residual (leftover) forms of contamination existing within the soils, soil vapor, air, surface water and groundwater media from releases of HTRW from known and listed HTRW sites. This occurs when undefined portions of the remaining known residual HTRW releases are encountered at known HTRW properties.

The survey conducted in this report is based on information available from the EPA and the ODEQ on response actions under CERCLA. The survey was conducted on land within ¼ mile of the river starting at the start of the Verdigris River at Tulsa, OK and ending at Fort Coffee, OK along the Arkansas River. Review of the EPA NPL and RCRA database found no sites within the study area (Figure 3). Review of the ODEQ RCRA Corrective Action, Brownfield, and Solid/Hazardous Waste Permit facilities found no sites within the study area (Figure 4).

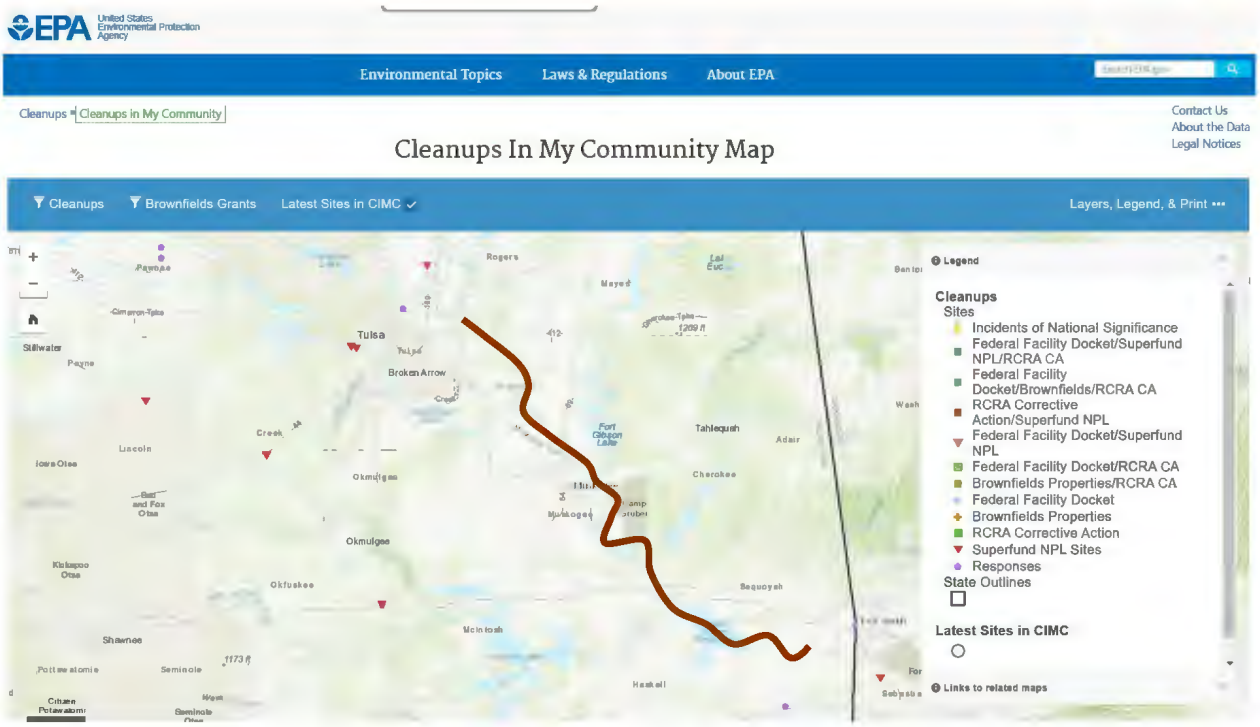

Figure 3. EPA, NPL, and RCRA Sites with Approximate Survey Area (EPA, 2021)

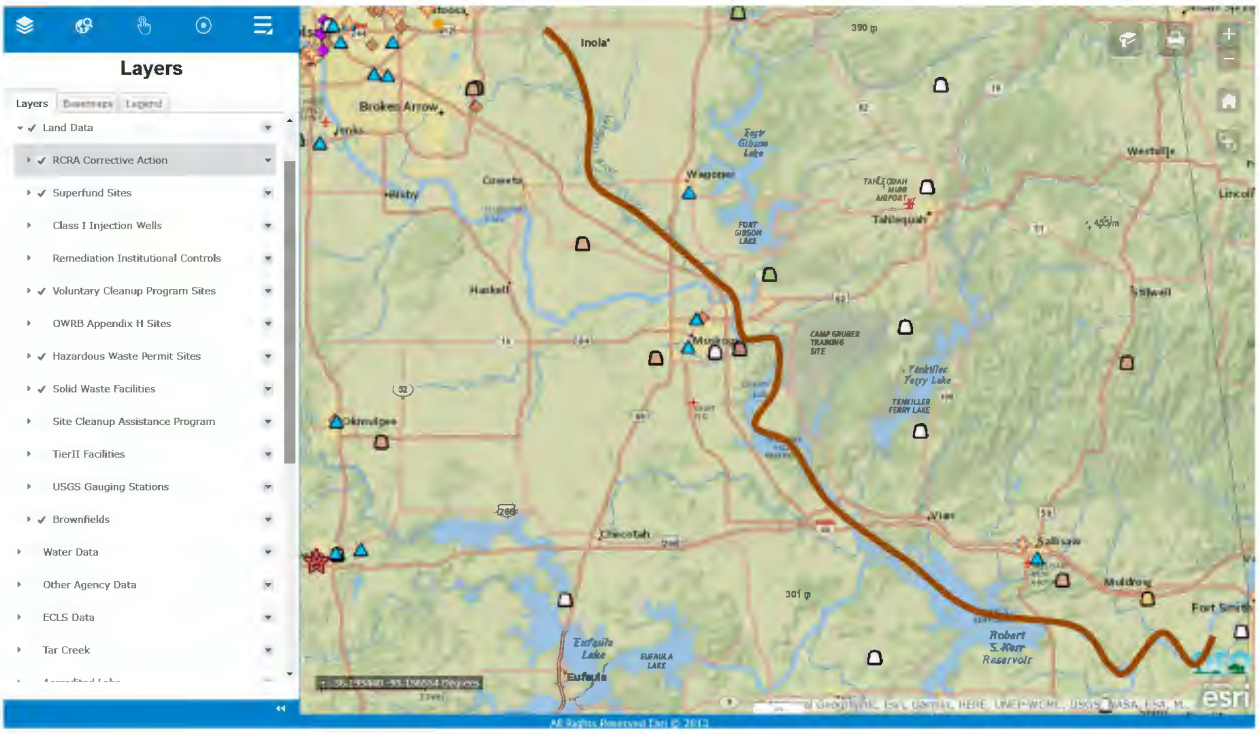

Figure 4. ODEQ, RCRA, and Waste Facility Sites with Approximate Survey Area Drawn as Green Line (ODEQ, 2021b)

2.10.1 No Action Alternative

Under the No Action Alternative, there would be negligible impacts to HTRW.

2.10.2 Emergency Action Alternative

There are no known high or low impact HTRW expected from the dredging activity. There are also no expected impacts resulting from the sunken barges filled with 3,800 pounds of phosphate fertilizer. Because of the high solubility of the fertilizer, biodegradability of its contents, and high river flow rate from flood conditions, there is little to no concern for HTRW impact from the barge contents on the dredged materials that would have been disposed in approved and unapproved sites.

There are no anticipated measurable impacts expected by implementation of the mitigation plan. The exposure of any unanticipated hazardous material unearthed during excavation activities of the mitigation sites would be dealt with in a manner consistent with ER 1165-2-132 HTRW Guidance for Civil Works Projects.

To minimize potential impacts from hazardous and regulated materials during construction of the mitigation sites, all fuels, waste oils, and solvents would be collected and stored in tanks or drums within a secondary containment system that consists of an impervious floor and bermed sidewalls capable of containing the volume of the largest container stored therein.

The refueling of machinery would be done following accepted guidelines, and all vehicles would have drip pans, when not in use, to contain minor spills and drips. Although it would be unlikely for a major spill to occur, any spill of five gallons or more would be contained immediately within an earthen dike, and the application of an absorbent (e.g., granular, pillow, sock, etc.) would be used to absorb and contain the spill. Any major spill of a hazardous or regulated substance would be reported immediately to USACE environmental personnel who would notify appropriate Federal and State agencies.

A Spill Prevention Plan would be in place prior to the start of construction, and all personnel shall be briefed on the implementation and responsibilities of this plan. Adoption and full implementation of the construction measures described above would reduce adverse hazardous/regulated substances impacts to insignificant levels.

2.11 Terrestrial Resources

2.11.1 Invasive Species

Frequent flooding of the Arkansas and Mississippi river floodplains has precluded invasion of most non-native plant species in bottomland hardwood habitats. At higher elevations in the uplands some invasive species, such as *sesbania spp*., Johnson grass (*Sorghum halepense*), and shattercane (*Sorghum bicolor*) are present. These species are typically known as “crop pests” and occur on open farm and moist-soil sites. Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*) are widespread along forest edges and in reforestation sites and in some timber harvest stands. Other problem plants include callery pear (*Pyrus calleryana*), multiflora rose (*Rosa polyantha*), mimosa (*Albizia julibrissin*), Chinaberrytree (*Melia azedarach*), and nonnative pine occasionally found in restored fields. Exotic bamboo and kudzu

(*Pueraria montana*) are found in localized pockets. *Forsythia spp*., orange day lily (*Hermerocallis fulva*), yucca, crimson clover (*Trifolium incarnatum L*.), and non-native pines are found as ornamentals on private lands.

Domestic swine are commonly introduced into the wild in Oklahoma, creating populations of feral hogs (*Sus scrofa*). These hogs are also commonly captured and moved to unoccupied areas to create new hunting opportunities.

Beavers (*Castor Canadensis*) are native to Oklahoma but were extirpated in the early 1900s. They reestablished in the late 1900s and have since reached a level at which they are often considered a nuisance species. The beaver's natural behavior of building dams and the associated flooding of forested areas can provide beneficial wetland areas, but such extended flooding particularly during the summer months can change the vegetation composition leading to habitat conversion.

Several species of invasive birds, including Eurasian collared dove (*Streptopelia decaocto*), European starling (Sturnus vulgaris), and house sparrow (*Passer domesticus*)*,* have been observed using the area, but none have been observed nesting or using bottomland habitat.

The primary aquatic plant species of concern in the study area are water hyacinth (*Eichornia crassipes*), alligator weed (*Alternanthera philoxeroides*), Eurasion watermilfoil (*Myriophyllum spicatum*), and didymo (*Didymosphenia geminata*). When water hyacinth takes over, boating and fishing become nearly impossible in covered areas, and dissolved oxygen concentration also decreases, which can lead to fish kills and a decline in the aquatic populations. When a nuisance bloom of didymo occurs, large benthic mats of up to two-foot long stalks attach themselves to the substrate. The mat can end up covering up to 100 percent of a streambed in some areas and reduce the availability of the area for aquatic invertebrates and fish spawning.

Four carp species have been identified within the area. Species such as the common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys nobilis*) and silver carp (*Hypophthalmichthys molitrix*), are well established. As the densities and range of these species expand in the watersheds, there will likely be substantial effects to native species including outcompeting native fish species for resources, indirectly altering water quality, and significantly impacting prey populations.

Asian clams (*Corbicula fluminea*) and zebra mussels (*Dreissena polymorpha*) occupy the study area. They are highly prolific and quickly dominate the benthic community, overwhelm native species, and cause mass suffocation, competition for resources, and alteration of water quality.

2.11.2 Vegetation

Fields that are not routinely maintained through mowing, burning, or disking are dominated by old field communities that consist of perennial grasses, forbs, and early successional woody species. Typical old field vegetation includes blackberry (*Rubus spp.),* Johnson grass, winged sumac (*Rhus copallina*), smooth sumac (*Rhus glabra*), eastern red cedar (*Juniperus virginiana*), winged elm (*Ulmus alata*), persimmon (*Diospyros virginiana*), mockernut hickory (*Carya tomentosa*), bitternut hickory (*Carya*

cordiformis), sassafras (*Sassafras albidium*), and sweetgum (*Liquidambar styraciflua*). Frequently mowed areas are dominated by cool season grasses such as Kentucky bluegrass (*Poa pratensis*), tall fescue (*Festuca arundinacea*), and warm weather grass such as Bermuda grass (*Cynodon dactylon*).

The two primary forest communities in the study area are the bottomland hardwood community along the Arkansas River and the upland forest community. The bottomland hardwood community occurs within the floodplain of the Arkansas River or in riparian areas immediately adjacent to small streams. The dominant bottomland hardwood trees include cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), box elder (*Acer negundo*), river birch (*Betula nigra*), black willow (*Salix nigra*), silver maple (*Acer saccharinum*), black walnut (*Juglans nigra*), sugarberry (*Celtis laevigata*), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), and willow oak (*Quercus phellos*). Bald cypress (*Taxoidium distichum*) is also common.

The upland forest community on moist areas, generally on east facing or north facing slopes, is dominated by white oak (*Quercus alba*), black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), southern red oak (*Quercus falcata*), black gum (*Nyssa sylvatica*), and red maple (*Acer rubrum*). Flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), ironwood (*Carpinus caroliniana*), pawpaw (*Asimina triloba*), basswood (*Tilia americana*), spice bush (*Lindera benzoin*), and red mulberry (*Morus rubra*) are typical understory species found on moist slopes.

The upland forest community adjacent to the study area exists on dry areas, usually the tops of high ridges, south facing slopes, and/or west facing slopes, and is characterized by generally slow growing species that are adapted to dry conditions and poor soils. This forest community, called the Cross Timbers, is a complex mosaic of upland forest, savanna, and glade that forms the broad ecotone between the eastern deciduous forests and the grasslands of the southern Great Plains. The presettlement Cross Timbers are believed to have covered over 30,000 square miles, extending from central Texas across Oklahoma into southeastern Kansas. The short, stout oaks of the Cross Timbers were not ideal for lumber production, so the original trees have often survived on steep terrain that was unsuitable for farming. Thousands of ancient post oak can still be found in eastern Oklahoma, and the Cross Timbers is one of the least disturbed forest types left in the eastern United States.

Cross Timbers overstory species include post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), eastern red cedar (*Juniperus virginiana*), black hickory (*Carya texana*), pignut hickory (*Carya ovalis*), bitternut hickory (*Carya cordiformis*), and shortleaf pine (*Pinus echinata*). Carolina buckthorn (*Rhamnus caroliniana*), rusty blackhaw (*Viburnum rufidulum*), winged elm (*Ulmus alata*), buckbrush (*Symphoricarpos orbiculatus*), and farkleberry (*Vaccinium arboreum*) are typical understory species adapted to dry conditions within the study area.

2.11.3 Wildlife

Common mammals present in the study area include: white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), least shrew (*Cryptotis parva*), southern short-tailed shrew (*Blarina carolinensis*), pine vole (M*icrotus pinetorum*), eastern mole (*Scalopus aquaticus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), eastern cottontail rabbit (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*), muskrat (*Ondatra zibethicus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale putorius*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), mink (*Mustela vison*), long-tailed weasel (*Mustella frenata*), nine-banded armadillo (*Dasypus novemcinctus*), gray fox (Urocyon cinereoargenteus), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and white-tailed deer (*Odocoileus virginianus*).

A wide variety of birds are known to occur within the study area due to the size of the area, the geographic location, and the diversity of habitats present. Common resident birds include the bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*) (Rio-Grande and Eastern), roadrunner (*Geococcyx californianus*), robin (*Turdus migratorius*), and northern cardinal (*Cardinalis cardinalis*). Most of the birds that frequent the study area are considered migratory, and they may be seasonal residents or simply transient migrants.

Many of the neotropical migrants, land birds that breed in temperate America and winter in the New World tropics, are considered breeders and common summer residents in Oklahoma. The neotropical migrants listed below in Table 9 are of particular concern within the study area because they are all Birds of Conservation Concern in the continental U.S., except for the bald eagle (*Haliaeetus leucocephalus).* However, the bald eagle warrants special attention because of the Eagle Act (U.S. Fish and Wildlife Service [USFWS], 2021a).

Table 9. Special Attention Migratory Birds Likely to Appear within the Study Area

Name	**Breeding Season**
American bittern (*Botaurus lentiginosus*)	Apr 1 to Aug 31
American golden-plover (*Pluvialis dominica*)	Breeds elsewhere
American kestrel (*Falco sparverius Paulus*)	Apr 1 to Aug 31
Bald Eagle	Sep 1 to Aug 31
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	May 15 to Oct 10
Blue-winged Warbler (*Vermivora pinus*)	May 1 to Jun 30
Bobolink (*Dolichonyx oryzivorus*)	May 20 to Jul 31
Buff-breasted Sandpiper (*Calidris subruficollis*)	Breeds elsewhere
Dunlin (*Calidris alpina arcticola*)	Breeds elsewhere

Name	Breeding Season
Eastern Whip-poor-will (*Antrostomus vociferous*)	May 1 to Aug 20
Harris's Sparrow (*Zonotrichia querula*)	Breeds elsewhere
Hudsonian Godwit (*Limosa haemastica*)	Breeds elsewhere
Kentucky Warbler (*Oporornis formosus*)	Apr 20 to Aug 20
Le Conte's Sparrow (*Ammodramus leconteii*)	Breeds elsewhere
Lesser Yellowlegs (*Tringa flavipes*)	Breeds elsewhere
Prairie Warbler (*Dendroica discolor*)	May 1 to Jul 31
Prothonotary Warbler (*Protonotaria citrea*)	Apr 1 to Jul 31
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	May 10 to Sep 10
Rusty Blackbird (*Euphagus carolinus*)	Breeds elsewhere
Semipalmated Sandpiper (*Calidris pusilla*)	Breeds elsewhere
Smith's Longspur (*Calcarius pictus*)	Breeds elsewhere
Sprague's Pipit (*Anthus spragueii*)	Breeds elsewhere
Willet (*Tringa semipalmata*)	Breeds elsewhere
Wood Thrush (*Hylocichla mustelina*)	May 10 to Aug 31

Migratory waterfowl such as mallards (*Anas platyrhynchos*), northern pintails (*Anas acuta*), gadwalls (*Anas strepera*), American widgeons (*Anas Americana*), lesser scaup (*Aythya affinis*), and ringneck ducks (*Aythya collaris*) utilize the wetlands, ponds, and other water bodies during their annual migrations. Wood ducks (*Aix sponsa*) and hooded mergansers (*Lophodytes cuccullatus*) are known cavity nesters throughout the Arkansas River Valley. Multiple species of geese are also common during their annual migrations. Snow (Chen caerulescens), Ross's (Chen rossii), Canada (*Branta canadensis*), and White-fronted (*Anser albifrons*) geese migrate through the area. Canada geese are also residents within the study area.

Common raptors that frequent the study area include the barred owl (*Strix varia*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), sharp shinned hawk (*Accipiter striatus*) and American kestrel (*Falco sparverius*).

Many species of reptiles and amphibians inhabit the diverse habitats along the Arkansas River. Common reptiles include the western ribbon snake (*Thamnophis proximus*), eastern hognose snake (*Heterodon platyrhinos*), timber rattlesnake (*Crotalus horridus*), common snapping turtle (*Chelydra serpentina*), red-eared slider (*Chrysemys scripta*), and the three-toed box turtle (*Terrapene carolina*). Most of the amphibians that inhabit the area are associated with aquatic environments such as intermittent and

permanent streams, vernal pools, ponds, lakes, and wetlands. The southern leopard frog (*Rana utricula*ta), northern spring peeper (*Pseudacris crucifer*), bullfrog (*Rana catesbeiana*), and green frog (*Rana clamitans*) can be found throughout the region.

2.11.4 U.S. Fish and Wildlife National Refuge Lands

The Sequoyah National Wildlife Refuge is 20,800 acres of open water and bottomland hardwood habitat spread throughout USACE fee-owned property (USFWS, 2020) (Figure 5). Lands were designated for the refuge to replace wildlife habitat and waterfowl hunting opportunities lost due to the construction of the Robert S. Kerr Pool (USACE, 2015b). The primary management practice within the Sequoyah National Wildlife Refuge is the establishment of large food plots within the refuge to attract large concentrations of migrating and wintering waterfowl. The principal crops which are grown on these plots are corn, grain sorghums, wheat, soybeans, millet, and buckwheat. Another highly successful management practice within the refuge is the construction and maintenance of large, controlled water level marshes. These marshes can be drained during the growing season; planted to crops; and then reflooded in the fall. Due to the nonfluctuating water level of the navigation project, the crops on the refuge produce a good yield every year.

Migrating birds regularly use the refuge as an important nesting and stopover destination (USFWS, 2020). There are approximately 250-plus species of birds that are likely to use bottomland hardwood forests in eastern Oklahoma. The refuge is intensively managed for wading bird, shorebird, and waterfowl food production and are actively managed to provide an appropriate food source during winter months.

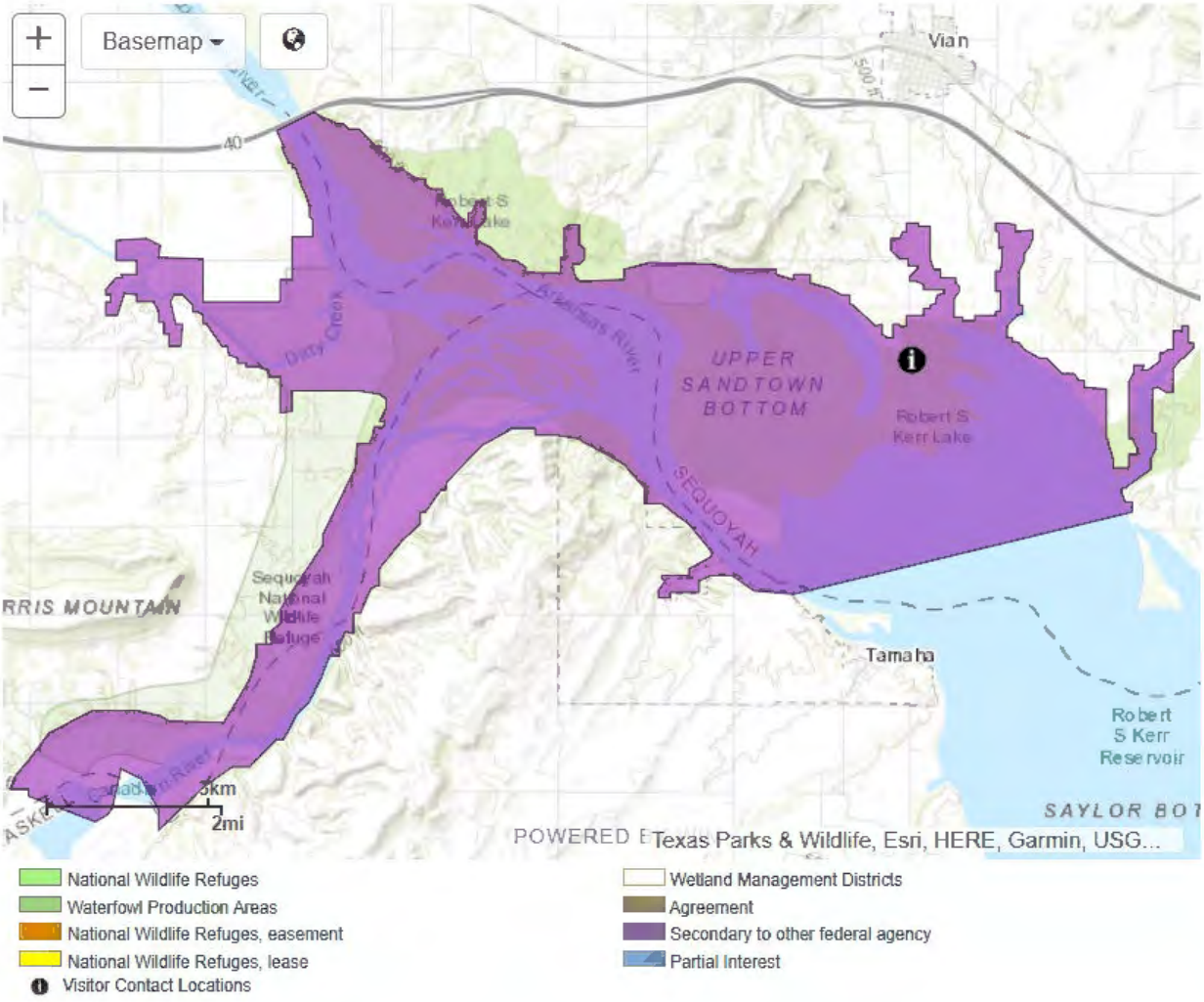

Figure 5. Sequoyah National Wildlife Refuge (USFWS, 2020)

2.11.5 No Action Alternative

Terrestrial resources could have a variation in responses to the No Action Alternative. The immediate drawdown of Webbers Falls Pool would have some major permanent adverse impacts to terrestrial species due to reduced food, water, and cover that would be available along the water's edge. Seasonal water drawdowns have been known to have beneficial impacts on wildlife that rely on wetlands and other aquatic resources; however, the effect of a large-scale drawdown could adversely impact species intolerant of this type of alteration. Wetland areas that are conducive to habitat factors for various mammals, birds, amphibians, and reptiles would decrease in availability, but would increase dry-land space for species that may not require a wetland habitat for breeding or nesting.

Terrestrial resources would be impacted by an enormous water drawdown because of the change to food webs and ecological functions. The loss of microorganisms, invertebrates, fish, and other wildlife would severely impact the ecosystem within the MKARNS.

2.11.6 Emergency Action Alternative

The Emergency Action Alternative has very similar impacts as described by the No Action Alternative. There were major impacts to aquatic resources through the dredge of the MKARNS and disposal into open water, emergent wetland, forested wetland, and bottomland hardwood forest habitats.

The Emergency Action Alternative adversely impacted 10 acres of bottomland hardwood forest habitat within the Webbers Falls Pool below Lock 16. All vegetation was wiped out within this disposal site. It should be assumed that because this site has been used, it is not likely to be restored and will be permanently affected by the current and future sediment resulting from dredge. However, this impact is expected to be minor due to the size of the location. The terrestrial vegetation at the Below Lock 16 disposal site is listed as an ecologically significant vegetation community; therefore, mitigation for this habitat type is necessary. Mitigation through native vegetation tree planting will be incorporated on most of the mitigation sites, for a minimum of 15 acres. The bottomland hardwood forest mitigation will serve, not only to restore lost habitat, but also as protection to more vulnerable wetland mitigation as a buffer. Wetland mitigation is described in sections 2.14.6 and 4.19, as well as in Appendix A – Mitigation Plan.

There were direct impacts to the Sequoyah National Wildlife Refuge due to disposal within the Robert S. Kerr Pool, specifically Stoney Point with approximately 76,444 cys of sediment disposed. The disposal at Stoney Point will provide minor benefits for shorebirds and ILT. The sediment on Stoney Point will be contoured to smooth the consolidated piles on the island. Vegetation will likely suffocate over time from the sediment, which will provide a larger area of sand for shorebirds. The USACE will continue to manage the altered island with herbicide to promote ILT habitat. Although open water disposal can have adverse effects to water quality, this action provided beneficial wading bird habitat by increasing the abundance of islands beneath the water surface. The island impacted by sediment disposal at Stoney Point was originally coordinated and addressed with USFWS in the 2012 Final Biological Assessment (USACE, 2012). It can be assumed sediment disposal at Stoney Point would not adversely impact a National Wildlife Refuge system due to previous coordination efforts in regard to ILT.

The overall increase of approximately 104 acres due to the restoration of bottomland hardwood, forested wetland, emergent wetland habitat would provide additional wildlife habitat (food, shelter, and reproductive resources) for small mammals, amphibians, reptiles, and birds. The appropriate use of BMPs such as erosion control practices and tree protection devices at mitigation construction sites would protect existing high-quality trees and large blocks of high-quality vegetation/habitat adjacent to the construction areas. Temporary construction impacts to vegetation within staging areas are not anticipated since staging areas would be stationed in areas with very little vegetation and vegetative diversity. Native vegetation planting within the mitigation areas would provide connectivity for bottomland hardwood forest, forested wetland, and emergent wetland habitats, more closely mimicking historical conditions. Efforts to restore native bottomland hardwood forest and emergent wetland species through seeding, planting, and invasive species management will bring the environment closer to original conditions, in which case the vegetation structure and diversity is expected to

increase in quality with the mitigation proposed. The mitigation will have a long-term major beneficial impact on vegetation within the study area because it is properly compensating the adverse impacts of the emergency work and will provide increased benefits through expanded wildlife habitats (Appendix A – Mitigation Plan).

As with any ground-disturbing activity, the probability of introducing, spreading, and/or establishing new populations of invasive, non-native species, particularly plant species, exists. Contractors and/or USACE personnel would be required to clean all equipment prior to entering the construction area to avoid the spread of invasive species into the project area. Executive Order (EO) 13112, Invasive Species, dated February 3, 1999, directs federal agencies to expand and coordinate their efforts to combat the introduction and spread of invasive species (i.e., noxious plants and animals not native to the U.S.). Implementation of BMPs such as cleaning equipment prior to entering restoration units and monitoring post construction for invasive species would prevent further spread of invasive species. Implementation of any of the mitigation plan would comply with EO 13112 (Appendix A – Mitigation Plan).

Areas that are expected to have high rates of erosion, are susceptible to invasive species establishment, or where recruitment of a monoculture is anticipated, would be vegetated with native species. Post-construction and plantings, if needed, each restoration unit would be monitored for invasive species and action taken to prevent establishment of any species.

2.12 State Wildlife Management Areas and Listed Species

The ODWC employs many of the same management techniques as the USFWS employs in the management of the State's licensed area. Food plots are established and planted in small grain crops. Other management practices for wildlife management areas include fencing and posting of the area to prevent unauthorized livestock grazing and to prevent hunters from trespassing on private property. All of the department lands are open to public hunting (USACE, 2015b). The McClellan-Kerr Wildlife Management Area (WMA) covers 7,905 acres in Wagoner, Muskogee, Haskell and Sequoyah counties and is mostly located within river and bottomland hardwood forest along the MKARNS. Game species within the WMA include white-tailed deer, turkey, quail, rabbit, coyote, raccoon, bobcat, dove, squirrel, and a variety of waterfowl.

The Oklahoma statute pertaining to threatened and endangered species is Title 29 O.S. §5-412. Under this statute, “no person may hunt possess, chase, harass, capture, shoot at, wound or kill, take or attempt to take, trap, or attempt to trap any endangered or threatened species or subspecies….” Section 5-412 protects only wildlife species. Plants are not currently protected under Oklahoma statute, although the Oklahoma Natural Heritage Program maintains a ranked list of rare plants for Oklahoma.

State-Listed threatened and endangered species for Oklahoma include the blackside darter (*Percina maculata*), longnose darter (*Percina nasuta*), and Oklahoma cave crayfish (*Cambarus tartarus*) (ODWC, 2020).

- Blackside darter – This is a state-listed threatened species. It has a small streamlined body and is approximately 3.5 inches long with yellowish-olive colored body. They have been found in Mountain Fork, Poteau, Kiamichi, and

Little River watersheds in Oklahoma and their associated tributaries. Its range is limited in Oklahoma, but it is widespread in the Mississippi River drainage. Streams with high water quality with a mix of gravel and large cobble are preferred. This species is susceptible to changes to river flows by reservoirs, impoundments, stream-bank destabilization, water pollution, and agricultural runoff (ODWC, 2020).

- Longnose darter – This is a state-listed endangered species. It has a small body that reaches approximately 4 inches in length with an elongated head and snout. Its body is yellowish with 10-14 dark vertical blotches. It is currently found in Lee Creek and Little Lee Creek in eastern Adair and Sequoyah counties, but also occurs in portions of western Arkansas. It prefers streams and rivers with high water quality and a mix of gravel and large cobble. This species is threatened by habitat degradation including river flow changes from reservoirs and impoundments, stream-bank stabilization, water pollution, gravel mining, and agricultural runoff (ODWC, 2020).
- Oklahoma cave crayfish – This is a state-listed endangered species. It is a small crayfish that is approximately 3 inches in length with a white or colorless appearance. It does not have external eyes and has thin pinchers and legs. It is only found in the shallow groundwater aquifer underneath portions of Spavinaw and Saline Creek watersheds in southern Delaware County. It is an endemic Oklahoma species and has never been found outside of Oklahoma. The crayfish prefers subterranean pools and streams in the limestone caves of the Ozark highlands. This species is threatened by groundwater pollution and direct disturbance by humans to cave habitats (ODWC, 2020).

An investigation of the study area for blackside darter indicates one occurrence in Cherokee County, two occurrences in Haskell County, and eight occurrences in Le Flore County. There are no occurrences of Oklahoma cave crayfish or longside darter within the study area, as indicated by the Oklahoma Natural Heritage Inventory (OHNI) in Attachment D of Appendix B – Biological Assessment. In addition, Oklahoma cave crayfish is not expected to occur in the counties associated with the study area. Longside darter are listed within Sequoyah County, but OHNI does not indicate presence of longside darter within the study area.

2.12.1 No Action Alternative

The No Action Alternative would have allowed the unavoidable drawdown of Webbers Falls Pool. It is assumed changes to river flow by reducing effects of water impoundment would improve water quality and aquatic habitat over time. However, this effect would be temporary. The massive unavoidable water drawdown would have significantly reduced aquatic habitat for state-listed species with the most potential for presence in the study area, the blackside darter, and likely caused a major die-off of any fish in the Webbers Falls Pool. The eventual drawdown of Webbers Falls Pool would have major permanent adverse impacts to the blackside darter. There would also have been major adverse impacts to state wildlife management areas due to the reduction of aquatic habitat for fish, waterfowl, and other game species.

2.12.2 Emergency Action Alternative

Dredging the MKARNS for the Emergency Action would have had similar effects to regular operations and maintenance on the channel on the state-listed species. Increased turbidity because of mixing and dredged material would adversely affect aquatic wildlife within the area of dredge. All species on the state list are sensitive to water quality impacts and could have been impacted through population reduction, habitat destruction, and/or breeding. However, dredging is a standard practice within the MKARNS. The Emergency Action Alternative is not expected to have permanent impacts more so than normal operating procedures. Any disposal within the Arkansas River would have the same adverse impacts as dredging to the species mentioned above.

The 259,322 cys dredge and 11.1 acres sediment disposal at Salt Creek; approximately 18.5 acres of sediment disposal at Spaniard Creek; and 778,330 cy dredge and approximately 48.1 acres of sediment disposal at Sandtown Bottom will have major permanent adverse impacts on the state's wildlife management areas because they occur in the McClellan-Kerr WMA in the Webbers Fall and Robert S. Kerr portions.

2.13 Federally Listed Threatened and Endangered Species

The Endangered Species Act of 1973 (ESA) provides protection for endangered and Threatened Species and the ecosystems they depend on for survival. The USFWS is the primary agency responsible for implementing the ESA and is responsible for birds and other terrestrial and freshwater species. The USFWS responsibilities under the ESA include 1) the identification of threatened and endangered species; 2) the identification of critical habitats for listed species; 3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other Federal agencies concerning measures to avoid harm to listed species.

An endangered species is an animal or plant officially recognized by USFWS as being in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Species may be considered eligible for listing as endangered or threatened when any of the five following criteria occur: 1) current/imminent destruction, modification, or curtailment of their habitat or range; 2) overuse of the species for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing regulatory mechanisms; and 5) other natural or human-induced factors affecting their continued existence.

The USFWS Information for Planning and Consultation (IPaC) database (2021a) lists the threatened and endangered species that may occur within the project area (Table 10). Based on the habitat requirements of listed species, the likelihood of listed species occurring within the project area was evaluated based on existing habitat conditions. The ILT was a Federally listed species during implementation of the Emergency Action but was delisted on January 13, 2021. Any impacts on ILT will be evaluated similarly to species that are still Federally listed and it will be evaluated in the Biological Assessment (BA) (Appendix B – Biological Assessment).

Table 10. Federally Listed Threatened and Endangered Species (USFWS 2021a)

Name	Scientific Name	Federal Listing	Likely to Occur in Project Area
Mammals			
Gray Bat	*Myotis grisescens*	Endangered	No
Indiana Bat	*Myotis sodalis*	Endangered	No
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened	Yes
Ozark Big-eared Bat	*Corynorhinus (=Plecotus) townsendii ingens*	Endangered	No
Birds			
Piping Plover	*Charadrius melodus*	Threatened	No
Red Knot	*Calidris canutus rufa*	Threatened	No
Whooping Crane	*Grus americana*	Endangered	No
Interior Least Tern	*Sterna antillarum*	Endangered	Yes
Fishes			
Ozark Cave Fish	*Amblyopsis rosae*	Threatened	No
Clams			
Neosho Mucket	*Lampsilis rafinesqueana*	Endangered	No
Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened	No
Insects			
American Burying Beetle	*Nicrophorus americanus*	Threatened	Yes

Gray Bat

The gray bat is a medium-sized bat with a wingspan of 10 to 11 inches (USACE, 2012 and USFWS, 1997a). It has grayish-brown fur and is the only bat in its range with uni-colored dorsal hairs. The fur is usually gray in color but may be chestnut brown or russet. Other bats within its range have bi-colored or tri-colored dorsal hairs. The wing membrane of the gray bat connects at the ankle instead of the base of the first toe as in other members of the genus.

The gray bat roosts almost exclusively in caves year-round and has very specific requirements (USACE, 2012 and USFWS, 1997a). Winter caves must be cold, deep, and with vertical walls. This species is very temperature sensitive; winter roosts must range in temperature between 42 ºF and 52 ºF. Summer caves must be warm (57 ºF – 77 ºF) or contain tightly restricted rooms that can trap the body heat of the roosting bats. Summer caves are usually located close to rivers and lake shorelines which are near the bats' feeding areas. Bats are known to range up to 12 miles from their colonies to feed.

Very little, if any, suitable habitat containing caves is present for this species within the study areas (USACE, 2012 and USFWS, 1997a). Due to the feeding range and foraging habits of this species it could use the shorelines of the MKARNS and associated lakes for feeding areas.

Indiana Bat

The Indiana bat is a medium-sized bat with a dull gray to chestnut colored fur dorsally, and pinkish white underparts (USACE, 2012 and USFWS, 2011a). The basal portion of the hairs of the back is a dull gray color.

In Oklahoma, bats were reported to occur at only Keystone, Eufaula, and Tenkiller lakes (USACE, 2012 and USFWS, 2011a). Habitat requirements are similar to the gray bat in that they need limestone caves for hibernation, and caves with pools are preferred. They require stable temperatures from 39 ºF to 46 º F and 66 to 95% humidity. Because of these requirements, this species is highly selective of hibernacula. Low cave temperatures allow the bats to maintain a low metabolic rate throughout hibernation. Consequently, only a small percentage of caves meet the specific conditions required by Indiana bats. Maternity sites are in trees. During the summer months, they can be found under bridges, in old buildings, under tree bark, or in hollow trees generally associated with streams.

Northern Long-eared Bat

The northern long-eared bat (NLEB) is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and spends summers in wooded areas (USFWS, 2016). The key stages in its annual cycle are hibernation, spring staging and migration, pregnancy, lactation, volancy (independent flight)/weaning, fall migration and swarming. The bats generally hibernate between mid-fall through mid-spring each year. Spring migration period likely runs from mid-March to mid-May each year, as females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Young are born between mid-June and early July, with nursing continuing

until weaning, which is shortly after young become volant in mid- to late-July. Fall migration likely occurs between mid-August and mid-October.

Suitable summer habitat for NLEB consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures (USFWS, 2016). This includes forests and woodlots containing potential roosts, as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.

Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels) (USFWS, 2016). There may be other landscape features being used by NLEB during the winter that have yet to be documented. Generally, NLEB hibernate from October to April depending on local climate (November-December to March in southern areas and as late as mid-May in some northern areas).

Ozark Big-eared Bat

The Ozark big-eared bat is a medium-sized bat that weighs from 5 to 13 grams, which is the largest of the five subspecies of *P. townsendii* (USACE, 2012 and USFWS, 2011b). The Ozark big-eared bat has very large ears (over 1 inch) that connect at the base across the forehead. The snout has prominent lumps with fur that ranges in color from light to dark brown.

Cherokee County is the only county where this species has been recorded within the study area; historically, it was found in Sequoyah County, but it does not occur there presently (USACE, 2012 and USFWS, 2011b). The Ozark big-eared bat is found in caves, cliffs, and rock ledges associated with oak-hickory forests of the Ozarks (USFWS, 1995). They forage along the edges of upland forests for insects (primarily moths); edge habitat between forested and open areas is the preferred foraging area. The temperature of hibernacula ranges from 40 ºF to 50 ºF, and maternity caves range from 50 ºF to 59 ºF (USACE, 2012 and USFWS, 2011b). This species migrates between hibernation and summer caves; the distance of migration can be from four to 40 miles (USACE, 2012 and USFWS, 2011b).

Interior Least Tern

The ILT was a Federally listed species during implementation of the Emergency Action but was delisted on January 13, 2021. Any impacts on ILT will be evaluated similarly to species that are still Federally listed and it will be evaluated in the BA (Appendix B – Biological Assessment).

The ILT is the smallest of the species in the tern family (Sternidae). The USFWS listed the interior population of the least tern as endangered wherever found, the USFWS has not designated critical habitat for the least tern (USFWS, 2020b). The project area is in the probable migratory path for least terns and provides stopover habitat. Since 2005, the SWT has annually monitored least terns in the Arkansas, Canadian, and Red Rivers in accordance with the USFWS 2005 Biological Opinion on the effects of USACE

multipurpose projects. Least terns annually forage and nest along the Arkansas River and associated sand bars within the project area.

Least terns nest in colonies on barren to sparsely vegetated sand and gravel bars in braided streams and rivers, as well as on man-made structures such as inland beaches, wastewater treatment plants, and gravel mines. The terns prefer open, unobstructed areas rather than thick vegetation. The forage fish base for least terns is typically most abundant in shallow, flowing riverine habitats. Additionally, least terns tend to forage no farther than about two miles from their nest sites, although some may fly up to four miles to fish (USFWS, 1990).

The distribution of ILT began to decline in the early 1900s due to widespread alteration of its riverine habitat (USFWS, 1990). Much of the sandbar habitat was compromised by stream channelization, irrigation, and the construction of dams such as Keystone. Keystone Lake traps the sediments that would maintain downstream island habitat for least terns leading to a decline in the quantity of sandbars suitable for least terns (USACE and Tennessee Valley Authority [TVA], 2009).

While the species continues to breed in river systems such as the Arkansas River, its distribution has become more restricted due to widespread alteration of its riverine habitat (USFWS, 1990). The manipulation of river flow can destroy or alter sandbars, preventing the creation of new river island habitat. Increased flow can wash away nests and chicks, and sand mining within the Arkansas River Corridor has removed least tern habitat. The Keystone Dam has also reduced scouring stream flows and allowed for the encroachment of vegetation on sandbars, reducing the quality of the habitat for least tern nesting despite efforts to clear the vegetation annually.

Low flows during the nesting season (approximately April to August) contribute to terns nesting at lower elevations, which increase the potential for those nests to be flooded during periods of higher flows. Lower flows result in land bridging which increases predator access to least tern nests.

Piping Plover

The piping plover is a small shorebird approximately seven inches in length with a wingspan of approximately 15 inches and weighs from 1.5 to 2 ounces (USACE, 2012 and USFWS 2011c). It is sand-colored on the back with white undersides. It is distinguished from similar species by its bright orange legs. During the breeding season, the plover has a single black band across its breast and forehead, which are absent during the winter.

Piping plover breeding habitat is comprised of open, sparsely vegetated areas with alkali or unconsolidated substrate (USACE, 2012 and USFWS, 2000). On rivers they nest in association with sandbars and bare islands (USACE, 2012 and USFWS, 2011c). During migration periods they use beaches and alkali flats. They feed mainly on freshwater, marine, and terrestrial invertebrates.

Red Knot

The study area is located within the probable migratory path, between breeding in the Arctic tundra and winter habitats in the southern U.S. and Central and South America. Red knots forage along sandy beaches and mud flats, and this species may use the study area for temporary stopover and foraging. The sandbars and bare gravel islands along the Arkansas River within the study area could provide suitable habitat during the red knot's spring and fall migrations.

Whooping Crane

The whooping crane is a tall snowy white bird with a long neck and legs; it is the tallest bird in North America, reaching a height of five feet (USACE, 2012 and USFWS, 2011d). Adult whooping cranes have a red crown and a patch of black feathers below the eye, a black wedge shaped patch on the neck, and the black primary feathers are only visible during flight; the young cranes are whitish all over, but have a rust-colored head and neck.

In Oklahoma, the whooping crane is federally listed in 59 counties; 13 counties (Atoka, Bryan, Johnston, Kay, Marshall, McIntosh, Muskogee, Noble, Osage, Pawnee, Rogers, Wagoner, and Washington) contain parts of the proposed action areas for the state (USACE, 2012; USFWS, 2010;and USFWS, 2011d). The nesting grounds for whooping cranes are located in poorly drained prairie areas interspersed with numerous potholes and wetlands of the Northwest Territories in Canada (Canadian Wildlife Service [CWS] and USFWS 2007). The nest sites are made of bulrush and located in emergent vegetation along the edges of water (USACE, 2012 and USFWS, 2011d). During migration, whooping cranes use a variety of habitats including croplands, riverine habitats, and wetlands that are used for roosting (CWS and USFWS, 2007). The wintering grounds include areas of salt flats and coastal marshes and flats (USACE, 2012; CWS and USFWS, 2007; and USFWS, 2011d).

Ozark Cave Fish

The Ozark cavefish is a small fish about 2-1/4 inches long. It is pinkish-white and blind. The Ozark cavefish lives in cave streams and springs (USFWS, 2021c). The cave ecosystem is often dependent upon bats (especially gray bats) as a source of energy and nutrients. Very little is known about the reproduction of the Ozark cavefish. Spawning is often triggered by spring floods. The greatest obstacle to the cavefish may be finding a potential mate at the right time. Because it cannot see, the cavefish depends on sensing water movement to find animals to eat. The cavefish primarily eats plankton. They also eat isopods, amphipods, crayfish, salamander larvae, and bat guano. The cavefish can be found in caves within the Springfield Plateau of the Ozark Highlands in Arkansas, Missouri, and Oklahoma. It is threatened by chemicals in groundwater, as well as the intentional sealing of cave entrances by humans, which cuts off the food supply to the ecosystem.

Neosho Mucket

The freshwater mussel is classified by USFWS as endangered wherever it is found and can occur within the study area. Its preferred habitat consists of shallow waters with riffles but has been known to occur in larger rivers and creeks (NatureServe, 2020a). There is critical habitat designated for the Neosho mucket, however, the project area does not fall within the critical habitat designation.

Rabbitsfoot

The freshwater mussel is classified by USFWS as threatened wherever it is found and can occur within the study area. Its preferred habitat consists of high flowing rivers, creeks, and streams with high water quality with sandy to cobble substrates (NatureServe, 2020b). There is critical habitat designated for the Neosho mucket, however, the project area does not fall within the critical habitat designation.

American Burying Beetle

The American burying beetle (ABB) is the largest species of its genus in North America measuring from 0.98 to 1.4 inches in length (USACE, 2012 and USFWS, 1997b). It has a shiny black body with smooth and shiny black elytra with bright orange-red markings. The antennae are large, abruptly clubbed, and orange at the tip. It is a member of the Family Silphidae, which are known as the carrion or burying beetles due to their behavior of burying vertebrate carcasses which are used for brood chambers for their young.

In Oklahoma, this species was originally thought to occur in only Latimer, Cherokee, Muskogee, and Sequoyah counties. The typical habitat types the beetle uses include oak-pine woodlands, open fields, oak hickory forests, open grasslands, and edge habitat.

2.13.1 No Action Alternative

An extended drawdown of Webbers Falls Pool would have created major adverse impacts to ILT due to the loss of river habitat essential for feeding. Interior least tern are heavily dependent upon sand and gravel bars within unobstructed river channels, which provide preferred nesting habitat. Under the No Action Alternative, there would be a “May Affect, Likely to Adversely Affect” determination made for ILT. A “no effect” determination would have been made for: gray bat, Ozark big-eared bat, Indiana bat, piping plover, red knot, whooping crane, Neosho mucket, rabbitsfoot, Ozark cave fish, NLEB, and ABB due to minute chances of occurrence and lack of presence within the open water and river habitat of the MKARNS and Webbers Fall Pool

2.13.2 Emergency Action Alternative

The BA includes a more thorough discussion of the Federally listed threatened and endangered species. The Emergency Action impacts have been evaluated and will be submitted to USFWS for concurrence. It was assumed that the Emergency Action Alternative would have "no effect" on the following Federally listed species:

- Gray bat,
- Ozark big-eared bat,
- Indiana bat,
- Piping plover,
- Red knot,
- Whooping crane,
- Neosho mucket,
- Rabbitsfoot, and
- Ozark cave fish.

It was determined by USACE and submitted for concurrence to USFWS that the Emergency Action “may affect, but is not likely to adversely affect” the following Federally listed species:

- ILT

A “may affect, likely to adversely affect” determination has been submitted for the ABB and NLEB regarding the Below Lock 16 disposal location. This site adversely impacted 10 acres of bottomland hardwood forest because tree removal was conducted within the NLEB pup season (June 1 to July 31). Northern long-eared bat and ABB surveys were not completed before implementing the Emergency Action; therefore, an adequate determination cannot be presented to argue “no effect” to NLEBs and ABBs. Given the mobility of the bats and beetle, it is probable that it could occur within the site if suitable habitat were present. A Biological Opinion (BO) is in place for the listed beetle and NLEB. It is assumed “incidental take” can be used and reported for end-of-year documentation to USWFS, including any potential impacts to ABB from construction of mitigation areas. In addition to the disposal sites, ABB are also likely to be adversely affected by the proposed mitigation sites due to the potential for excavation and grading.

There were direct impacts to the Sequoyah National Wildlife Refuge due to disposal within the Robert S. Kerr Pool, specifically Stoney Point with approximately 76,444 cys of sediment disposed. The disposal at Stoney Point will provide minor benefits for shorebirds and ILT. The sediment on Stoney Point will be contoured to smooth the consolidated piles on the island. Vegetation will likely suffocate over time from the sediment, which will provide a larger area of sand for shorebirds. USACE will continue to manage the altered island with herbicide to promote ILT habitat. Although open water disposal can have adverse effects to water quality, this action provided beneficial wading bird habitat by increasing the abundance of islands beneath the water surface.

The proposed mitigation could cause short-term minor adverse impacts within the construction area. However, every effort will be made to avoid all contact with threatened and endangered species. After completion of construction and establishment of emergent wetland, forested wetland, and bottomland hardwood forest plantings, the area will be improved in habitat quality. The effects of effectively managing at least 104.3 acres of newly created habitat will cause major long-term beneficial impacts for species by returning original habitat conditions, as best as possible, and regulating habitat for wildlife.

2.14 Aquatic Resources

Aquatic resources include both surface water and groundwater; associated water quality; and floodplains. Surface water consists of lakes, ponds, rivers, streams, impoundments, and wetlands in a defined area or watershed. Subsurface water, commonly referred to as groundwater, is typically found in aquifers. Aquifers are areas with high porosity rock where water collects in pore spaces. Water quality describes the chemical and physical composition of water as affected by natural conditions and human activities. Floodplains are relatively flat areas adjacent to rivers, streams, watercourses, bays, or other bodies of water subject to inundations during flood events.

The floodplain in the study area exhibits a complex pattern of abandoned channels, oxbow lakes, back swamps, natural levees, deposits, meander scars, and active point bars typical of ridge and swale alluvial geomorphic landforms. The historic floodplain has been modified by an extensive system of levees and water control structures.

The MKARNS contains a diverse array of aquatic environments including major rivers and their tributaries, lakes, cutoffs, and wetlands that result in diverse habitats that support a variety of aquatic flora and fauna. Important riverine elements within the study area include the Arkansas River and Verdigris River and their associated side channels, dikes, revetments, locks, dams, navigation pools, cutoffs, backwaters, and tributary mouths. Additionally, several major tributaries to the MKARNS have been impounded to create reservoirs that are managed to support recreational game fish populations, as well as shallow water habitats for fish, migratory waterfowl and other aquatic biota.

The diverse aquatic environments throughout the MKARNS currently provide good habitat for a variety of fishes. Twenty-two families containing 126 species of fishes have been identified from the Arkansas River and its tributaries. Common sporting species include bluegill, crappie, bass, and catfish.

Freshwater mussels are also present in the MKARNS. Little is known about unionid species composition and distribution in the MKARNS system. A few of the Arkansas River tributaries (White River, Verdigris, Poteau, Grand Rivers) are known to harbor unionids, but previous unionid studies in the mainstem are limited. The mapleleaf (*Quadrula quadrula*), is sometimes extremely abundant in impoundments or large oxbows. The washboard (*Megalonaias nervosa*), paper pondshell (*Anodonta imbecillis*), and lilliput shells (*Toxolasma spp*.) are also known to occur in reservoirs but are not as common. Several exotic species, such as the asiatic clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*), have invaded the Arkansas River, its tributaries and associated reservoirs, and have caused considerable economic and ecological damage.

Other invertebrates play an important role in the health of the MKARNS ecosystem. Phytoplankton are major contributors to primary production in these aquatic systems and are the base to the system's trophic pyramid. In addition, zooplankton play an important role in aquatic ecosystems as primary consumers and as foraging material for larger invertebrates and small fishes. Benthic invertebrates also play a crucial role in the functionality of aquatic ecosystems as decomposers, predators, and prey. Examples of these organisms found in the Arkansas River are nematodes, oligochaetes, crayfish, and insect larvae of mayflies, dragonflies, caddisflies, midge flies, beetles, and many others.

2.14.1 Surface Water

The project area falls within the Lower Arkansas River Watershed. Various types of surface water occur including lakes, oxbow lakes, shallow depressions, swales, chutes, sloughs, abandoned channels, flowing channels, and scour holes. Sandbars, point bars, rip-rapped banks, collapsing banks, and snags add to the diversity of water types.

Water levels vary by season, with November through May being the wettest months and July to October the driest. There are numerous small lakes and sloughs that are semi permanently to permanently flooded. In addition, the various marshes and swamp areas are temporarily or seasonally flooded. Large lakes and oxbows in the study area include Robert S. Kerr Pool and Webbers Falls Pool.

The reservoir system of the MKARNS is part of a larger navigation and flood control plan for the Arkansas River in Oklahoma and Arkansas. The authorization for the construction of the reservoirs on the MKARNS came principally from the passing of the various Flood Control Acts (1936, 1938, 1944, and 1962) and subsequent amendments to the original legislation. Legislation was also passed through the RHA to incorporate upstream reservoirs in Oklahoma that have the capacity to control flows on the MKARNS into the multipurpose plan for the system.

River flow and water storage of the MKARNS are primarily influenced and controlled by these 11 reservoirs in Oklahoma as well as the upper Arkansas River upstream of its confluence with the Verdigris River (river mile 394). The 11 Oklahoma reservoirs are:

- Keystone Lake;
- Oologah Lake;
- Grand Lake O' the Cherokees (Pensacola Dam);
- Lake Hudson (Markham Ferry Dam);
- Fort Gibson Lake;
- Tenkiller Ferry Lake;
- Eufaula Lake;
- Kaw Lake;
- Hulah Lake;
- Copan Lake; and

- Wister Lake.

Additional information about each lake can be found in the 2005 Arkansas River Navigation Study EIS.

The 11 reservoirs include nine SWT reservoirs as well as two Grand River Dam Authority (GRDA) electric utility reservoirs. The reservoirs provide flood control, water supply, power generation, recreation, and water quality maintenance (through sediment trapping) and fish and wildlife habitat. The reservoirs also aid the MKARNS by assisting in the control of water release through spillways and power generating units. The rate at which water is released from each reservoir depends on many factors including available water storage, power requirements, navigation water requirements, inflow rates, river flow rates downstream and weather conditions.

Wetlands are present throughout the study area. They are primarily scattered across the floodplain of the Arkansas River valley. The USACE and EPA jointly define wetlands as: areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A variety of wetland types are shown in Figure 6 and Figure 7. However, this mapping system is only an estimate and required field verification. On January 25th and 27th 2021, USACE personnel accessed the Emergency Action project areas to assess the impacts caused by the sediment disposal. The site visit confirmed that emergent wetlands, forested wetlands, and open water habitats were impacted by the Emergency Action.

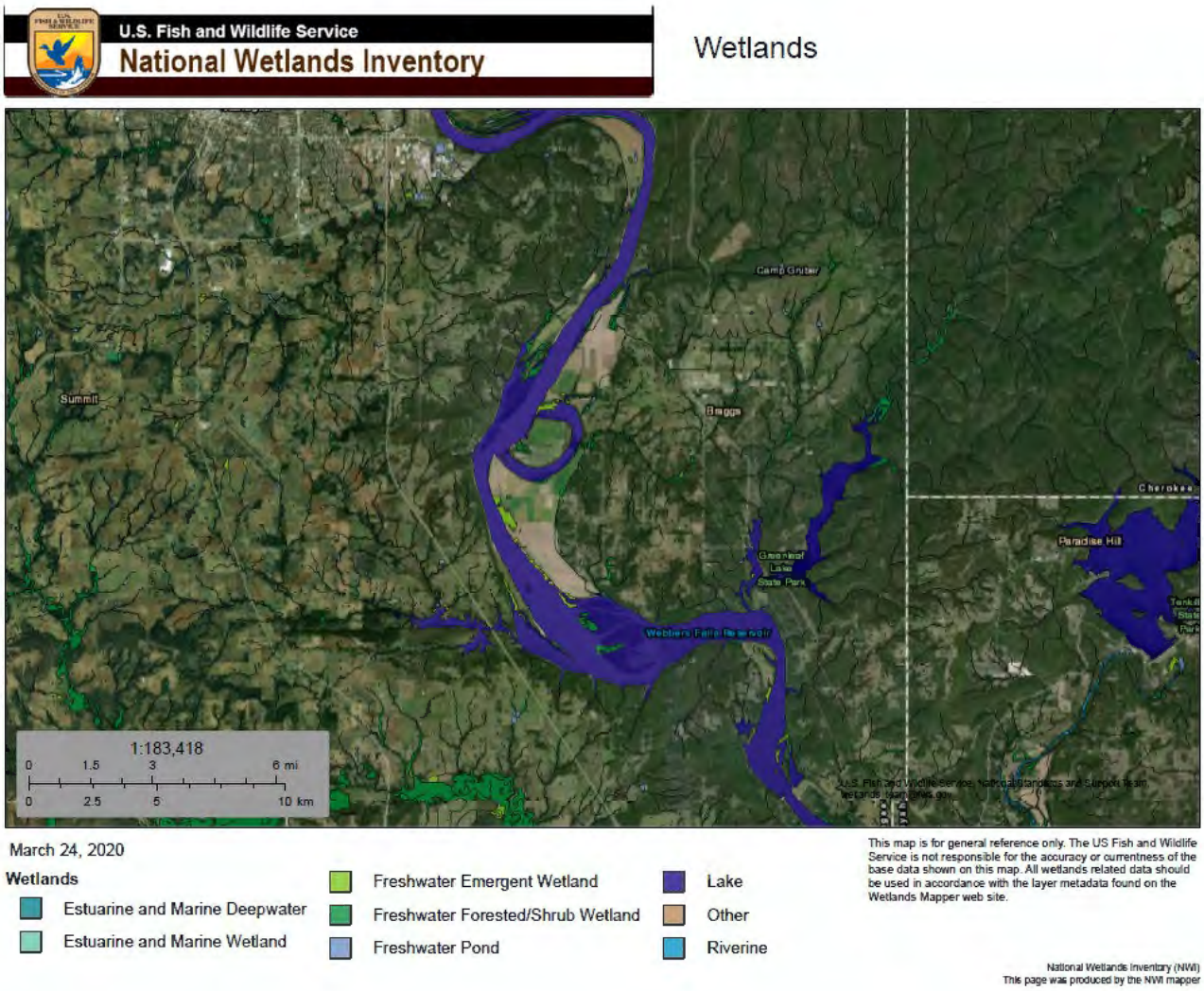

Figure 6. Wetland Types within the Study Area

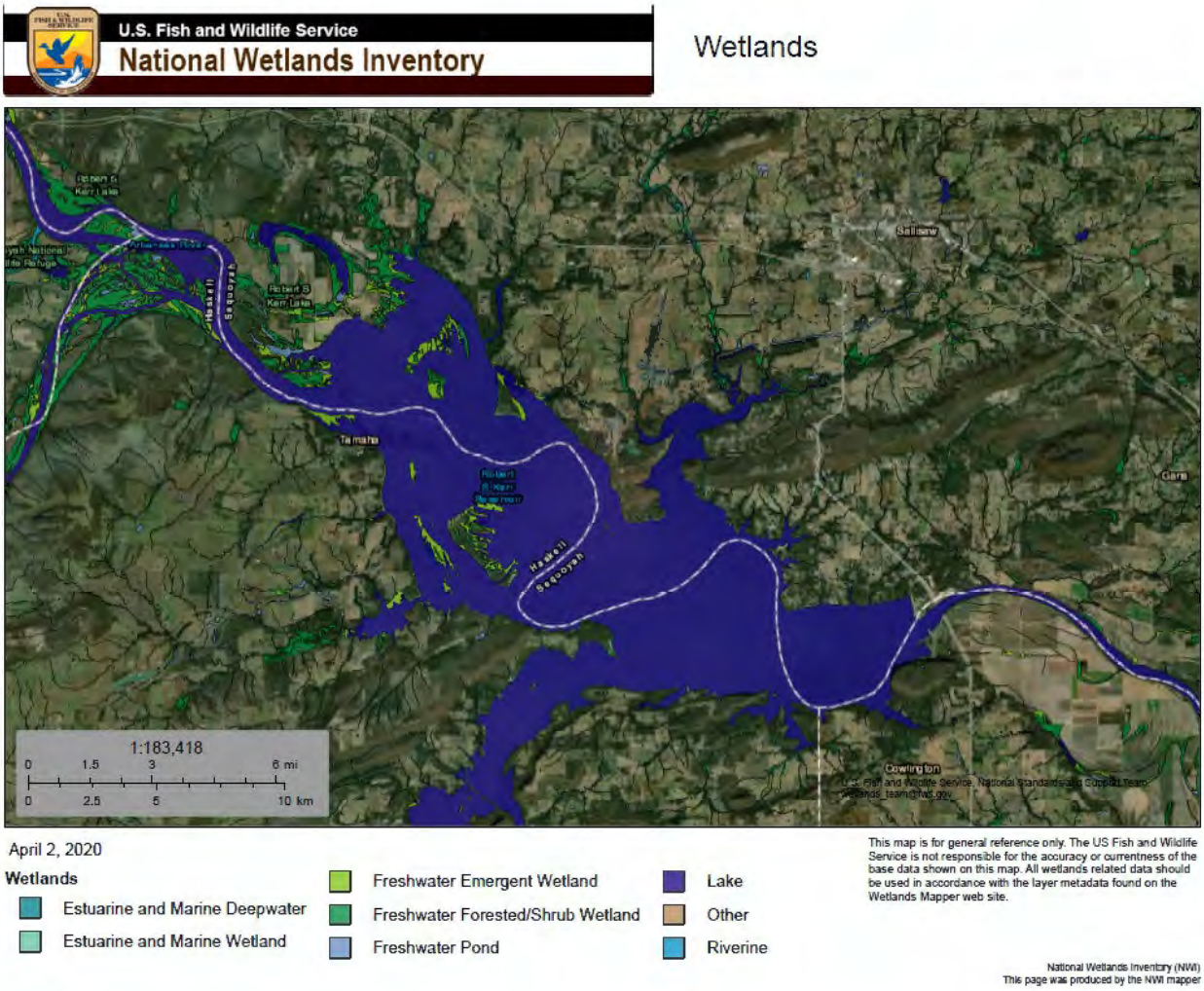

Figure 7. Wetland Types within the Study Area

The National Wetland Inventory (NWI) (2020) was primarily used to identify wetlands in the impacted project area as displayed in the figures above. The survey confirms and indicates a portion of the project areas are wetlands. The NWI maps indicate that a variety of riverine, lacustrine, and palustrine wetlands exist in the study area. The palustrine system includes forested, emergent, scrub-shrub, and aquatic bed classes. The riverine system includes lower perennial and intermittent subsystems as well as open water, streambed, unconsolidated bottom, and unconsolidated shore classes. The lacustrine system includes limnetic and littoral subsystems as well as open water, unconsolidated shore, unconsolidated bottom, and aquatic bed classes. Water regimes include temporarily flooded, seasonally flooded, semi-permanently flooded, intermittently exposed, and permanently flooded.

Broad floodplains along the Oklahoma portion of the MKARNS support bottomland forests of elm, oak, hackberry, cottonwood and sycamore. The forest floor is heavily shaded, allowing for limited understory development. In poorly drained sites, sedges, willows and buttonbush form thickets along wetland edges. These wetlands are typically found on the backside of broad stable flood plains. Sediment loading is limited to large flood events. Surface water accumulation is from both riverbank flooding and runoff from adjacent uplands.

At lower river elevations, wetlands consist of emergent herbaceous wetlands and forested wetlands characterized by rooted, herbaceous hydrophytes that typically grow in flooded soils. Emergent wetlands can be found along the edge of the Arkansas River.

Emergent wetlands provide food and shelter for fish and wildlife species, including macroinvertebrates, which make up the foundation of the aquatic food chain, and habitat for various amphibians, reptiles, birds, and insects. Frogs and salamanders use emergent wetlands for breeding grounds and egg laying. Ducks and migratory birds use them for resting areas on migration routes and for nesting. Abundant aquatic insects provide a food source for fish, aquatic invertebrates, amphibians, reptiles, and birds, and break down organic material present in riverine and riparian wetland areas. Since these wetland communities are found in lower elevations, or are associated with more permanent open water habitats, they have been the most susceptible to disruptive and unnatural flow regimes resulting from the construction and operation of the lock and dam system within the MKARNS. Emergent wetland vegetative species within the project areas included cattail (*Typha spp.*), smartweed (*Polygonum spp.*), nutsedge (*Cyperus spp.*), soft rush (*Juncus effusus*), and other unidentified rushes.

Forested wetlands are open, occasionally flooded areas dominated by shrub and hardwood saplings mixed with emergent herbaceous vegetation. Forested wetlands provide shelter, food, and nesting habitat for a variety of wildlife. These wetland communities are found at elevations slightly above emergent wetland communities and adjacent to riverbanks where less frequent inundation by flows and reduced scour allows shrub and sapling strata to establish. Forested wetland tree species included American sycamore, elm (*Ulmus spp.*), green ash, and black willow. Emergent wetland vegetation within the forested wetland habitats included soft rush, and shrubby species like buttonbush (*Cephalanthus occidentalis*).

2.14.2 Hydrology

All aspects of the hydrologic cycles of the Arkansas River have been altered from historic conditions. The numerous development projects including lock, dam and levee construction, meander cutoffs, river training and dredging have each contributed to the alteration of stream gradients, flow regime, and sediment regime that characteristically maintained dynamic equilibrium of fluvial systems. The complex and interconnected hydrology of the study area now has reduced access to the numerous sloughs, bayous, channels, swales, oxbows and back swamps that historically provided conduits that moved massive quantities of water down the study area to converge in and near the Mississippi River.

2.14.3 Groundwater

The primary aquifer located within the study area is the Arkansas River Aquifer. The Arkansas River Aquifer runs from Ponca City in north central Oklahoma down southeast to Fort Smith Arkansas in west central Arkansas. Its primary uses are for irrigation, public supply, domestic, and industrial. Average depth to it is 24.5 feet, and it is considered an alluvial and terrace aquifer (OWRB, 2014).

In Oklahoma, wells near the Arkansas River near Tulsa supply irrigation water that yield as much as 600 gallons per minute. The water storage in this region occurs in deep alluvial sand and gravel deposits that can be as much as 150 feet thick and five miles wide.

Groundwater tables are near the surface during the winter and early spring. Vegetation on these sites typically is an overstory of black willow, pin oak (*Quercus palustris*), green ash, butternut hickory (*Carya cordiformis*) and pecan, with an understory of sedges and grasses. When disturbed these areas convert to willow or cottonwood thickets.

2.14.4 Water Quality

Congressionally authorized projects for dredging and dredged material disposal conducted by the USACE do not receive permits but must comply with the RHA of 1899 and the CWA. Under the CWA, the EPA is responsible for developing the environmental criteria used by the USACE to evaluate proposed discharges of dredged material and for environmental oversight. The CWA Section 404(b)(1) guidelines are the substantive criteria by which proposed dredged material discharge actions are evaluated. The EPA also maintains general environmental oversight, including Section 404(c) permit veto authority if there will be an "unacceptable adverse effect." Under Section 401, proposed discharges of dredged or fill material must comply with applicable state water quality standards.

The ODEQ sets and implements standards for surface water quality to improve and maintain the quality of water in the state based on various beneficial use categories for the water body. The Water Quality in Oklahoma 2018 Integrated Report, which is a requirement of the Federal Clean Water Act Sections 305(b) and 303(d), evaluates the quality of surface waters in Oklahoma and identifies those that do not meet uses and criteria defined in the Oklahoma Water Quality Standards (WQS). The Water Quality in Oklahoma 2018 Integrated Report describes the status of Oklahoma natural waters based on historical data and assigns waterways to various categories depending on the extent to which they attain the WQS.

Water quality is strongly influenced by land uses. In general, waters in the study area have relatively high levels of turbidity and suspended solids. Decreased water quality within Robert S. Kerr Lake (OK 220200020020_00) and Webbers Falls Lake (OK120400010070_00) led to the listing of these two reservoirs in the ODEQ 2018 303(d) List as impaired by turbidity.

2.14.5 No Action Alternative

Under the No Action Alternative, a drawdown of Webbers Falls Pool would have occurred. This would have potentially killed off native aquatic vegetation and led to increased nutrient loading. Nutrient loading would have temporary beneficial impacts through increased vegetative growth but could eventually lead to an algae bloom. Algae blooms are a prominent factor in adverse impacts to aquatic organisms by producing dangerous toxins and creating “dead zones” in remaining standing water.

A drawdown of Webbers Falls Pool would adversely impact wetlands by drying vegetation for an extended period. This would affect wildlife such as waterfowl, fish, amphibians, and reptiles through reduced cover and food within this habitat type. In the scenario that water would become non-existent due to a drawdown, species inhabiting the littoral zone would be exposed to drying in the summer and freezing in the winter. The river fluctuation would have a drying effect on wetland habitats that serve as nurseries for juvenile fish and habitat for migrating waterfowl, producing an overall reduction in the diversity of the species using these habitats. Low flows would further affect the geomorphology of the MKARNS, producing increased streambank erosion and the destruction of riverine wetlands and oxbow habitats, further reducing the availability of productive habitats (USACE and TVA, 2009). Emergent herbaceous communities dominate wetland habitats located within the active river channel. These communities are more prone to structural instability from rapid changes in the flow regime making their size and placement in the river corridor more transient. Wetland soils and emergent vegetation are subject to habitat smothering from changes in river geomorphology. Frequent desiccation also reduces formation of wetland soils and selects for early successive invasive species, such as Johnsongrass, that impact vegetation strata.

2.14.6 Emergency Action Alternative

The Emergency Action Alternative resulted in major permanent adverse impacts to wetlands. The quantity and quality of aquatic and wetland habitat was affected. There were 9.8 acres of wetland impacts in Salt Creek, 7.6 acres in Stoney Point, and 16.4 acres in Sandtown Bottom. Mitigation efforts are described in Section 4.19 and Appendix A – Mitigation Plan. The discharge of fill material into these wetlands destroyed habitat and adversely affected the biological productivity of individual wetland ecosystems by smothering, dewatering, and altering substrate elevation and water movement. The Emergency Action led to the destruction of wetland vegetation, which is assumed to lead to an advancement of upland species unless properly treated with chemical or mechanical controls. Current patterns and velocities were altered within the wetland systems and in some cases eliminated the mechanism to flush, circulate, and filtrate aggravating materials. In addition, the modification of these wetlands may have adversely affected the ability to retain and store floodwaters and protect upland areas from erosion.

Increased sediment suspension during dredging and disposal of dredged material in aquatic areas also caused minor short-term adverse impacts to surface water in the Arkansas River. This action may also have impacts on reservoir elevation and river stage water levels. There were 1.3 acres of open water impacts at Salt Creek, 146

acres at Spaniard Creek, 4.9 acres at Stoney Point, 97.7 acres at Sandtown Bottom, 8.3 acres at Kerr Lake River Mile 343, and 30 acres at San Bois Creek. It is assumed that moving dredge from one location in the river into another location (open water disposal) would not have permanent impacts but would mostly directly affect the water quality within that given area and downstream of the site.

Approximately 1.6 million cys of navigation channel substrate was dredged along the MKARNS in addition to maintenance dredging. Because the main channel of the MKARNS has been degraded from dredging and deepening activities associated with establishing and maintaining the navigation channel, prime aquatic substrate habitat loss due to dredging of substrate, impacts would be minor from the actual dredge work.

A 2004 Freshwater Mussel (Unionid) Survey conducted by Ecological Specialists, Inc (ESI) collected a total of 5,467 live unionids of 27 species at 43 sample sites encompassing dredging areas, disposal areas, and areas reported to harbor mussel beds along the MKARNS, and two additional species were found only as weathered shells. No threatened or endangered species were found in the mussel survey. Mussel populations could have potentially incurred major adverse impacts at Sandtown Bottom, Kerr Lake River Mile 343, and San Bois Creek because there are higher density mussel populations in those areas based on the 2004 ESI survey. The survey is located in Attachment E of Appendix B – Biological Assessment.

Adverse impacts to fish species associated with the Emergency Action would be short-term and minor, primarily as a result of displacement during the dredging and disposal activities. Benthic macroinvertebrates in the dredged areas could have been removed with the material and redistributed or buried during the disposal process. Those invertebrates at the disposal site could have been buried. These two actions could also cause a temporary and short-lived reduction in prey items for fish and crayfish at these locations. Recolonization by invertebrate species would follow completion of dredging at both the dredging and disposal areas. Macroinvertebrate production would occur at both the dredge site location and on the disposed material during the next growing season. These species would be available as food organisms to resident fish in the following spring. In addition, the Emergency Action increased the degree of aquatic habitat heterogeneity (e.g., water depths, shallow water habitat, flow refugia) relative to that present before the 2019 flood. It is the opinion of USACE that the open water disposal is self-mitigating.

Resident fish could use the area upstream and downstream of the sites where dredging and disposal activities occurred. Fish could return to the activity areas shortly after completion of the Emergency Action.

The USACE has performed a “screening” level analysis of MKARNS sediment quality in support of both future O&M dredging needs (maintenance of nine-foot channel) as well as impact assessment for channel deepening proposals described in the 2005 Arkansas River Navigation Study EIS. In general, constituents were reported at low detection frequencies and concentrations throughout the sampled Oklahoma portion of the MKARNS. The final result of the analysis is included in the 2005 Arkansas River Navigation Study EIS. It has been assumed that any sediment traveling downstream

already existed within the MKARNS; therefore, new sediment testing was not conducted before dredging and disposal actions occurred.

The mitigation associated with the Emergency Action would have temporary negligible adverse impacts to surface water through construction activities for excavation and contouring of emergent wetlands. These impacts are expected to temporarily degrade water quality as a result of ground disturbing activities. Erosion and sedimentation controls, such as silt fencing and sediment traps, the application of water sprays, and the prompt revegetation of disturbed areas would be required during construction to reduce and control siltation or erosion impacts. In addition, every construction project poses a potential contamination risk from petroleum or chemical spills. The contractor and/or USACE personnel would be required to prepare and follow a site-specific Spill Prevention Plan during construction, which would include use of BMPs such as proper storage, handling, and emergency preparedness, reducing the risk of such contamination.

Impacts to surface waters following implementation of the mitigation plan could have moderate beneficial impacts on water quality. The creation of 89.3 acres of wetlands for compensatory mitigation would increase the natural nutrient and pollutant filtering functions of the wetlands that are adjacent to the Arkansas River.

A letter was provided to SWT USACE on July 10, 2019 from ODEQ, which waived the water quality certification for 1.25 million cys of dredged material and 550 acres of Waters of the U.S. disposal. It is USACE's intention to have the approximate addition of 350,000 cys of dredged material and 33.8 acres of wetland impacts either waived under the same considerations or achieve water quality certification for these additional impacts. The 2019 waiver can be found as an attachment to Appendix C – Clean Water Act Section 404(b)(1) Analysis.

2.15 Environmental Consequences Summary

In Section 2, there were two alternatives evaluated. These alternatives include the No Action Alternative and the Emergency Action Alternative which include combinations of components from the project features that achieve, in varying degrees, completion of the emergency work associated with the 2019 flooding.

In general, the impacts associated with the Emergency Action are directly associated with the extent of the habitat loss/disturbance caused by implementation of the emergency dredging and disposal and subsequent compensatory mitigation. Environmental impacts vary between the alternatives evaluated; however, it is assumed the No Action Alternative would exhibit the highest level of adverse impacts and the Emergency Action Alternative the lowest level of adverse impacts. Therefore, the Emergency Action is considered the Environmentally Preferred Alternative. Table 11 shows a summary of the environmental consequences.

Table 11. Environmental Consequences Summary

Resource	Environmental Consequences		Summary of Emergency Action Alternative Impacts
	No Action	Emergency Action	
Navigation	Adverse	Beneficial	Major beneficial impacts by reopening the MKARNS for navigation.
Land Use	Adverse	Adverse	Minor adverse impacts due to disposal locations, does not majorly affect land use as described.
Geology, Topography, and Soils	Adverse	Adverse	Minor short-term adverse impacts from sediment suspension, movement, and resettlement from dredging and eventual erosion from disposal.
Climate, Climate Change and Greenhouse Gases	No Impact	Adverse	Negligible short-term adverse impacts from the use of heavy machinery to dredge and dispose of sediment.
Air Quality	Beneficial	Adverse	Negligible short-term adverse impacts from the use of heavy machinery to dredge and dispose of sediment.
Noise	No Impact	Adverse	Negligible short-term localized adverse impacts from the use of heavy machinery to dredge and dispose of sediment.
Socioeconomics and Environmental Justice	Adverse	Beneficial	Major permanent beneficial impacts by keeping the MKARNS open for navigation.

Resource	Environmental Consequences		Summary of Emergency Action Alternative Impacts
	No Action	Emergency Action	
Recreation and Aesthetic Resources	Adverse	Adverse	Minor adverse impact to the overall study area, but major permanent adverse impacts to the localized project areas for hunting, fishing, and visual aesthetics.
Cultural, Historical, and Archaeological Resources	Adverse	No Impact	No known impacts to disposal areas, and cultural resources in mitigation locations will be identified, avoided, monitored, and protected.
Hazardous, Toxic, and Radioactive Waste	No Impact	No Impact	No known impacts.
Terrestrial Resources	Adverse	Adverse	Due to the size of the bottomland hardwood disposal location, impacts are expected to be minor.
State Wildlife Management Areas and Listed Species	Adverse	Adverse	Major permanent adverse impacts to the state's waterfowl hunting opportunities due to reduced vegetation, invertebrate, microorganism, and fish communities necessary for waterfowl breeding and nesting.
Federally Listed Threatened and Endangered Species	Adverse	Adverse	Eight species listed as "No Effect," two species listed as "May Affect, but Not Likely to Adversely Affect," and two species (ABB and NLEB) will have a "May Affect, and is Likely to Adversely Affect" determination.

Resource	Environmental Consequences		Summary of Emergency Action Alternative Impacts
	No Action	Emergency Action	
Aquatic Resources	Adverse	Adverse	Major permanent adverse impacts to wetlands. Minor short-term adverse impacts to open water habitat and water quality.

3 Cumulative Impacts

Potentially, the most severe environmental degradation does not result from the direct effects of any particular action, but from the combination of effects of multiple, independent actions over time. As defined in the CFR, 40 CFR 1508.7, a cumulative effect is the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” Some authorities contend that most environmental effects are cumulative because almost all systems have already been modified. Principles of cumulative effects analysis, as described in the CEQ guide considering Cumulative Effects under NEPA, are:

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative effects are the total effects, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (Federal, non-Federal, or private) has taken the actions.
- Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
- It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
- Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative effects may last for many years beyond the life of the action that caused the effects.
- Each affected resource, ecosystem, and human community must be analyzed in terms of the capacity to accommodate additional effects, based on its own time and space parameters.

Past, present, and foreseeable projects include:

- Oklahoma Department of Transportation’s (ODOT) MKARNS Mooring Modernization Project: It will replace existing structures that were not designed for extreme flood events, enhance harbor safety by eliminating damage to infrastructure due to loose barges, and expand the capacity for vessels within the waterway and prepare ports for increased freight demand within the MKARNS (ODOT, 2020). The project is expected to be completed in 2027.
- Implementation of the 2005 Arkansas River Navigation Study: Section 309 of the Water Resources Development Act of 2020 stated that “Any Federal funds, regardless of the account from which the funds were provided, used to carry out construction of the modification to the McClellan-Kerr Arkansas River Navigation System, authorized in section 136 of the Energy and Water Development Appropriations Act, 2004 (117 Stat. 1842), shall be considered by the Secretary

as initiating construction of the project such that future funds will not require a new investment decision."

- Unavoidable pool drawdown resulting from the barges sinking and crashing into the Webbers Falls Pool Lock and Dam, leading to significant environmental and economic impacts to the MKARNS in May 2019.
- Sites considered for sediment disposal in the reasonably foreseeable future are likely to occur in those sites adversely impacted by the Emergency Action. These sites have already been impacted and are expected to be mitigated in other areas as described in Appendix A – Mitigation Plan and Section 4.19. It is likely the wetland disposal sites could be used in the future because they have already been adversely impacted by USACE's Emergency Action.

Topics such as land use, climate and climate change, air quality, and recreation and visual aesthetics, are not addressed in Section 3 because the cumulation of those impacts are negligible in comparison to the overall Arkansas River corridor and would not have long-term or permanent impacts to address on a larger scale.

Navigation

Dredging the 2019 flood sediment from the MKARNS produced cumulative effects to the overall system in Oklahoma and Arkansas. Because the MKARNS spans such a large area, any section that becomes inaccessible impacts both the upstream and downstream functions of navigation. Dredging allowed USACE to remove the sunken barges from the Webbers Falls Pool and to reopen the channel for navigation. This action produced major beneficial cumulative effects, not only for the MKARNS but also for any upstream and downstream reservoirs that are dependent upon the Arkansas River.

Geology, Topography, and Soils

The removal of material due to the Emergency Action disturbed more sediment than under normal conditions. Future construction activities, along with the Emergency Action produced cumulative changes in the amount of sediment entering the system. However, cumulative impacts on soils from this alternative are expected to be minimal.

Socioeconomics and Environmental Justice

The MKARNS extensively contributes to commerce and jobs in the nation and in Oklahoma and Arkansas. It influences approximately $8.5 billion in overall sales with the Oklahoma section contributing approximately $4.5 billion. Port and shippers' activities and transportation costs are the largest contributing factors and produce approximately $6.2 billion in sales. Nationwide, the MKARNS supplies close to 55,872 jobs with Oklahoma delivering 22,761 jobs. Port activities are the biggest contributor to MKARNS jobs in Oklahoma with approximately 8,969 in total (Nactmann, 2015). The Webbers Falls Pool Lock and Dam 16 is an essential component to the system that maintains navigation and commerce. The Emergency Action, although essentially maintaining the channel, produced major beneficial cumulative effects for the nation by keeping opening the channel for navigation.

Cultural, Historical, and Archaeological Resources

The Emergency Action involved no ground preparation; dredge material was excavated and placed directly on the ground surface. Thus, there was a further reduction in any perceived potential to affect historic properties. When analyzed in full, these considerations, both concerning the project specifications and the river geomorphology as it relates to archaeological site potential of the specific locations where dredge was disposed, lead to a firm determination that any cumulative impacts to cultural resources would be non-existent or minor.

Compensatory mitigation will involve intensive cultural resources investigations to identify, delineate, and avoid archaeological sites, and monitoring both during and after construction to ensure the sites are not adversely impacted. Long term monitoring to accomplish continued avoidance of the sites will result in any cumulative impacts to cultural resources being non-existent or minor. Protection of any identified sites by fencing and monitoring of mitigation areas would potentially result in long-term beneficial impacts to the resources.

Terrestrial Resources

The Emergency Action utilized a total of 10 acres of terrestrial habitat for dredged material disposal that was not previously approved by past NEPA documents. This impact, when combined with impacts to terrestrial habitat associated with population growth in the study area, could have cumulative impact on terrestrial habitat. However, as the total loss of terrestrial land amounts to less than 1% of the total terrestrial habitat in the study area, and the majority of areas that would be impacted are agricultural croplands and old field habitats that are not of high quality, cumulative impacts to terrestrial resources would be minor.

State Wildlife Management Areas and Listed Species

Oklahoma manages over 1.4 million acres of fish and wildlife habitat for hunters, anglers, and other recreationists. Although the project area is not the sole source of hunting and fishing opportunity in the state, the MKARNS contributes to the overall area that the state manages. Approximately 77.7 acres of wildlife management areas were impacted because of the Emergency Action, which is less than 1% of ODWC's managed lands. There were minor adverse cumulative impacts to this resource.

Federally Listed Threatened and Endangered Species

Impacts to Federally listed threatened and endangered species are assumed to be cumulative because the listing is presented on a nationwide basis. The ABB and NLEB have been adversely impacted by the Emergency Action. There were 10 acres of unapproved bottomland hardwood disposal areas. This small area in comparison to other land base and critical habitat contributes to a minor adverse cumulative impact to Federally listed threatened and endangered species.

Aquatic Resources

A total of 31.4 acres of emergent wetland, 2.4 acres of forested wetland, and 288.2 acres of open water habitat would be impacted by disposal of dredged material. This amounts to less than 1% of aquatic habitat in the study area. This impact, together with impacts to aquatic habitat associated with reasonably foreseeable future projects would not be cumulatively significant.

Dredging to reopen the navigation channel and disposal of dredged materials would have minor short-term adverse impacts on water quality. These impacts would include increased sediment suspension during dredging within riverbed sediments. However, the overall quantity of sediment disturbed from the Emergency Action combined with that anticipated from existing and foreseeable future activities, is minor in relation to the size of the overall MKARNS. Therefore, adverse impacts to water quality would not be cumulatively significant.

Other past, present, and future activities, including continued and future wastewater and stormwater discharges, mooring modernization, and the projected maintenance or construction of nearby streets, highways, interstates, and associated bridges over the Arkansas River, would affect water quality. These impacts are not expected to be cumulatively significant given the scope of the MKARNS relative to the impacts.

Emergency Action activities associated with this project, other future development or construction projects, and population growth along the MKARNS would produce cumulative changes in the amount of impervious surfaces and runoff in the system. All projects would adhere to local, State, and Federal stormwater control regulations and BMPs which are designed to limit inputs to surface water. Consequently, impacts to surface water would be minimal.

3.1 Indirect Effects

Indirect effects, as defined by the CEQ's regulations, are "caused by the proposed action and occur later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8). Indirect effects differ from direct impacts associated with the construction and operation of a proposed project and are caused by an action or actions that have an established relationship or connection to a proposed project. However, indirect effects can be linked to direct effects in a causal chain, which can be extended as indirect effects that produce further consequences.

As previously discussed, implementation of the Emergency Action would directly result in adverse impacts to the MKARNS study area and the associated vegetation and wildlife. During the emergency work and subsequent precipitation events, there will be increased turbidity and sedimentation downstream of the project area. However, the mitigation regarding these impacts would result in benefits that extend further outside the study area for several notable environmental resources, such as emergent wetlands, forested wetlands, and bottomland hardwood.

The establishment of native plant species in the study area for mitigation efforts will provide significant indirect benefits. The seed production of the vegetation in the study area can be transported downstream, during high water events, and deposited in the Arkansas River banks.

As discussed above, even though portions of the indirect effects study area are located outside the Emergency Action project mitigation limits, these areas would receive ecological benefits resulting from mitigation activities.

3.2 Irretrievable and Irreversible Commitment of Resources

The NEPA requires that Federal agencies identify “any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented” (42 U.S.C. § 4332). Although, the proposed action (the Emergency Action) has already been implemented it is still important to note any resources that may have been committed on behalf of the Federal government.

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g. energy and minerals) that cannot be replaced within a reasonable period. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored because of the action (e.g. extinction of a threatened or endangered species or the disturbance of a cultural site).

The Emergency Action resulted in the direct and indirect commitment of resources. These would be related mainly to dredging and disposal components. Energy typically associated with these activities were expended and irretrievably lost under the Emergency Action. Fuels used during the operation of dredging equipment, barges, placement equipment (e.g. bulldozers, backhoes, etc.) and support vehicles would constitute an irretrievable commitment of fuel resources. The use of such resources would not adversely affect the availability of such resources for other projects both now and in the future.

Benthic communities were removed and lost along with sediment during dredging and placement operations. Benthic communities would also take several years to recover. Slow moving or non-motile fish, wildlife, invertebrates, and plant (aquatic and terrestrial) species would be entrained in the materials during dredging or smothered during placement of the disposal materials. These losses would be irretrievable as well. However, most impacts to the species’ population, would be insignificant. These impacts would have only occurred during the Emergency Action.

4 Compliance with Environmental Laws and Regulations

This EA has been prepared to satisfy the requirements of all applicable environmental laws and regulations and has been prepared in accordance with the CEQ’s implementing regulations for NEPA, 40 CFR Parts 1500 – 1508, and the USACE ER 200-2-2, Environmental Quality: Procedures for Implementing NEPA. The following is a list of applicable environmental laws and regulations that were considered in the assessment and the status of compliance with each:

4.1 National Environmental Policy Act

The NEPA was signed into law on January 1, 1970. It requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions. Section 102 in Title I of the Act requires federal agencies to incorporate environmental considerations in their planning and decision-making through a systematic interdisciplinary approach. Specifically, all federal agencies are to prepare detailed statements assessing the environmental impact of all alternatives to major federal actions significantly affecting the environment. The EA that has been prepared has occurred after-the-fact due to emergency authorization delegated by the SWT District Commander. The CEQ regulations (40 CFR 1506.11) and guidance provide for alternative arrangements for NEPA compliance in emergency situations. Agencies are not to delay immediate actions necessary to secure lives and safety of citizens or to protect valuable resources. The Emergency Action is compliant with NEPA through the after-action analysis of environmental impacts.

4.2 Anti-Deficiency Act

In compliance with the Anti-deficiency Act, 31 U.S.C. § 1341, the implementation of any additional action identified in the Emergency Action alternative is subject to the availability of funding, and no funds will be obligated prior to appropriation or apportionment.

4.3 Fish and Wildlife Coordination Act of 1958, as amended

The Fish and Wildlife Coordination Act (FWCA) requires Federal agencies that impound, divert, channelize, control, or modify waters of any stream or other body of water to consult with the USFWS and appropriate state fish and game agencies to ensure that wildlife conservation receives equal consideration in the development of such projects. From the initial stages of the Emergency Action the USFWS, ODWC, and ODEQ were asked for input and concerns regarding the after-action EA. All agencies provided comments throughout the NEPA process, and the USFWS provided valuable information regarding existing habitat conditions and habitat mitigation options.

A Fish and Wildlife Coordination Act Report (CAR) will be included as an Attachment to Appendix D – Public, Agency, and Tribal Coordination in the Final EA. The CAR will describe potential impacts to natural resources as well mitigation measures that have been prepared regarding the emergency work. Recommendations from USFWS can be integrated into the mitigation plan described in Section 4.19 and Appendix A – Mitigation Plan, where appropriate.

4.4 Endangered Species Act of 1973, as amended

Through informal consultation with the USFWS Oklahoma Ecological Services, the USACE determined the Emergency Action did not adversely affect any species except for the ABB and NLEB. USACE determined the subsequent disposal within bottomland hardwood forest habitat at the site Below Lock 16 by presence, may affect, and is likely to adversely affect ABB. USACE determined the clearing of vegetation for this disposal site, may affect and is likely to adversely affect NLEB. At the time of the Emergency Action, it was not feasible to conduct presence/absence surveys; therefore, the USACE has assumed presence. Avoidance and mitigation at the time of Emergency Action

implementation was not possible. The incidental take associated with the Below Lock 16 disposal site will be permanent and the site will most likely be utilized in the future because it has already been adversely impacted by sediment.

It is assumed that there were beneficial effects for ILT due to the disposal of sediment on islands. The disposal will contribute to quality nesting habitat for ILT due to their preference for sandy materials with little to no vegetation.

USACE has requested formal consultation with USFWS and will submit a BA to the USFWS Oklahoma Ecological Services Office (Appendix B – Biological Assessment), the USACE has not yet received a Biological Opinion from FWS as of the date of this Draft EA. Additional discussion of potential impacts to all of the species evaluated are found in Appendix B – Biological Assessment.

4.5 Executive Order 13186, Migratory Birds and Their Habitats

Sections 3a and 3e of EO 13186 direct Federal agencies to evaluate the impacts of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential adverse impacts on migratory birds. Below Lock 16 bottomland hardwood vegetation was cleared in June and July of 2019. It can be assumed that the Emergency Action resulted in adverse impacts to migratory birds and their habitat. Section 4.19 and Appendix A – Mitigation Plan describe the actions associated with bottomland hardwood forest mitigation that will mitigate the impacts to migratory bird habitat.

4.6 Migratory Birds Treaty Act

The importance of migratory nongame birds to the nation is embodied in numerous laws, executive orders (EO) and partnerships. The Fish and Wildlife Conservation Act (Nongame Act) of 1980 demonstrates the Federal commitment to conservation of nongame species. Amendments to the Nongame Act adopted in 1988 and 1989 direct the USFWS to undertake activities to research and conserve migratory nongame birds. The EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds directs Federal agencies to promote the conservation of migratory bird populations, including restoring and enhancing habitat. The Migratory Nongame Birds of Management Concern is a list maintained by the USFWS. The list helps fulfill a primary goal of the USFWS to conserve avian diversity in North America. Additionally, the USFWS Migratory Bird Plan is a draft strategic plan to strengthen and guide the agency's Migratory Bird Program.

The nonregulated “take” of migratory birds is prohibited under this act in a manner similar to the prohibition of “take” of threatened and endangered species under the Endangered Species Act. Avoidance and minimization did not occur within the bottomland hardwood forest disposal area at Below Lock 16. The area was not surveyed for migratory birds or their nests before the area was cleared for sediment disposal use. It can be assumed that adult birds would not have been impacted by the Emergency Action, but there is the potential that nests and eggs could have been destroyed by the clearing of vegetation in this area.

4.7 Bald and Golden Eagle Protection Act of 1940

The bald eagle is protected by the Bald and Golden Eagle Protection Act even though it has been delisted under the Endangered Species Act. This law, originally passed in 1940, protects the bald eagle and golden eagle (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22).

"Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (16 U.S.C. 668c; 50 CFR 22.3). The 1972 amendments increased civil penalties for violating provisions of the Act to a maximum fine of $5,000 or 1-year imprisonment with $10,000, or not more than two years in prison for a second conviction. Felony convictions carry a maximum fine of $250,000 or 2 years of imprisonment. The fine doubles for an organization. Rewards are provided for information leading to arrest and conviction for violation of the Act.

Bald eagles use large trees along the Arkansas River in the study area for roosting, nesting and foraging. The Emergency Action did not have direct take of bald eagles but could potentially have had a direct impact on their nests due to the vegetation clearing associated with the bottomland hardwood forest site at Below Lock 16. Bald eagles are most likely to use trees between 20 inches to 75 inches DBH for their nests. The vegetation cleared for use of Below Lock 16 averaged between 10 inches and 20 inches DBH. It is unlikely a bald eagle would utilize the area for nesting due to the size of the existing and cleared trees. In addition, bald eagles were not recorded within this specific area during the annual USACE bald eagle survey and due to the size of the nests, it would likely be known if there were any direct impacts. However, one sighting was recorded approximately 0.5 to one mile away on the opposite riverbank and the Oklahoma Natural Heritage Inventory has 12 occurrences of bald eagle in Muskogee County and two occurrences of bald eagle in Sequoyah County which can be assumed as occurring within the immediate area.

4.8 Section 10 of the Rivers and Harbors Act of 1899

Title 33 U.S. Code Section 403 states “That the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same.”

The Emergency Action was not in compliance with Section 10 of the RHA of 1899. It should be noted that the sediment disposed within the Arkansas River was dredged from within the main navigation channel. The Emergency Action was implemented to directly benefit the navigation capacity of the MKARNS.

4.9 Clean Water Act of 1977

The USACE, under direction from the U.S. Congress, regulates discharge of dredged and fill material into waters of the United States, including wetlands. Although USACE does not issue itself permits for construction activities affecting U.S. water, it must satisfy legal requirements of the Act. As a result, a CWA Section 404(b)(1) Analysis was completed for this project and is included as Appendix C – Clean Water Action Section 404(b)(1) Analysis. A water quality certification waiver was received by USACE in regard to the Emergency Action on July 10, 2019 for 1.25 million cys of sediment dredge; however, this does not cover the full amount of dredge required by the end of the Emergency Action. This waiver can be found as an attachment to Appendix C.

The Emergency Action was the implemented plan and was the Least Environmentally Damaging Practicable Alternative compared to the No Action Alternative. The Emergency Action altered 33.8 acres of wetlands and 288.2 acres of open water. Compensatory wetland mitigation is required and described in Section 4.19 and Appendix A – Mitigation Plan.

No net loss of open water occurred under the Emergency Action because the sediment dredged and disposed within the channel was a result of the 2019 flooding; however, there were 33.8 acres of wetlands lost resulting from sediment disposal and approximately 350,000 cys of dredging not covered under the original 2019 waiver. The USACE will provide the ODEQ with a copy of the CWA Section 404(b)(1) Analysis for review as part of the State Water Quality Certification under Section 402 of the Federal Clean Water Act to ensure the implemented project did not significantly alter WQS (see Appendix C – Clean Water Act Section 404(b)(1) Analysis).

Construction that disturbs upland areas (land above Section 404 jurisdictional waters) is subject to the National Pollutant Discharge Elimination System (NPDES) requirements of Section 402(p) of the Clean Water Act. In Oklahoma, ODEQ is the permitting authority and administers the NPDES. Operators of construction activities that disturb 1 or more acres must prepare a Storm Water Pollution Prevention Plan (SWPPP), submit a Notice of Intent to ODEQ and obtain authorization under General Permit OKR10 for Storm Water Discharges from Construction Activities, conduct onsite posting and periodic self-inspection, and follow and maintain requirements of the SWPPP. During construction, operators must assure that measures are taken to control erosion, reduce litter and sediment carried offsite (silt fences, hay bales, sediment retention ponds, litter pick-up, etc.), promptly clean-up accidental spills, use BMPs onsite and stabilize sites against erosion before completion.

The USACE did not obtain a NPDES permit with ODEQ before conducting the clearing on disposal site Below Lock 16. In addition, a berm was constructed around the perimeter of the Below Lock 16 site with disposed sediment. Construction of this berm is likely the only activity that would have caused stormwater runoff, but the entirety of the berm is less than one acre in size.

4.10 National Historic Preservation Act of 1966, as amended

Federal agencies are required under Section 106 of the NHPA to “take into account the effects of their undertakings on historic properties” (cultural resources with information potential, and thus significance) and consider alternatives “to avoid, minimize or mitigate the undertaking’s adverse effects on historic properties” [(36 CFR 800.1(a-c)] in consultation with the SHPO and appropriate federally recognized Indian Tribes (Tribal Historic Preservation Officers [THPO]) [36 CFR 800.2(c)]. In accordance with this and other applicable regulations, including NEPA, the NAGPRA, and ER 1105-2-100, USACE has reviewed the Oklahoma State Files and archaeological survey reports to better determine the existing conditions and potential to have impacted cultural resources.

Section 106 compliance for the dredge disposal component of the Emergency Action was achieved by a thorough analysis of existing geomorphological and archaeological information pertaining to the dredge disposal locations. Geomorphological investigations in the Webbers Falls Pool area have demonstrated that alluvium dates to the recent Holocene Period, and that in many areas no potential for cultural horizons pre-dating the Historic Period exists in soil horizons above two meters in depth. Additionally, the dredge disposal did not involve any ground preparation due to the emergency nature of the dredging. The Tulsa District determined that the emergency dredge disposal portion of the subject federal action did not have the potential to affect historic properties. Therefore, an archaeological investigation (or damage assessment) is not necessary for the emergency dredge disposal action.

However, due to differences in settings and the extent of planned actions, the compensatory mitigation required to reduce the significance of the Emergency Action’s adverse impacts to natural resources will require additional consideration under Section 106 of the NHPA. The compensatory mitigation is currently in the planning phase. As plans and designs are formalized, cultural resources will continue to be taken into consideration in accordance with Section 106 and implementing regulations. The areas currently under consideration for mitigation activities are located in settings along portions of the MKARNS that have a higher probability of encountering cultural resources. Cultural resources will be avoided completely, along with a defined buffer around site boundaries, and therefore will not be impacted by the proposed mitigation activities. However, in order to be avoided, cultural resources must first be identified.

Cultural resources surveys, including deep testing where appropriate for the proposed mitigation designs, will be undertaken to assist in finalizing locations for the proposed mitigation. Surveys will be performed and reported in accordance with USACE SWT requirements, and in coordination with the Oklahoma SHPO and Tribal Nations who have an interest in the locations or whose ancestral or historic homelands include the proposed locations. All surveys will be conducted by professional archaeologists meeting the requirements established in Secretary of the Interior's Standards and Guidelines (36 CFR Part 61), under ARPA permits issued by SWT, and in accordance with all relevant laws, regulations, and executive orders.

4.11 Archaeological Resources Protection Act

The ARPA of 1979 compels federal land-holding agencies to protect archaeological sites and artifacts on government land from looting, vandalism, and trafficking, enforce penalties, both Civil and Criminal, against violators of the Act, and better manage archeological sites on public land.

The Tulsa District complied with ARPA by monitoring archaeological sites exposed by the rapid lowering of the water caused by the barges colliding with the gates at Webbers Falls. The emergency dredging was required in order to access and remove the barges and repair the gates. The reduction in water levels, while not a federal action, was of great concern to SWT. Specifically, this concern related to federal responsibilities under ARPA and NAGPRA. Tulsa District archaeologists monitored exposed archaeological sites for any evidence of looting or vandalism. Multiple District personnel increased regular patrols of prioritized areas to identify and deter any looting activity and ensure protection of the archaeological resources. In addition to this internal response, SWT coordinated with law enforcement officers with ODWC and with resource personnel at Camp Gruber to conduct patrols of specific areas as well. Archaeological monitoring activities of this nature were conducted by SWT for the full extent of the pool drawdown, with only minor collecting activities observed at Webbers Falls, and no major looting damage during this event. The Tulsa District notified and was in contact with the Oklahoma SHPO, Oklahoma Archeological Survey, and several Tribal Nations regarding these efforts.

ARPA compliance for the compensatory mitigation required by the impacts of the emergency action will be attained by the issuance of ARPA permits required for all cultural resources investigation on SWT lands, and by monitoring of construction, ongoing mitigation activities, and site conditions. Archaeological Resources Protection Act permitting requirements allow Tulsa District oversight of proposed cultural resources survey work plans, methodologies, fieldwork, and reporting.

4.12 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act, passed in 1990, directs federal land-holding agencies to protect Native American burials and burial sites on federal fee lands. This Act additionally sets out procedures for conducting inventories and repatriations of Native American human remains and funerary objects.

As mentioned in Section 4.12, SWT coordinated with appropriate agencies to ensure protection of burials and funerary features. Monitoring was conducted by SWT for the full extent of the pool drawdown, and no disturbance (or evidence of prior disturbance) of burials or funerary features was observed.

The emergency dredging allowed removal of the barges and repair of the gates, resulting in reestablishment of the Webbers Falls normal pool level. The dredging itself was not a concern, as its purpose was to remove silt redeposited during flooding. The dredge was disposed on the unprepared modern ground surface, and no cultural items were observed. However, proposed mitigation requirements will involve both cultural resources investigations and grading associated with mitigation designs, and there is a possibility that human remains or funerary features could be inadvertently discovered.

The U.S. Army Corps of Engineers will comply with NAGPRA and its implementing regulations.

If an inadvertent discovery is made during on-going activity on Federal lands, such as cultural resources investigations or any actions associated with compensatory mitigation, all activity must cease within a predefined perimeter around the inadvertent discovery, and a reasonable effort made to protect the discovery. The agency must be notified immediately by phone, and the medical examiner and law enforcement must be called to make a determination that the remains are not modern, and the location is not a crime scene. Once this determination has been made, the agency will secure and protect the discovery location and notify the appropriate Tribes of the discovery.

Activity resulting in the inadvertent discovery may resume thirty days after the Federal agency acknowledges receipt of written confirmation and notification or upon execution of a binding agreement between the Federal agency and the affiliated Tribe(s) that provides a recovery plan for excavation or removal. To avoid potential delays and provide greatest protection to human remains or funerary features, a NAGPRA Plan of Action may be executed between the Federal agency and Tribal Nations (those in whose aboriginal or historical homelands the work is being performed, and those who express an interest in the area).

4.13 Clean Air Act of 1977

The CAA requires Federal agencies to review air emissions from projects receiving Federal funds or permits to ensure conformity with State Implementation Plans in non-attainment areas. Oklahoma is currently in attainment for air emissions, and the Emergency Action is not expected to have altered attainment status given its relatively small construction footprint and the normal maintenance that occurs within the channel. Therefore, the Emergency Action Alternative is in compliance with the CAA and does not require a General Conformity Determination.

4.14 Farmland Protection Policy Act (FPPA) of 1980 and 1995 and CEQ Memorandum dated August 11, 1980

The FPPA's and the CEQ Memorandum's purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. The dredging and disposal associated with the Emergency Action did not have any adverse impacts on Prime Farmlands. However, mitigation will be required to compensate for lost habitats resulting from the Emergency Action. There will be a total of approximately 132 acres associated with compensatory mitigation that are Prime Farmland. A Farmland Conversion Impact Rating (Appendix D – Public, Agency, and Tribal Coordination) has been prepared and will be provided to the Natural Resources Conservation Service (NRCS) upon release of the Draft EA.

4.15 Executive Order 11990, as amended, Protection of Wetlands

Executive Order 11990 directs Federal agencies to take action in the conservation of wetlands. Agencies should take part in avoiding possible degradation or destruction of wetlands and promote wetland health. The Emergency Action did not comply with EO 11990 to minimize degradation or destruction of Federal wetlands and improve the circumstances for natural wetlands and their benefits on the environment. Loss of

wetland habitat occurred within disposal sites as described in Section 1. However, mitigation for wetland habitat will be implemented and is described in Section 4.19 and Appendix A – Mitigation Plan.

4.16 Executive Order 11988, as amended, Floodplain Management

Executive Order 11988: Floodplain management was enacted May 24, 1977, in furtherance of the NEPA of 1969, as amended (42 U.S.C. 4321 et seq.), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 et seq.), and the Flood Disaster Protection Act of 1973 (Public Law 93-234, 87 Star. 975). The purpose of the EO was to avoid, to the extent possible, long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

The EO states that each agency will provide and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for: 1) acquiring, managing, and disposing of Federal lands and facilities; 2) providing Federally undertaken, financed, or assisted construction and improvements; and 3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Because the amount of sediment disposed in wetland and open water sites was dredged from within the channel due to the 2019 flooding, it can be assumed there was a no net-loss of floodplain due to the Emergency Action. Elements of the Emergency Action would neither increase or decrease the floodplain capacity within the study area. Therefore, the Emergency Action Alternative complies with EO 11988.

4.17 Executive Order 13112 and 13751, Invasive Species

Executive Order 13112 recognizes the significant contribution native species make to the well-being of the natural environment and directs Federal agencies to take preventive and responsive action to the threat of the invasion of non-native plants and wildlife species in the United States. This EO establishes processes to deal with invasive species, and among other items, establishes that Federal agencies “will not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

Executive Order 13751 of 2016 amends EO 13112 to maintain the National Invasive Species Council (Council) and the Invasive Species Advisory Committee, expands the membership of the Council; clarifies the operations of the Council; incorporates considerations human and environmental health, climate change, technological innovation, and other emerging priorities into Federal efforts to address invasive species; and strengthens coordinated, cost-efficient Federal action.

Although operations of the Emergency Action did not actively consider the effects of invasive species, it is expected that dredging and disposal did not promote the establishment of invasive species within the project area. In addition, sediment dredged from the MKARNS channel is not expected to have held materials that do not already exist within the Arkansas River Basin. The mitigation enacted as a result of the Emergency Action would reduce the abundance of invasive plant species by maintaining through herbicide or physical controls, as well as replacing those areas with native vegetation. Therefore, the emergency action is in compliance with EO 13751.

4.18 Executive Order 12898, Environmental Justice

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations, Feb. 11, 1994, requires all Federal agencies to identify and address disproportionately high and adverse effects of its programs, policies, and activities on minority and low-income populations. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Data were compiled to assess the potential impacts to minority and low-income populations within the study area. The Emergency Action better protects minority and low-income populations through the dredging and disposal of sediment to open the MKARNS channel for navigation purpose. No adverse impacts to environmental justice occurred as a result of the Emergency Action Alternative.

4.19 Mitigation

Environmental impacts are identified by resource category and are characterized by their relative magnitude as described in Section 2. A summary of mitigation measures is shown in Table 12. The first result of implementation of the mitigation measures proposed is, where possible, adverse impacts were avoided or minimized. When avoidance or minimization of impacts was not achievable, adverse impacts to the environment resulting from the Emergency Action will be mitigated through compensation. Determination of the required function and value of the impact and mitigation was performed through analytical and quantitative analysis. Implementation of the mitigation measures will compensate or rectify all adverse impacts to the environment if any of the project alternatives are carried out. To ensure the desired results of the mitigation measures are achieved, a long-term monitoring program and adaptive management plan is being developed to make modifications to measures when necessary to achieve the intended quality outputs. A more in-depth description of proposed mitigation can be found in Appendix A – Mitigation Plan.

Table 12. Summary of Proposed Mitigation Measures

Habitat Type	Mitigation Category	Mitigation Description
Emergent Wetland	Compensation	The following mitigation measures on 78.5 acres of USACE fee-owned property converted from agricultural use to emergent wetland habitat: • Light grading to achieve natural contours, if necessary • Temporary erosion control and stabilization in bare areas (BMPs) • Native emergent and submergent vegetation planting • Control of exotic and invasive vegetation • Permanent fence installation and/or native riparian shrub and tree buffer
Forested Wetland	Compensation	The following mitigation measures on 10.8 acres of USACE fee-owned property converted from agricultural use to forested wetland habitat: • Light grading to achieve natural contours, if necessary • Temporary erosion control and stabilization in bare areas (BMPs) • Native emergent and submergent vegetation, as well as native shrub and hardwood tree planting • Control of exotic and invasive vegetation • Permanent fence installation and/or native riparian shrub and tree buffer
Bottomland Hardwood Forest	Compensation	The following mitigation measures on 15 acres of USACE fee-owned property converted from agricultural use to bottomland hardwood habitat:

Habitat Type	Mitigation Category	Mitigation Description
		• Temporary erosion control and stabilization in bare areas (BMPs) • Native shrub and tree planting • Control of exotic and invasive vegetation • Permanent fence installation
Open Water	Self-mitigating	Open water habitat impacts are self-mitigating through substitution of habitat due to the change in substrate elevations. This change can be considered a benefit to micro/macro invertebrates, fish, reptiles, waterbirds, waterfowl, and hydrophytic plants by providing new habitat in the aquatic system.

5 Public, Agency, and Tribal Coordination

The Tulsa District has and will continue to coordinate with local, state and Federal agencies, tribes, the public and interested parties through comment periods, email exchanges, social media, and news releases as the EA and mitigation progress to the next phases.

During the after-action assessment, electronic copies of a Public Notice were emailed to each agency, tribe, and stakeholder as shown in Appendix D – Public, Agency, and Tribal Coordination. All coordination in 2020 and 2021 between the Federal government and the public was virtual due to the COVID-19 pandemic. The general public was notified of the public scoping period using SWT's Public Affairs Office social media accounts.

The USACE began its public involvement process with a public scoping comment period to provide an avenue for public and agency stakeholders to ask questions and provide comments. The public scoping comment period began August 20, 2020 and ended September 20, 2020.

Agency coordination was conducted using formal and informal forms of communication including teleconferences, email, phone calls, and webinars. In addition, a separate virtual meeting was coordinated with state and federal agencies to describe the impacts of the emergency action and the ongoing work on October 28, 2020.

The agencies below were actively invited to participate in the scoping process of the EA and were notified of major changes and results of site assessment.

- USFWS,
- EPA,
- ODWC, and
- ODEQ

5.1 Native American Tribes

The Tribal Nations below were actively invited to participate in the scoping process of the EA and were notified of major changes and results of site assessment. The USACE will continue to consult with these Tribal Nations throughout the duration of the project.

- The Caddo Nation
- The Cherokee Nation
- The Chickasaw Nation
- The Choctaw Nation of Oklahoma
- The Muscogee (Creek) Nation
- The Osage Nation
- The Quapaw Nation
- United Keetoowah Band of Cherokee Indians in Oklahoma
- Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie)

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7 Acronyms and Abbreviations

%	Percent
°	Degrees
BMP	Best Management Practice
BP	Before Present
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations

cfs	Cubic Feet per Second
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO2e	CO2-equivalent
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EP	Engineer Pamphlet
ER	Engineer Regulation
F	Fahrenheit
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
msl	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO	Nitrogen Oxide
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRRS	National Recreation Reservation Service
O_3	Ozone
OAQPS	Office of Air Quality Planning and Standards
Pb	Lead
PCB	Polychlorinated Biphenyls
PCPI	Per Capita Personal Incomes
$PM_{2.5}$	Particulate Matter Less than 2.5 Microns
PM_{10}	Particulate Matter Less than 10 Microns
ROD	Record of Decision
RPEC	Regional Planning and Environmental Center
SGCN	Species of Greatest Conservation Need
SO_2	Sulfur Dioxide

TCAP	Texas Conservation Action Plan
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characteristic Leaching Procedure
TPWD	Texas Parks and Wildlife Department
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds

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