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Arkansas River Corridor Feasibility Report



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**US Army Corps
of Engineers** ®
Tulsa District



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Draft Report

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Tulsa District
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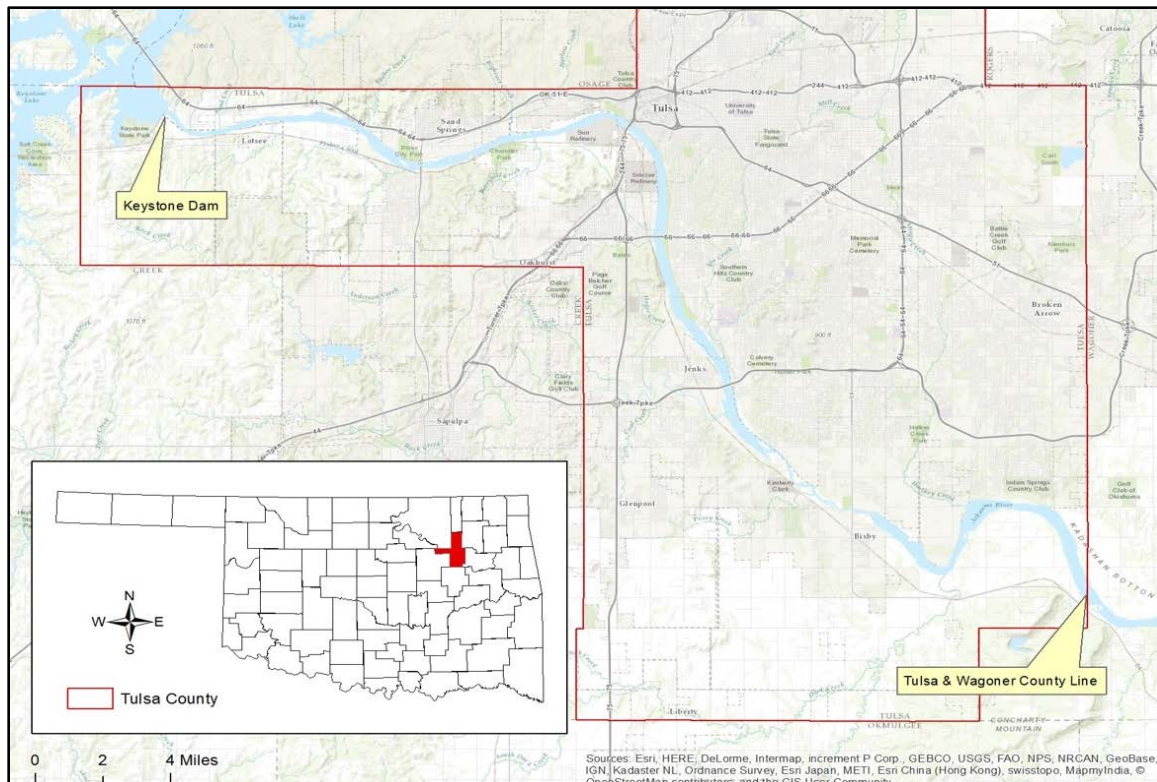
1 EXECUTIVE SUMMARY

2 The purpose of the Arkansas River Corridor Feasibility Study is to evaluate the components of
3 the October 2005 Arkansas River Corridor (ARC) Master Plan and determine if there is a
4 Federal interest that aligns with the U. S. Army Corps of Engineers (USACE) mission areas.
5 The study area includes the 42-mile long Arkansas River Corridor ecosystem downstream of the
6 Keystone Dam to the Tulsa/Wagoner County boundary (Figure ES1). Key tributary streams
7 include, but are not limited to, Prattville Creek at Sand Springs, Crow Creek in Tulsa, and
8 Vensel Creek at Jenks. The study area is confined to within the existing banks of the Arkansas
9 River.

10 The study identifies ecosystem restoration measures to restore the 42-mile riverine ecosystem
11 within the Arkansas River Corridor that has been degraded since the installation of Keystone
12 Dam and operation of the associated hydropower generation plant. The Resource of National
13 Significance for the study is the Interior Least Tern (*Sterna antillarum*), a Federally listed
14 endangered species that depends upon sandbar islands within the river for nesting habitat.

15 The generation of hydropower at Keystone Dam, which has been in operation since 1968, has
16 had a significant influence over the health and ultimate degradation of the ecosystem within the
17 study corridor. The dam houses two hydropower-generating turbines with a power-generating
18 capacity of 80 megawatts with a full-power discharge from the reservoir of 12,000 cubic feet per
19 second (cfs). The Southwestern Power Administration (SWPA) markets the hydroelectric power
20 in the area from the USACE-operated multipurpose dam. SWPA's current authorization is to
21 produce only peak power which also impacts flow release schedules. The power discharge
22 schedules are tentative and subject to change at any time to meet power demands. Outside of
23 hydropower, USACE may also schedule releases for purposes of flood risk management.

24 The impacts on the aquatic and riparian ecosystem within the study area from Keystone Dam
25 and associated operations are dramatic. The dam is a physical barrier for natural river flow and
26 connectivity, sediment transport, and migratory and spawning life histories of native fauna.
27 During hydropower generation, the associated 6,000-12,000 cfs flow release sustains a flowing
28 river reach throughout the study area. Flood pool releases from Keystone Dam maintain river
29 flow between hydropower operations. As summer progresses and precipitation becomes less
30 frequent, water levels behind the dam drop below flood pool level and into the conservation
31 pool. Once in the conservation pool, typically by mid-to-late June, the only water released
32 downstream is via hydropower turbines to meet peak energy demands. As noted above,
33 hydropower generation occurs on an on-demand basis. As a result, the current flow regime
34 within the study area exhibits daily bouts of brief 6,000-12,000 cfs river flow followed by
35 extended periods of near zero river flow from Keystone Dam. Without releases from Keystone,
36 the Arkansas River within the study area is reduced from a flowing river to stagnant isolated
37 pools and a disconnected floodplain habitat lasting from several hours during the week to
38 several days over the weekend. This creates an incredibly disruptive, unnatural flow regime
39 impacting all aquatic and riparian habitat types as well as the flora and fauna throughout the
40 study area. While the drying of rivers is a naturally occurring process in the southwestern region
41 of the United States, those conditions are generally experienced in smaller drainages and
42 during extended severe droughts. In the study area, flooding and drought conditions are
43 exacerbated beyond this natural drying process by the impacts of Keystone Dam and
44 hydropower releases.



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2 **Figure ES 1: Arkansas River corridor study area location amp**

3 The dam also traps a significant amount of sediment resulting in downstream sediment-starved
4 flow causing channel and tributary incision and bank erosion. The impacted geomorphology has
5 resulted in streambank erosion and the destruction of riverine wetlands, backwaters, and
6 slackwater habitats that were once important fish nurseries and feeding/resting areas for
7 resident and migrant waterfowl. As an example, the current mouth of Prattville Creek is an
8 erosional shortcut to the Arkansas River, bypassing nearly one mile of the original Prattville
9 Creek channel, caused in part by Arkansas River channel down cutting.

10 Within the study area, Federally listed endangered Interior Least Terns annually nest on the
11 sandbar islands. As river flow diminishes and the river bed is exposed, the sandbar islands
12 become connected to the shoreline. This fluctuating flow cycle coincides with peak Interior
13 Least Tern nesting activities in the study corridor, exposing the nesting colonies to inundation
14 during high flows, and human and predator disturbances when low flows create land bridges to
15 sandbar islands. The low flow conditions also induce Interior Least Terns to nest in unsuitable
16 low-lying areas. Hours or days later when river flows return, the low-lying nests have a higher
17 probability of being swept into the river. Both inundation and low flow conditions contribute to
18 nesting failure in the Arkansas River Corridor.

19 Without river flow, the remaining shallow, isolated pools subject trapped fish, fish eggs and
20 larvae, and aquatic invertebrates to increased predation, intolerable environmental conditions,
21 and desiccation if river flow does not return in time. The disconnected river reaches and
22 exposed river bed created by low flow conditions severely impact the ability of migratory fish,
23 such as the Paddlefish (*Polyodon spathula*), Shovelnose Sturgeon (*Scaphirhynchus*
24 *platyrhynchus*), and Sauger (*Sander canadensis*) to reach upstream spawning habitat within the
25 backwater and slackwater habitats. These and other native fish species require continuous
26 flows to prevent egg desiccation and to suspend larval offspring before they are fully mobile.

1 Along the shorelines, a variety of vegetation types including aquatic, emergent, shoreline, and
2 moist soil dependent communities face similar challenges in a low flow condition. These
3 habitats provide the vegetative structure necessary for refuge and critical nesting and nursery
4 life for numerous species across all fauna. In addition, these habitats supply the base of the
5 food web throughout the study area. Seed, zooplankton, forage fish, and insect production are
6 all dependent on the presence and function of these habitats. The low or no-flow conditions
7 disconnect the above described habitats from the hydrologic regime they require to sustain
8 growth. The result is a diminished food base with limited foraging opportunities, reducing the
9 carrying capacity of the study area. Nesting Interior Least Terns, migratory waterfowl, migratory
10 fish, amphibians, bats and all other species that forage on small fish, seeds, zooplankton, and
11 insects are faced with sustenance shortfalls.

12 Additionally, the lack of adequate water promotes the desiccation of aquatic and riparian
13 vegetation communities that naturally stabilize the riparian corridor. Without the vegetation
14 communities, erosion, and marginalization of the remaining habitat would continue when higher
15 river flows return.

16 Measures identified for the ecosystem restoration of the Arkansas River Corridor to a more
17 resilient and sustainable condition include a pool control structure located at river mile 530 to
18 help regulate flows released in the corridor from hydropower generation, Rock Riffle and
19 Wetland Plantings at Prattville Creek, and a Constructed Sandbar Island located just upstream
20 of the Tulsa/Wagoner County line where the river more closely resembles a braided prairie
21 stream. Table ES1 lists the final array of alternative, or “best buy”, plans.

22 Alternative 5 is the recommended/National Ecosystem Restoration (NER) plan. With the
23 implementation of the NER plan more natural river flow would return to 42 river miles of the
24 Arkansas River within the study area. The NER plan would provide approximately 2,144 acres
25 of additional riverine habitat, nearly doubling the amount of currently available habitat under low
26 flow conditions. Also five acres of restored wetlands, and three acres of reliable sandbar island
27 habitat where none currently succeed, would be restored as part of the NER plan. Shoreline,
28 river, backwater, slackwater, wetland, and sandbar island habitat quality would all be improved
29 generating an overall increase in the ecosystem quality and carrying capacity at a first cost of
30 approximately \$109.4 million (October 2016 prices).

31 Restoration of the Arkansas River Corridor would add to the larger existing habitat complex of
32 the Arkansas River. The current intermittent flow regime reduces the river to isolated pools
33 dotting the 42 river mile reach. Implementation of the NER would increase the river’s surface
34 water from 1,591 acres to 3,735 acres and most importantly, provide a continuous river flow of
35 1,000 cfs from the pool structure to the Tulsa/Wagoner County line. Restoring river flow,
36 wetlands, and sandbar habitat would greatly benefit the Federally listed endangered Interior
37 Least Tern. The sustained river flows provided by the NER maintains nesting habitat and forage
38 fish species. Restored wetlands increase forage fish abundance to support a growing Interior
39 Least Tern population. Constructed a sandbar island to withstand higher flow rates providing
40 additional nesting habitat during elevated river stages.

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1 **Table ES1: Final Array of Alternatives (Best Buy Plans)**

Measures	Alternatives								
	1	2	2a	3	4	5	6	7	8
No Action	X								
Pool structure located at Keystone Lake Project reregulating dam (river mile 531)		X	X						
Pool structure located at Keystone Lake Project reregulating dam (river mile 531) + Prattville Rock Riffle and Wetland Plantings +New Interior Least Tern Island				X	X	X	X	X	X
Pool structure located at river mile 530			X		X	X	X	X	X
Pool structure located at river mile 530 + Prattville Rock Riffle and Wetland Plantings			X			X	X	X	X
Pool structure located at river mile 530, Prattville Rock Riffle and Wetland Plantings +New Interior Least Tern Island							X	X	X
Pool structure located at river mile 530, Prattville Rock Riffle and Wetland Plantings, New Interior Least Tern Island + Riverside Rock Riffle and Wetland Plantings								X	X
Pool structure located at river mile 530, Prattville Rock Riffle and Wetland Plantings, New Interior Least Tern Island, Riverside Rock Riffle and Wetland Plantings +Riverside Riparian Plantings									X

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3 The restoration of connected river reaches also expands migratory routes for native fish in the
 4 Arkansas River Corridor and provides them access to side channel and backwater habitat they
 5 use for refuge, spawning, and nursery habitat. As evidenced by the numerous conservation and
 6 management cooperatives established to address adverse impacts to avian populations in
 7 North America, migratory birds are of great ecological value and contribute immensely to
 8 biological diversity. These same backwater areas and vegetated shorelines also provide food
 9 and cover for millions of waterfowl and migratory birds that utilize the Central Flyway. The study
 10 area lies along the eastern fringe of the Central Flyway and likely supports regular Mississippi
 11 Flyway migrants as well. The restored Arkansas River Corridor would provide tremendous
 12 additional habitat to support winter and summer migrants as the study area is positioned at a
 13 relative midpoint location for many species migration routes.

14 The riparian corridor that brackets the study area would be further supported by continuous river
 15 flow provided by the NER. Currently, the shorelines are subjected to frequent bouts of drying
 16 followed by high flow events. This constant shift in water levels subjects the shorelines to
 17 increased erosion and fosters invasive species encroachment. The NER provides a more stable
 18 flow regime to support native riparian vegetation growth. Native vegetation naturally stabilizes
 19 shorelines providing habitat and reducing the need for expensive constructed shoreline
 20 stabilizing measures that offer little habitat.

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1 The Arkansas River Corridor project recommended plan:

- 2 • fulfills the U.S. Army Corps of Engineers restoration mission,
- 3 • is in accordance with the USACE Civil Works Strategic Plan,
- 4 • is in accordance with the USACE Environmental Operating Principles,
- 5 • is in compliance with USACE restoration and recreation policies,
- 6 • is sustainable through the application of geomorphologic principles for sediment
- 7 transport, hydraulic modeling, native vegetation species survivability, and synergistic
- 8 effects,
- 9 • restores biological and environmental resources that were present prior to the
- 10 construction of the Keystone Dam,
- 11 • restores nesting habitat for the Federally listed endangered Interior Least Tern,
- 12 • complements other Federal, state, and local restoration programs and projects,
- 13 • demonstrates ecosystem restoration co-exists effectively with the existing Keystone
- 14 Dam and associated Tulsa Levee project purpose of flood risk management, and
- 15 hydropower production,
- 16 • is supported by U.S. Fish and Wildlife Service, and Oklahoma Department of Wildlife
- 17 Conservation, and
- 18 • has widespread local support.

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20 Tulsa County is identified as the non-Federal sponsor. Tulsa County and the City of Tulsa
21 support the recommended plan and, should the plan be approved, intend to participate in its
22 implementation. The draft Feasibility Study with integrated Environmental Assessment and draft
23 Finding of No Significant Impacts (FONSI) were available for public review February 6 – March
24 06, 2017 and a public meeting was held in the study area February 27, 2017.